

**THE LIFE AND WORK OF MICHAEL SENDIVOGIUS (1566-1636)**

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## Abstract

Despite the great popularity of the works of the Polish alchemist Michael Sendivogius through the seventeenth century and well into the eighteenth century, historians of chemistry have paid little attention to the ideas contained in them or attempted to establish why the work continued to find a wide readership well into the period increasingly dominated by the mechanical philosophy.

The neglect of Sendivogius is due, in part, to the romantic legends, which are only now being replaced by a more reliable biographical account.

In this thesis a revised biography, hitherto accessible only in recent Polish works, introduces an extended analysis and reevaluation of the central concepts of Sendivogius' major work, the *Novum Lumen Chymicum* (1604). The work, based on practical laboratory experience and centred on a grand theory involving nitre, played a significant role in shifting the attention of chemists and natural philosophers towards a study of air and its role in manifold processes on the earth, particularly in combustion and respiration.

A new and extensively revised bibliographical examination of Sendivogian works has been undertaken, with particular reference to French language editions:

i. The *Treatise on Salt* is analysed, and reasons suggested for its recognition as a genuine Sendivogian work.

ii. The *Statutes of the Unknown Philosophers* is translated and analysed, and the significance of its

publication during the period of the Rosicrucian manifestos discussed.

An analysis of the ideas of John Mayow (1641-1679) in his *Tractatus Quinque* (1674) is undertaken to illustrate the continuing influence of Sendivogius' ideas, and similarities and contrasts between Mayow's 'nitro-aerial spirit' and Sendivogius' 'Central Nitre' theory are examined.

The thesis presents new evidence for the recognition of Sendivogius' ideas as important for the emergence of a number of seminal modern concepts regarding nitre, air, combustion and respiration.

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## Introduction

Until about thirty years ago, the main interest in Michael Sendivogius (1566-1636) was in his remarkable life as a nobleman of Slavic origin who supposedly possessed the secret of transmuting base metals into gold (1). During his lifetime he was supposedly involved in remarkable escapades with emperors and kings which involved him in imprisonment and torture. He thus became a well known personality throughout Europe.

In 1867 the Polish artist Jan Matejko painted a famous scene depicting Sendivogius holding a transmuted gold coin in front of king Zygmunt III Waza and his court. Even today, it is possible to buy in Poland a slide strip entitled: *Jak Mistrz Sędziwój latał, or How Maestro Sendivogius flew* which describes his escape from a burning tower in which he was imprisoned.

With biographical interest focused on his colourful adventures, it is scarcely surprising that Sendivogius has not been recognised as having contributed significantly to philosophy or science. Nevertheless, historians of chemistry had expressed some interest in him, by virtue of a book entitled *Novum Lumen Chymicum* (translated into English as *A New Light of Alchymie*) which was arguably attributed to Sendivogius, and had a wide readership throughout Europe during the seventeenth century. The opinions expressed by historians, even Poles, have not been favourable. In 1954 Emilian Ostachowski wrote:

"One could therefore divide alchemists into two groups. In the first group one ought to include those who practised the art of alchemy for financial reasons only, and to the other - those whose activity was prompted by the thirst for



knowledge. SĘDZIWIÓJ ought to be reckoned rather among the first group, for he did not enrich the science with any valuable contribution." (2)

In his encyclopedic work, *A History of Chemistry*, John Partington included Sendivogius among the major chemists of his time, but he concluded the short biographical section on him by remarking that:

"Even the existence of Sendivogius is doubtful." (3)

In the 1975 edition of the *Dictionary of Scientific Biography*, Włodzimierz Hubicki wrote of Sendivogius:

"His alchemical writings had no influence on the development of chemistry, but his treatise *De lapide philosophorum* is of great value for the history of science." (4)

The question therefore arises: why have historians arrived at such a negative assessment of Sendivogius? A partial answer to this issue has recently been provided by Cherry Gilchrist:

"Occasionally a legend can actually devalue the work of an alchemist, as in the case of Michael Sendivogius... Careful research by both Professor Hubicki and Professor Bugaj has shown that this story [she had earlier described the legend about Sendivogius and his reputed relationship with the the Scottish alchemist Alexander Seton] is a fabrication, probably invented in the seventeenth century by a Frenchman, Pierre Des Noyers, who had a dislike of Poles in general and of Sendivogius in particular. It has been perpetuated in various histories of alchemy until the present day." (5)

A further reason, as I suggest below, was Sendivogius' obsession with anonymity.

During the past thirty years or so, scholarly research has shown that Sendivogius was the author of several short works, which had a significant influence on the development of certain branches of natural philosophy throughout Europe during the seventeenth and eighteenth centuries (6). The aim of the present thesis is to contribute a further

reevaluation of Michael Sendivogius' role in the history of chemistry by bringing to light fresh evidence concerning his person and his writings.

#### Notes

1. Numerous accounts exist, of which the better known are:
  - (a) A.E. Waite, *Lives of the Alchemystical Philosophers* (London, 1888), 175-181.
  - (b) J. Partington, *A History of Chemistry* (London, 1969), 2, 426-429.
  - (c) J. Ferguson, *Biblioteca Chemica* (Glasgow, 1906), 2, 368-369.
  - (d) J. Read, *Humour and Humanism in Chemistry* (London, 1947), 50-65.
  - (e) E. Holmyard, *Alchemy* (Harmondsworth, 1968), 223-238.
2. E. Ostachowski, "Michael Sendivogius, the Polish Alchemist", *Archives Internationales d'Histoire des Sciences* 33 (Paris, 1954), 274.
3. J. Partington, *op.cit.*, 427.
4. W. Hubicki, *op.cit.*, 12, 308.
5. C. Gilchrist, *Alchemy. The Great Work*. (Wellingborough, 1984), 86-87.
6. (a) W. Hubicki, "Michael Sendivogius' Theory, its Origin and Significance in the History of Chemistry", *Actes X Congrès International d'Histoire des Sciences*, Ithaca, 1962, 2 (Paris, 1964), 829-833.
  - (b) K. Lubinski, *Michał Sędziwój, najświetniejszy polski alchemik, jako poszukiwacz kamienia filozoficznego* [Michael Sendivogius, the most famous Polish alchemist, and his quest for the philosopher's stone.] (Ph.D. thesis, Gdańsk Medical Academy, 1964).
  - (c) R. Bugaj, *Michał Sędziwój (1566-1636) Życie i Pisma* [Michael Sendivogius (1566-1636) His Life and Works] (Ossolineum Publishers, Wrocław-Warszawa-Kraków, 1968) and *Traktat o kamieniu filozoficznym Michał Sędziwój* [Treatise on the philosopher's stone Michael Sendivogius] (Państwowe Wydawnictwo Naukowe, Warszawa, 1971).  
From this point onwards, these two works will be referred to as: R. Bugaj, *Michał Sędziwój* and R. Bugaj, *Traktat*.
  - (d) K. Figala, "Die exacte Alchemie von Isaac Newton", *Verhandlungen Naturforschende Gesellschaft*. 94 (Basel, 1984), 157-228.

## Chapter One

### The historical background to Sendivogius and his works

#### Introduction

In Polish history the sixteenth century is frequently referred to as its "Golden Age". It was a politically stable period during which the nation prospered. The Jagiellonian University of Kraków, which had been founded in 1364, had become established as a major European centre of scholarship. Art, architecture, classical studies, literature, mathematics, music and philosophy all flourished in Poland at this time. The best known representative of Polish learning of this period was the astronomer, mathematician, theologian, architect and doctor - Nicholas Copernicus.

As a result of Poland's central geographic position in Europe and of improved land and sea communications, travelling and international relations became integrally linked to cultural activities. Poland's ties with Italy during this period had a particularly significant influence in the fields of architecture and education (1).

An important role in the development of the nation's culture was undoubtedly played by the Polish nobility. They dominated politically through the Diet and economically through the grain trade which brought about a new feudalism on their great estates. After the extinction of the Jagiellonian line, they won even greater concessions from elected monarchs, which enfeebled central power, and crippled the growth of a merchant class in the towns. But cultural life burgeoned under their patronage, and an

atmosphere of great toleration prevailed in intellectual and religious matters. Poland thus became a fertile breeding ground for both the arts and the sciences.

A particularly noteworthy representative of the Polish nobility was Jan Zamoyski, who was born in 1542. As a young man he studied at the Sorbonne in Paris, and later at the universities of Kraków and Padua. He became converted from the Protestant to the Catholic faith and also developed a keen interest in antiquity and classical civilization. (2) He embarked on a political career in Poland and was appointed successively vice chancellor to King Stefan Batory in 1576, chancellor in 1578, and commander-in-chief of the army in 1581. He continued to dominate the Polish political scene until his death in 1605. He was also a shrewd businessman, and acquired vast wealth and territories within Poland. In 1580 he began to build New Zamość, which was to be an ideal city, based on the Roman model. This was a remarkable project and it was completed, with its own university, in 1594.

Thus towards the end of the sixteenth century, the building of an ideal town and community at Zamość reflected in classic style the Polish spirit of those times. It was a spirit as Adam Zamoyski puts it, of

"...unbounded faith that science and learning could breed perfect citizens, that ideal conditions could produce political harmony, that artistic unity could physically enhance life... that utopia could be built." (3)

These were the times during which alchemy thrived in Poland.

## Alchemy in Poland during the Renaissance (4)

The spread of alchemy in Poland owed much to three important influences:-

1. The introduction of hermetic elements into cultural trends through the activities of the Florentine Academy.

2. The spread of iatrochemistry and the great popularity of the Paracelsian corpus.

3. The rapid expansion of metallurgical and mining activities which led to considerable advances in technical chemistry. This occurred because Poland extended over an area which was rich in metal ores, and in extensive rock salt deposits.

The Jagiellonian University of Kraków was the principal centre of learning, and drew students from all over Europe. Subjects such as alchemy, necromancy, cabbalism, chiromancy, crystalomancy and catoptromancy were taught and practised. Although almost certainly unofficial in character, there is nevertheless strong evidence to suggest that they were extremely popular amongst both students and academics. Of the subjects mentioned, alchemy was by far the most important. (Professor Hubicki has suggested that this was probably taught in the faculty of medicine, albeit discreetly, since alchemy was banned.)

The first Polish alchemical manuscripts date back to the fifteenth century and were all written by the staff of the Cracovian Academy: Adam Jan of Bochyń (Professor of Medicine, d. 1514), Kasper of Skarbimierz (Professor and Doctor of Philosophy and Medicine), Maciej from Miechów, Stanisław from Kraków, Piotr from Idzikowice and Jan Mellar

from Śmigło. Their works were written in typical hermetic style and have resisted interpretation in a modern chemical sense.

In 1569 Polish alchemy took a novel turn, with the publication (in Latin) of two Paracelsian works: the *De Praeparationibus* and the *Archidoxae*. This was not, however, the first mention of the name of Paracelsus in Polish annals. Paracelsus had visited Poland in 1520, and had established a personal relationship with the court doctor of King Zygmunt I, Wojciech Baza. Baza had witnessed Paracelsus healing a man with an incurable disease, and had been astounded by his confidence in dealing with a seemingly impossible case. (5)

One of Paracelsus' last letters was addressed on 5.8.1541 to a certain Jan Boner of Kraków, with whom he had established a personal friendship. (6) The two examples mentioned are amongst many which show that Paracelsus had a large following in Poland. One of his most ardent followers was the Palatine of Sieradz, Olbracht Łaski (1536-1603). Łaski had grand political ambitions - he wished to be King of Poland - and he was also a very keen alchemist. In 1583 he visited England, where at the court of Queen Elizabeth I, he met the two English alchemists John Dee and Edward Kelly. He became involved in their experiments and also their magic and brought them back with him to Poland. It has been recorded that both Łaski and King Stefan Batory financed some of their experiments. They left for Prague in 1584. (7)

The publication of the two Paracelsian works marked

Kraków's eminence as a centre of Paracelsism (8), alongside Basle, where Paracelsus spent some years. During the second half of the sixteenth century Jerzy Retyk (1514-1574) and Andrzej Dudycz (1533-1589) headed a literary/scientific circle which met regularly for some twenty years. Besides mathematics and astronomy, Paracelsus' iatrochemical ideas were prominent in their discussions. Retyk, who had been a professor at both the universities of Wittenberg and Leipzig, himself wrote seven treatises on chemistry. Throughout his writing career he kept up a lively correspondence with Tadeusz Hajek (1525-1600), who was court physician to Emperor Rudolph II. (9)

Although Paracelsian teachings were widespread in Poland, there was nevertheless a body of strong opposition to his iatrochemical ideas. Foremost among his critics were several professors of the Kraków Academy: Andrzej Grutyński (Grutinius, 1562-1599), Stanisław Zawadzki, and Walenty Fontanus (1545-1618). The last of these was a professor of medicine and one of the first supporters of Copernicus' heliostatic theory. Of iatrochemistry he wrote:

"These remarkable people do not cure with normal medicines which have been developed by conventional means by normal people, but they use miraculous cures: the celebrated elixir, balsam, gold, the heavens and the Philosopher's Stone. I beg you, please keep the golden remedies for the forthcoming golden age; but for the purposes of our present wooden age, please allow us to assist in human tragedies with simple wood." (10)

An outstanding representative of Polish alchemy and medicine, who was also a Paracelsist, was Aleksander Suchta (Zuchta or Suchten) who lived from 1520 to 1590. (11) Between 1557 and 1563 he was the court physician of Zygmunt

August II. He wrote nine medico-alchemical works. On the basis of quantitative experiments he refused to believe in the transmutation of metals.

Polish territory has always encompassed areas which are rich in natural resources. During the latter part of the fifteenth century and the first half of the sixteenth century the metallurgical industry expanded rapidly: lead was manufactured in Rabsztyn and the Tarnów mountains, iron in Żelazne Nogi near Chęciny, bronze in Staszynów, copper near Kraków and silver was mined in the Tatra mountains. In 1517 King Zygmunt I opened the first mining centre in Poland, where the assaying of metals and alloys could be carried out. This was particularly important since gold coins were being used: the analysis and composition of these had a great economic significance. Substances produced at the centre included nitric and sulphuric acids, and aqua regia. Sulphur, mercury, antimony and lead were all purified there, since these were required for the separation of gold from silver. (12)

Thus in parallel with the development of iatrochemistry, there was also a great development in the use of metallurgical techniques for the extraction and purification of metals.

During the latter half of the sixteenth century alchemy continued to thrive in Poland. Leading alchemists of this period included Jan Zamoyski, Piotr Gorajski (d.1619), Tomasz Radzki and Michał Sędziwój (Michael Sendivogius). Zamoyski is known primarily as a brilliant statesman and politician, as we have mentioned earlier.



Little is known of his alchemical activities, although he was interested in recent developments in medicine, and he actively supported the work of alchemists and doctors. (13)

The widespread interest in alchemy in Poland during this period provoked hostile reactions, especially from the clergy. Their opposition was frequently motivated by the dishonest activities of pseudo-alchemists whose only intention was to make money by deceit. Occasionally, these clergy used rational arguments to make their point. Father Stanisław Poklatecki, who lived during the latter half of the sixteenth century, put forward his case in a short work entitled *Pogrom Czarnoksiężskie Błędy*. (14) He denied that it would ever be possible to make gold by alchemical methods. Among other arguments, he noted that although natural gold had been successfully employed in many medical preparations, gold which had been prepared by alchemists had never cured anyone: indeed it had actually inflicted great harm and even killed some people.

In spite of attacks on the art, alchemy nevertheless continued to flourish in Poland. It had the enthusiastic support, of the Kings Zygmunt August II and Zygmunt Waza III, both of whom maintained alchemical laboratories. (15)

It is tempting but deeply misleading to distinguish between two sorts of alchemy that seemed to emerge in Poland during this period: a mystical alchemy persuing false ideals, and a useful and practical form of alchemy whose basis was the investigation of nature. This latter positive approach could then be said to have led to the development of medicines and several aspects of technical

chemistry which included processes such as: ceramic manufacture, distillation, tanning, dyeing, glassmaking, smelting of iron, tin and lead, soapmaking, and the production of nitre, gunpowder, and sugar. (16) It is not a distinction which the practitioners of alchemy would themselves have recognised. They distinguished the "puffers" and charlatans from the true adept, who pursued alchemy as a combined religious and practical-experimental vocation.

The following final thoughts constitute a fitting conclusion to Roman Bugaj's paper on early Polish chemistry:

"...those ragged and poor alchemists sweated for long periods of time in extremely uncomfortable conditions, hoping that in their efforts they would discover the mysteries of nature. It was their persistent and heroic efforts which have formed the foundations of modern chemistry." (17)

#### Notes

- (1) A. Zamoyski, *The Polish Way* (Oxford University Press, 1986), 108.
- (2) N. Davies, *God's Playground A History of Poland* (Oxford, 1983), 1, 151.
- (3) A. Zamoyski, *op.cit.*, 116.
- (4) Based on the article by R. Bugaj: "Chemia i Alchemia w Polsce w Dobie Odrodzenia" [Chemistry and Alchemy in Poland during the Renaissance], *Studia i Materiały z Dziejów Nauki Polskiej* 25 (1981), 23-38.
- (5) W. Szumowski, *Żywot i Nauka Paracelsusa* [The Life and Teachings of Paracelsus] (Kraków, 1909), 7.
- (6) K. Sudhoff (ed.), *Theophrast von Hohenheim gen. Paracelsus, Sämliche Werke* (Munich and Berlin, 1928), 11, 295.
- (7) R. Bugaj, *Nauki Tajemne w dawnej Polsce - Mistrz Twardowski* [Clandestine Sciences in Polish History - Maestro Twardowski], (Ossolineum publishers, 1986), 145.
- (8) Beata Ciećko, "Idee chemiczno-alchemiczne Paracelsusa w

Polsce w XVI w. oraz Paracelsyści Polscy" [Paracelsian chemico-alchemical ideas in Sixteenth Century Poland, and the Polish Paracelsians], *Studia i Materiały z Dziejów Nauki Polskiej* 25 (1981), 1-23.

- (9) J. Dianni, "Pobył J. Retyka w Krakowie" [J. Retyk 's stay in Kraków], *Studia i Materiały z dziejów Nauki Polskiej* 1 (1953 series C), 72. See also K.H. Burmeister, "Dzieła Joachima Retyka z Dziedziny Chemii" [Joachim Retyk's Chemical Works], *Kwartalnik Nauki i Techniki* (1973), 527-535.
- (10) J. Sołtykiewicz, *O stanie Akademii Krakowskiej* [On the state of the Cracovian Academy] (Kraków, 1810), 447. The fragment quoted has been found in the writings of of Jan Brożek.
- (11) W. Hubicki, "Doktor Aleksander Zuchta. Zapomniany Polski chemik, lekarz i poeta XVI wieku" [Doctor Alexander Zuchta, the forgotten Polish chemist, physician and poet of the sixteenth century], *Studia i Materiały z Dziejów Polskich* 1 (1953 series C), 102-120.
- (12) W. Hubicki, "Alchemia i Chemia w Polsce w XVI wieku" [Alchemy and Chemistry in Poland in the sixteenth century], *Kosmos* 1 (1960 series B), 18.
- (13) S. Łempicki, "Protektor Medycyny i Medyków" [A Protector of Medicine and of Medics], *Renesans i Humanizm w Polsce* (1952), 277-321.
- (14) S. Poklutecki, *Pogrom Czarnoksięskie Błędy* [Rout of the Magicians' Errors] (Kraków, 1595), 4.
- (15) R. Bugaj, *Michał Sędziwój*, 126.
- (16) J. Kołaczkowski, *Wiadomości tyczące się przemysłu i sztuki w dawnej Polsce* [Information on early Polish chemical industry] (Kraków, 1888).
- (17) R. Bugaj, op.cit., 38. The Polish original reads: "...owi 'odrapani i nędzni' alchemicy pracowali w pocie czoła, często w trudnych warunkach materialnych, pragnąc w ciężkim znoju wydrzeć naturze jej tajniki, i że ich właśnie wytrwała, heroiczna praca stworzyła podwaliny nowożytnej chemii."

## Chapter Two

### Michael Sendivogius: A short Biography

Two aspects of Sendivogius' life have featured prominently in all modern biographical accounts:

- a) his relationship with the Scottish alchemist Alexander Seton
- b) his complex financial affairs which cast doubts on his probity.

Roman Bugaj has shown that these two aspects of Sendivogius' life cannot withstand historical scrutiny (1). An abbreviated version of his biography, according to Bugaj, is given below, together with some original contributions by Henryk Barycz (2).

Michael Sendivogius, the philosopher, alchemist, doctor and diplomat, was born on 2nd February 1566, in the village of Łukowica near Sącz in Southern Poland. His father was Jakub Sędziwój, a nobleman, and his mother Katarzyna Pielsz, too, was of noble descent.

The Sędziwój family has a well documented history which spans the latter half of the sixteenth, the seventeenth and eighteenth centuries. They lived in lavish style typical of Polish nobles at that time. Henryk Barycz describes it as follows:

"...the Sędziwójs of Łukowica undoubtedly conducted their affairs in a style which was in excess of their means. They frequently entertained in grand manner, and ran their domestic budget not along the sensible lines of "spend what you can afford", but they rather adopted the traditional Polish maxim: give a good show at all cost." (3)

Documentary evidence of details is found in the account books of their local town merchant Jerzy Tymowski: the accounts show that the Sędziwójs almost always bought on

credit terms, and that the items purchased fell into two main categories: materials for clothes, and food seasoning. Traditional Polish cuisine has always required a variety of imported spices: saffron, ginger, nutmeg, cinnamon, cloves and pepper. Thus the Sędziwójs ate "...not only well and in large quantities, but also in good taste and in considerable style." (4)

Little is known of Michael's first thirty years. His primary and secondary education was almost certainly gained at Kraków, which was then the capital of Poland. It is here that he made his first contact with alchemy. During this period he also established a friendship with Mikołaj Wolski (1555-1630), who was later to become Crown Marshal of Poland. Wolski probably arranged Sendivogius' first voyage abroad, and they remained in close contact until Wolski's death.

There is no doubt that Sendivogius enjoyed travelling, as several of his contemporary authors have affirmed. One of these was Georgius Carolides, who, addressing Krzysztof, Sendivogius' son, wrote:

"...having completed military service successfully as a young man, he came to realise that his freedom of thought and expression were limited in his own country, and he therefore decided to widen his horizons by travelling. He visited several distant, and also less distant, countries including the Muscovite one, Sweden, England, Spain, Portugal, Germany, Bohemia and other far off lands. He took careful note of the different customs in these countries and their geography. He also visited several academies: Cambridge, Ingolstadt, Leipzig, Altdorf, Frankfurt, Rostock, Wittenburg and met their most distinguished lecturers." (5)

The extent of these travels is supported by documentary evidence. Sendivogius' name appears on the registers of three universities during this period: Leipzig, Vienna and

Altdorf. Indeed, on 13th October 1591, Sendivogius matriculated at Vienna University (6). At Leipzig he established contact with many academics, including two professors of anatomy and surgery: Joachim Tancke and Johannes Thölde. They were both great enthusiasts of the hermetic arts, and put forward proposals for the establishment of alchemy as a recognised university discipline. They suggested that standard texts required for this field ought to include works by both Geber and Lully. These would constitute the alchemical equivalents of works by Hippocrates and Galen in the fields of medical studies.

In 1593, Sendivogius came to Prague, and served as a courtier to Rudolph II. (7) Rudolph was a great enthusiast and patron of alchemists. During his 36 year reign, Prague became the alchemical "capital" of Europe. From 1598, Sendivogius was appointed court adviser. It is most likely that he was introduced to Rudolph's court by Mikolaj Wolski. While he was based at Prague, Sendivogius also studied philosophy at the University of Altdorf between 1594 and 1595. At some stage before his arrival in Prague, he had married Veronica Stiber, with whom he had two sons and two daughters. During the Plague which swept through Prague in 1599, his wife and two of their children died.

From 1595, Sendivogius also appears in documents as personal secretary to the Polish King - Zygmunt III. It is known that Zygmunt maintained a somewhat secretive relationship with the Habsburg Court in Prague, and Sendivogius played an important diplomatic role on his behalf. It is believed that his alchemical experiments with

Mikołaj Wolski caused the fire which burnt down part of the Royal Castle in Kraków in January 1595.

During his service in Prague, Sendivogius met several leading alchemists, including the best known of Czech alchemists - Bavor Rodovský from Hustiřan (1526-1600). In addition, he met several rich families and established friendships with them.

In short, Sendivogius became a popular and well-known figure - both at Prague and at Kraków. Several poets and authors dedicated works to him. Two of these were the court poet Georgius Carolides and the Polish armorist Bartłomiej Paprocki, who dedicated the third part of his *Ogród Królewski* [Royal Garden] (Prague, 1599) to Sendivogius.

Sendivogius did not escape the attention of some enemies he had made. Some of these were the members of the family of a well-known Prague townsman Ludvik Koralek. Koralek was a great enthusiast of alchemy, and funded the activities of several alchemists, including Sendivogius. After Koralek's premature death in 1599, his family accused Sendivogius of causing his death by administering a medicine during the illness, which subsequently turned out to be fatal. In addition, they accused Sendivogius of causing Koralek to go bankrupt, by extorting large sums of money from him, as well as jewellery and furniture. A court case commenced on 28th July 1599. Sendivogius admitted that he had legally borrowed money from Koralek, but was innocent of all the offences of which he was accused. After a trial which lasted three months, Sendivogius was acquitted, but ordered to repay his loans within six weeks.

Between 1600 and 1604, Sendivogius spent most of his time in Poland. Little is known of what he did, except that he was involved in a high ranking diplomatic mission which concerned Poland's conflict with the Habsburgs, over rights to the Black Sea.

In 1604, Sendivogius is reputed to have performed a celebrated transmutation of a base metal into gold, in front of Rudolph II, and a large number of witnesses. To commemorate the occasion, a tablet with the engraving :

Faciat hoc quispiam alius  
quod fecit Sendivogius Polonus

was built into the palace wall. No details are available which would enable a modern chemical interpretation of this "transmutation" to be attempted. That year, Sendivogius' most celebrated work, his *De Lapide Philosophorum. Tractatus Duodecim, é Naturae Fonte, et Manuali Experientia deprompti* [Twelve treatises on the Philosophers' Stone, drawn from the Fountain of Nature and Manual Experience] known in a subsequent edition of that year and in further subsequent editions as *Novum Lumen Chymicum* [A New Light of Alchemy] was published in Prague. (8)

In 1605 Sendivogius visited the Duke of Wittenburg, Frederick, at his castle in Stuttgart. Together with his court alchemist Mühlenfels, Frederick organised a pretext for keeping Sendivogius a prisoner until he handed over some of his transmuting powder. Both Rudolph II and Zygmunt III intervened. Sendivogius was freed, and Mühlenfels was sentenced to death in June 1607. That year, Sendivogius' second popular work: *Dialogus Mercurii, Alchymistae et Naturae* [Dialogue of Mercury, the Alchemist



and Nature], was published for the first time in Cologne.

Between 1607 and 1616, Sendivogius lived in Poland, and remained in close contact with Marshal Wolski. Wolski had a special interest in technological chemistry, and was largely responsible for the development of metallurgical industry in Poland during this period. In Krzepice near Częstochowa he set up a works for manufacturing iron in the form of sheets, wire and rods. This was a large-scale enterprise, the whole factory consisting of ten buildings. During this same period he opened a lead foundry and a factory for making cannon balls. This industrial region of Poland became very well known, and additionally manufactured needles, knives, swords and sheet copper and bronze. Sendivogius lived at Wolski's castle in Krzepice, where he was able to conduct experiments in the castle laboratory.

In 1616 Sendivogius went to Marburg in Germany, where he worked in Johann Hartmann's iatrochemical laboratory. (9) There, he was involved in the preparation of a variety of Paracelsian medicaments. Whilst in Germany, Sendivogius re-established contact with the court doctor of Landgraf Maurice of Hesse, Michael Maier. He had made the acquaintance of Maier during his stay in Prague and now entered into a closer relation with him. Maier wrote that he had personally witnessed the transmutation of a base metal into gold by Sendivogius. This impressed him so much, that he included Sendivogius in his well-known book *Symbola aureae mensae duodecim nationum* [Symbols of the Golden Table of Twelve Nations], which was first published

in Frankfurt in 1617. This book contained the portraits of twelve great natural philosophers, and a short summary of their contribution to natural philosophy. In addition to Sendivogius, who is represented in the work as "Sarmata Anonymus", other figures included were Democritus, Avicenna, Albert the Great, Thomas Aquinas and Roger Bacon.

In 1616, Sendivogius' second extensive work, the *Tractatus de Sulphure* was published in Cologne.

From 1619 until 1624, Sendivogius was based at Vienna, at the court of Emperor Ferdinand II, who was Rudolph's successor. Sendivogius promised Ferdinand that he would supervise the construction of a new lead mine in Silesia, on the Polish border (10). This was to be a very well paid job. At the same time, he is mentioned in Polish documents as secretary to the King of Poland. Sendivogius therefore seems to have divided his time between Kraków and Vienna during this period.

In 1624 Sendivogius went to Padua, where he established contact with several academics, including the outstanding mathematician and astronomer Jan Brożek (1585-1652).

As a result of the Thirty Years War, which broke out in 1618, Sendivogius ran into financial difficulties, Ferdinand being unable to pay his salary regularly. This sparked off a long lasting imbroglio, in which Sendivogius repeatedly appealed to several authorities for repayment, either in the form of cash or in the form of real estate. Eventually, on 12th August 1626 the Emperor ordered the Silesian Chamber of Commerce in Wrocław to pay Sendivogius a regular salary of 1000 florins annually, until his death.

This money did not materialize as promised however, and Sendivogius had to persistently remind the Chamber of unpaid dues. Sendivogius was finally offered two substantial villages: Krawarz and Kąty in Ołomuniec, on 29th July 1630. These, and a substantial sum of money, were in settlement of the payments for his services in Silesia. Unfortunately for Sendivogius, he also inherited the previous owners' substantial debt, which came with the estate. Only by personal representations to Ferdinand was Sendivogius able to free himself from the further financial obligations which had been unfairly transferred to him.

The story did not end there. Sendivogius encountered many problems with the estates, and finally decided to sell them early in 1636. They were never sold however, and Sendivogius died at some stage during that year. Documentary evidence is provided by a letter dated 12th August 1636 in which Maria Veronica von Eisendorf "...the daughter of the deceased Sendivogius..." was making enquiries about the debts owed to her (11). She eventually inherited the entire estate.

It is clear from this brief sketch of the life of Michael Sendivogius, that he was a man of considerable charm, style, wit, humour and intelligence, and that he was also very resourceful. He had a successful career as a diplomat, and may also have been a political double agent.

Do these qualities necessarily preclude the possibility that he might also have been a brilliant natural philosopher?

## Notes

- (1) Roman Bugaj, who is currently living in Warsaw, and whose first degree was in chemistry, completed his doctoral thesis on Sendivogius in 1964 . Since then he has spent much time piecing together the details of Sendivogius' life, on the basis of documentary evidence. His version of Sendivogius' life story appears on pages 13-19, and 50-160 of his monograph entitled: *Michał Sędziwój*, which I have mentioned on page nine.
- (2) Henryk Barycz, *Z epoki renesansu, reformacji i baroku: Prądy - idee - ludzie - książki* [From the epoch of the Renaissance, Reformation and Baroque: Trends - ideas - people - books] (Warsaw, 1971). On pages 591-627 of this book, Barycz has written the following chapter: *W Poszukiwaniu kamienia filozoficznego, czyli traktat o Michale Sędziwoju*. [In search of the Philosopher's Stone, or a treatise on Michael Sendivogius].
- (3) Barycz, op.cit., 606. The Polish original reads: "...Sędzimierowie łukowiccy żyli niewątpliwie nad stan, wystawnie i hucznie, kierując się w ekonomice domowej nie tyle zasadą nie przekraczania w wydatkach posiadanego dochodu, ile staropolską maksymą 'zastaw się a postaw'."
- (4) ibid., 607. The Polish original reads: "jedzono bowiem nie tylko tłusto i obficie, ale na ówczesną modłę, modnie i smacznie."
- (5) G. Carolides, *Praecepta Institutionis Generosae Indolis, jambico dimetro conscripta ad Illustrissimi et Magnanimi Herois, Domini Michaelis Sendivogii, de Skorsko et Lukovisze Lib. Baronis Filium primogenium Christophorum Michaellem Sendivogium*. (Prague, 1598), B2 .
- (6) *Die Matrikel der Universität Wien. Im Auftrage des Akademischen Senates herausgegeben von Institut für österreichische Geschichtsforschung*. IV. B; Bearbeitet von Fr. Gall, Graz-Kolonia 1961, 33.
- (7) See also: R.J.W.Evans, *Rudolph II and his World* (Oxford at the Clarendon Press, 1973), 211-212.
- (8) A photograph of the title page of the first 1604 edition is printed on page 81 in Bugaj's earlier mentioned monograph, and further details of two other 1604 editions are given on page 284 of the same work.
- (9) J. Partington, *A History of Chemistry* (London, 1969), 2, 177. "Johann Hartmann was... the first professor of chemistry in Europe."
- (10) P. Borel, *Trésor de recherches et antiquitez gauloises et françoises*. (Paris, 1655). This substantial work

contains notes on all authors relevant to the subject, who were known to Borel. They are listed alphabetically. The book is divided into two parts, of which the second part evidently forms an extended addendum. The identity of the mysterious Cosmopolite was clearly an issue which was of some importance at that time, since Borel devoted an exceptionally large amount of space to it. This section occupies pages 475-489 in the second section of the book, and it is entitled: "Vita Sendivogii Poloni nobilis baronis breviter descripta a quodam Germano olim ejus oratore, patrono, seu causidico." This section is divided into two parts: a Latin one from pages 475-478, written by Bodowski, and a French one on pages 478-489 written by des Noyers. Bugaj has used information from the Latin story on page 475 concerning Sendivogius' role in the construction of lead mines.

- (11) J. Zukal, "Alchymista Michal Sendivoj", *Knihy snešeni* 4 (1909), 7.

## Chapter Three

### The Works of Michael Sendivogius

#### Introduction

The most frequently published and most widely read work of Sendivogius was his *Treatise on the Philosophers' Stone*. This invariably appeared with the *Philosophical Enigma* and almost invariably with the *Dialogue of Mercury, the Alchemist and Nature*. In addition to these well-known and universally accepted works, Sendivogius wrote several other treatises, of which the *Treatise on Sulphur* is also well known.

Until the recent extensive bibliographic researches by Roman Bugaj, very little attention was paid by scholars to most of the other Sendivogian works. Bugaj first published his findings in 1968, and again in 1971. (1) In the present chapter I shall summarize them and explain my own contributions, which add significantly to those of Bugaj.

#### Summary and critique of Roman Bugaj's Bibliography

Bugaj's was the first attempt at a comprehensive summary of all known works and editions of the Sendivogian corpus. It was prompted by the somewhat inaccurate and very incomplete bibliographies which had been compiled by major authorities such as Ferguson, Duveen and Kopp. More importantly however, Bugaj's bibliographic research was prompted by his desire to show that Sendivogius was one of the most widely published and widely read authors in Europe in the seventeenth century. Such a study would strengthen Bugaj's case that more serious consideration ought to be given by modern scholars to Sendivogius' writings.

The bibliographic summary appears on pages 280-304 of his monograph: *Michał Sędziwój (1566-1636) Życie i Pisma* which I have mentioned earlier. Bugaj based his initial study on the then already acknowledged works of biographers such as Pierre Borel (2), Lenglet Dufresnoy (3), John Partington (4), John Ferguson (5), Hermann Kopp (6), and also the Czech Čeněk Zibrt (7) and the Poles Tadeusz Żebrowski (8) and Karol Estreicher (9). Of particular importance was the large scale work *Bibliografia Polska* by Estreicher. This is a comprehensive catalogue of works by Polish authors. Its 40 volumes were published between 1870 and 1939.

Bugaj found many inconsistencies and imperfections in these earlier biographies and, in addition to tabulating and discussing individually all editions known to him, he brought to notice two further important works by Sendivogius. These were the *Operatie elixiris Philosophici* [Operations on the Philosophical Elixir], which Bugaj found in manuscript form and which he translated from Latin/Polish into modern Polish, and the *Processus super centrum Universi, seu Sal centrale* [Process on the centre of the Universe, or the central Salt]. This latter work had first appeared in print in a compedium of works entitled *Chymischer Glücks-Hafen, oder Grosse Chymische Concordanz* [The Chemical Vademecum, or the Great Chemical Concordance] which was edited by J.J. Becher and published in Frankfurt in 1682. It was written in German/Latin and had apparently been overlooked by scholars. Bugaj translated it into Polish and first published it, together with the earlier

mentioned work, in 1968.

Bugaj listed the Sendivogian works in order of first known publication date as follows (10):

A - *Tractatus de Lapide Philosophorum* or *Novum Lumen Chymicum* - 44 editions and 9 reprints in collections of alchemical works.

B - *Parabola, seu aenigma philosophicum* - 44 editions and 9 reprints.

C - *Processus super centrum universi, seu Sal centrale* - 7? reprints.

D - *Dialogus Mercurii, alchymistae et Naturae* - 32 editions and 9 reprints.

E - *Tractatus de sulphure* - 26 editions and 9 reprints.

F - 55 letters - 4 editions and 6 reprints.

Altogether, he listed 84 separate editions which were published in 5 languages in 17 different places throughout Europe. The places of publication and the languages used are given below (11):

Place	no. of editions	Place	no. of editions
Paris	15	Vienna	2
Frankfurt	11	Wittenberg	2
Strasbourg	10	Nuremberg	2
Cologne	9	Kassel	2
Leipzig	6	Prague	1
Geneva	5	Moscow	1
London	3	Venice	1
The Hague	3	Halle	1
		Erfurt	1

place of publication not given - 4 editions

language used	no. of editions
Latin	34
German	24
French	17
English	3
Russian	1

It should be noted that the above statistics only applied to editions which were published between 1604 and 1787.



Five further editions were published after 1787. These are listed below:

1893 London, English

1900 Prague, Czech

1912? Prague, Czech

1921 Warsaw, Polish

1957 Warsaw, Polish

The bibliographical section summarized above is preceded by an introduction, in which Bugaj stresses the great difficulty which he experienced in compiling his data. This difficulty, he says, was caused by Sendivogius' use of anagrams and pseudonyms with which he evidently tried to conceal his identity. Bugaj also notes that the various editions of Sendivogius' works are distributed in libraries and collections throughout Europe, thus making direct access to them more difficult. In his detailed account of the 84 editions, Bugaj stresses that he has gone to some trouble to verify each one, and that he knows 40 of them from first hand experience. His research took him to many of the great libraries of Poland, Germany and Czechoslovakia. He was aware of the fact that his bibliography probably had many shortcomings and he anticipated that future researchers would improve his partially complete analysis.

#### **Proposals for an improved Bibliography**

I believe that four further works ought to be included in the Sendivogian corpus. These are tabulated below:

Title	First known publication date, place and language
<i>Harmony</i>	1618, Paris, French
<i>Treatise on Salt</i>	1656, Amsterdam, German
<i>Philosophical Letter</i>	1659, The Hague, French
<i>Statutes of the Unknown Philosophers</i>	1691, Paris, French

*Harmony* has been known to Bugaj for some time, and he makes several references to it in his work. Curiously, he mentions it in two different contexts: as a lost Sendivogian work, and as a work by the French tax collector Baron Jacques de Nuysement, otherwise known as Clovis Hesteau or Monte Cubiti. (12) Since 1968, Bugaj has translated *Harmony* from German into Polish and he has analysed it. He has shown that Nuysement's *Harmony* was in fact written by Sendivogius. (13) In order to complete the bibliographical analysis of the Sendivogian works, it has therefore become necessary seek out all known editions of *Harmony*. To this end, I have combined my own bibliographic research with that of Bugaj, and a table of all known editions of *Harmony* is presented shortly.

One of the problems which was encountered in identifying the different editions of a work such as *Harmony* was the fact that the different editions frequently bore different titles and the names of different authors. *Harmony*, for example, has also been called *Treatise on the true salt, secret of the Philosophers etc.* In his bibliography, Bugaj had confused this with the *Process on the Central Salt* which he had found in Becher's *Chymischer*

*Glücks-Hafen*. He was aware of a possible error in this respect and thus he marked the relevant note with a question mark. (14) The identity of the author of this particular work is further complicated by the existence of a third treatise with a similar title, the *Treatise on Salt*, which first appeared in print in 1656 in German. Its author was given as Johann Harprecht, and this work was subsequently translated into French and English. Although Bugaj had mentioned this work in passing (15), he had not commented on it at all, since he evidently did not consider it a Sendivogian work.

The elucidation of the various titles and editions of three works with similar sounding titles, which all include the word salt, constitutes a significant part of this thesis. I have analysed part of the *Treatise on Salt* and have also included it in the Sendivogian corpus.

A further work which had been unknown to Bugaj, for it was only published once, was the *Statutes of the Unknown Philosophers* which appeared in the 1691 Paris edition. Bugaj had been aware of this edition but not of its contents (16). I have translated and analysed this work and have also included it in the Sendivogian corpus. My analysis and discussion forms another major part of the present thesis.

On the basis of my own researches, I believe that the the best way to summarize the published Sendivogian works, in order of known publication date, is as follows:

date	title	language	length words
1604	<i>De Lapide Philosophorum</i>	Latin	11,000
1607	<i>Dialogus Mercurii, Alchymistae et Naturae</i>	Latin	3,500
1616	<i>Tractatus de Sulphure</i>	Latin	14,000
1618	<i>Traitez de l'Harmonie</i>	French	40,000
1656	<i>Tractat vom philosophischen Saltz</i>	German	12,000
1659	<i>Lettre Philosophique</i>	French	8,000
1671	<i>55 Lettres Philosophiques</i>	French	22,000
1682	<i>Processus super centrum Universi</i>	Latin/German	3,000
1691	<i>Statuts des Philosophes Inconnus</i>	French	5,000
1968	<i>Operatie Elixiris Philosophici</i>	Latin/Polish	2,500

In addition to the inclusion of four already mentioned works which Bugaj had not included, it will be seen that the *Parabola, seu aenigma philosophicum*, has been omitted. I felt that this was justified, since the *Parabola* was always published in conjunction with the *De Lapide Philosophorum*, and as such it therefore constitutes an integral part of that work.

#### A Summary of my own bibliographic research

As Bugaj had mentioned in his bibliography, the principal difficulty in identifying works by Sendivogius comes from his obsession with anonymity. Prefaces which begin with statements such as: "Friendly Reader, I intreat thee not to be inquisitive after who is the Author of this little Treatise, neither seek into the Reason for which he writ it. It is not necessary neither that thou should'st know who I am myself." (17) or: "It seemed good to me for some reasons to conceal my name, whilst I do not seek praise to my self, but endeavour to be assisting the lovers of wisdom." (18) were common.

Alternatively he, or his editors, would use pseudonyms such as :-

Divi Genus Leschi Amo (19)

Angelus Doce Mihi Ius (20)

## Cosmopolite (21)

The first of these is an anagram of "Michael Sendivogius" and it means "I love the divine race of the Lechites (i.e. Poles)" since Lech was one of the first kings of Poland. The second anagram means "Angel, teach me justice", and the third pseudonym suggests that its bearer is a "man of the world", or a person for whom knowledge is universal, unbounded by nationality or by creed.

Another pseudonym has recently come to light. It is IOACHIMUS D'ESTINGUEL. This name, which is almost (the 'T' is superfluous) a perfect anagram of MICHAEL SENDIVOGIUS, was used in the 1691 French edition of Sendivogius' 55 letters. Rafał T. Prinke has been researching the link between Sendivogius and the Rosicrucians, and he has recently published an article on this topic, in which he mentions this new pseudonym. (22)

In addition to these pseudonyms, it has now become clear that Sendivogius was quite content to have his work published under the authorship of others. Two particular instances are, as I have already mentioned, Jacques de Nuysement and Johann Harprecht. A further complication was the use of various titles for one work (23) and similar sounding titles for different works (24).

In view of these features it is not surprising that there has been so much confusion and controversy surrounding the authenticity of Sendivogius' works.

In order to facilitate references to his works, I have standardized their titles in English in Table 1, together with English translations of other titles, dates of

**Table 1 The works of Sendivogius - in order of first known publication date.**

No	Date	English Title	Other titles (English translation)	Ascribed to
1	1604	Treatise on the Philosophers' Stone	Treatise on Mercury or On Nature in General or A New Light of Alchemy	Cosmopolite or Muller or Sendivogius
2	1607	Dialogue of Mercury, the Alchemist and Nature		Cosmopolite or Sendivogius
3	1616	Treatise on Sulphur		Cosmopolite or Sendivogius
4	1618	Harmony	Treatise on the true salt of the Philosophers	Monte Cubiti or Clovis Hesteau or Nuysement or Sendivogius
5	1656	Treatise on Salt	A Light on the Salt of the Philosophers	Cosmopolite or Harprecht or Hautnorthon
6	1659	Philosophical letter		Cosmopolite
7	1671	55 Philosophical letters		Cosmopolite
8	1682	Process on the Central Salt		Sendivogius
9	1691	Statutes of the Unknown Philosophers		Cosmopolite
10	1968	Operations on the Philosophical Elixir		Sendivogius

publication, and authors of different editions.

### The French Editions

On account of the large number of French editions which have been published, I have also drawn up a comprehensive summary of all known ones. This, I believe, is of particular significance, since some of these editions contained key works, which only appeared once. Additionally, we can see from such a summary how the various Sendivogian works have been differently bound together and how the title pages and authors' names have changed. These changes are particularly significant in the case of the editions of *Harmony*. The brief summary presented in Table 2 is designed to list these editions whereas a complete documentation of them is given in the Appendix on pages 282-285. In compiling this catalogue of the French editions, I have used the following bibliographical sources which were not available to Bugaj:

Bibliothèque Nationale Catalogue

Caillet. A, *Manuel Bibliographique des Sciences Psychiques ou Occultes*, Paris, 1912.

Ferguson Collection Catalogue

National Union Catalog Pre 1965 Imprints

One of the results of compiling the catalogue is that it has revealed a further 11 editions which were unknown to Bugaj. These are nos. 6,7,8,9,10,11,13,15,17, 18 and 23 in table 2.

Some notes on each of Sendivogius' works

#### 1. *Treatise on the Philosophers' Stone*

This consists of twelve short chapters which are

Table 2

## A Summary of Sendivogius' French Language Editions

no.	date	place	publisher	works printed							
				A	B	C	D	E	F	G	
1	1609	Paris	Iérémie Périer	*							
2	1612	Paris	unknown	*							
3	1618	Paris	Sebastian Chapelet	*		*					
4	1618	Paris	Abraham Pacard	*							
5	1618	Paris	Abraham Pacard		*						
6	1618	Paris	Abraham Pacard	*	*	*					
7	1620	Paris	Perier				*				
8	1621	Paris	Perier & Buizard				*				
9	1621	Paris	Perier & Buizard				*				
10	1621	Paris	Perier & Buizard				*				
11	1621	Paris	Perier & Buizard				*				
12	1628	Paris	Pierre Billaine		*						
13	1628	Paris	Pierre Billaine	*	*						
14	1629	Paris	Pierre Billaine	*	*						
15	1629	Paris	Charles Hulpeau	*	*						
16	1639	Hague	Theodore Mairie	*	*	*					
17	1659	Hague	A. Vlacq						*		
18	1669	Paris	Jean D'Houry	*	*						
19	1669	Paris	Jean D'Houry	*	*		*				
20	1669	Paris	Jean D'Houry	*	*		*	*			
21	1691	Paris	Laurent D'Houry	*	*		*		*	*	
22	1723	Paris	Laurent D'Houry	*	*		*	*			
23	1723	Paris	Laurent D'Houry	*	*		*	*			

editions marked with heavy print are ones which I have seen

## Key to the works

A *Treatise on the Philosophers' Stone* together with the *Epilogue, Philosophical Enigma* and the *Dialogue of Mercury, the Alchemist and Nature*. These always appeared together in the French editions under the general heading: *De La Nature en General* or *Traité du Mercure*, except for the 1609 edition, which appeared without the *Dialogue*.

B *Treatise on Sulphur*

C *Harmony*

D *Treatise on Salt*

E *Philosophical Letter*

F *55 Philosophical Letters*

G *Statutes of the Unknown Philosophers*



followed by an *Epilogue* and a *Parable or Philosophical Enigma*. It was undoubtedly the best known Sendivogian work and was published 56 times between 1604 and 1787. The dates of the editions are presented in the form of a simple graph in order to show more clearly the period of time during which the work was most widely read. The dates of the editions are based on Bugaj's findings, together with four further editions which I have found (25). This work is familiar to modern historians of chemistry and has recently been summarized by Betty Jo Dobbs (26).

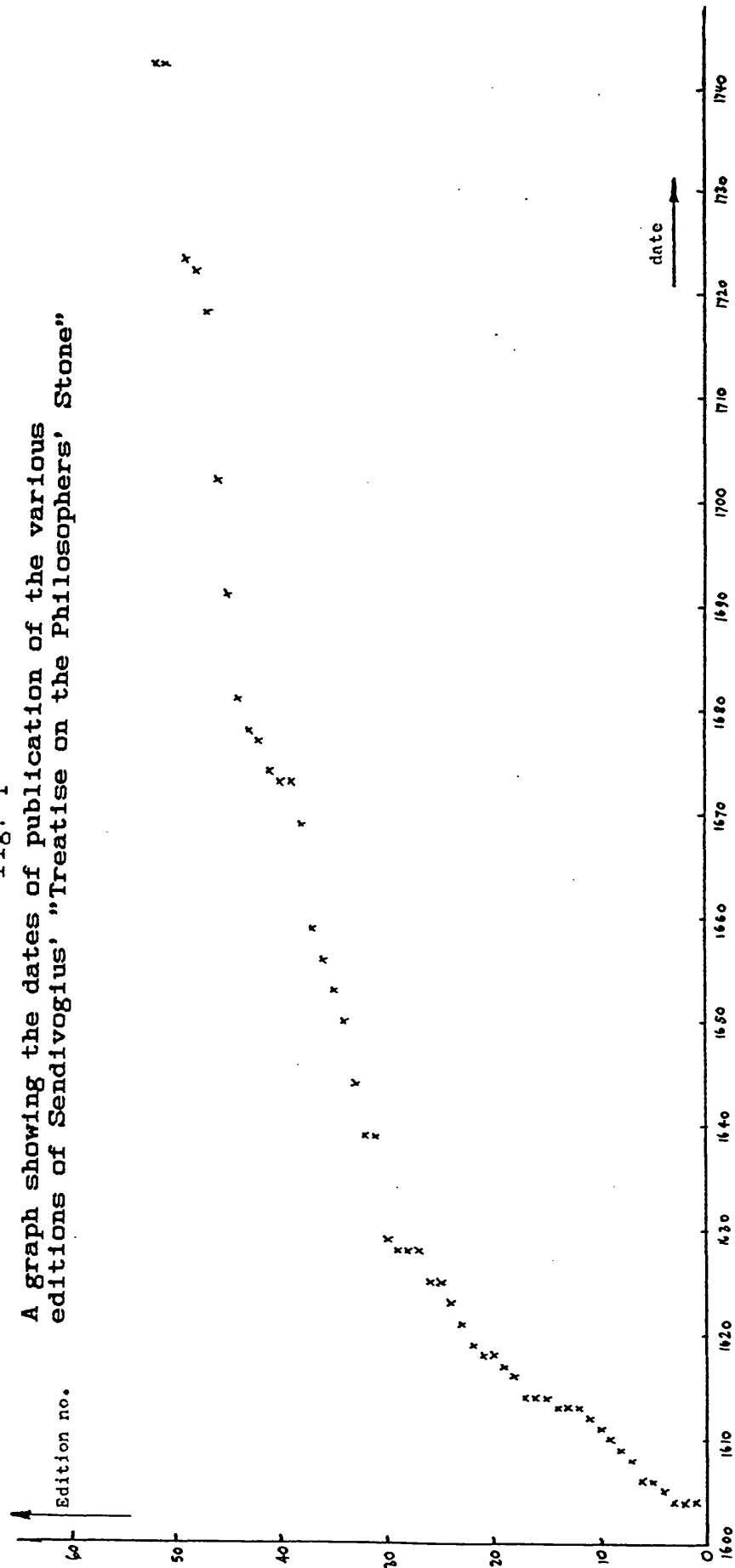
In this work Sendivogius puts forward what he believed to be a new approach (hence the title: *A New Light...*) to explain certain types of change which occur in Nature. The work covers a wide range of topics on various aspects of natural philosophy. His discussions on the Philosopher's Stone are of particular interest.

I have prepared a summary of this treatise which is in the Appendix on pages 268-281. The summary is based on Bugaj's translation of the Latin edition of 1604: *De Lapide Philosophorum Tractatus Duodecim, é Naturae fonte, et Manuali Experientia deprompti. Autor [sic] sum, qui DIVI LESCHI GENUS AMO. Anno M.DC.IV. (27)*

## 2. *Dialogue of Mercury, the Alchemist and Nature*

This was the sequel to the *Treatise on the Philosophers' Stone*, since it was almost always published in conjunction with it. The work is a clever satire in which a conceited alchemist is ridiculed by the mercury which he was attempting to turn into the Philosopher's Stone, and by Nature. Once again Sendivogius stresses the

fig. 1  
 A graph showing the dates of publication of the various editions of Sendivogius' "Treatise on the Philosophers' Stone"



futility of attempts to make quick gains by empty headed "puffers".

Stanton J. Linden has discovered that this work formed the basis for one of Ben Jonson's plays. (28)

### 3. *Treatise on Sulphur*

This is a fairly substantial work, which was frequently published in conjunction with the *Treatise on the Philosophers' Stone*, and which consists of chapters on the four Aristotelian elements, a chapter on the three Paracelsian principles, and a dialogue entitled *On Sulphur*. It contains further interesting ideas on many aspects of natural philosophy.

Of particular interest are the comments relating to the delicate balance of Nature (29), and how the four Aristotelian elements exist in equilibrium with one another. Additionally, Sendivogius expands and elaborates on his chemical theory with special reference to the Paracelsian principle of Sulphur.

### 4. *Harmony*

*Harmony* was Sendivogius' most extensive work. In it, he writes at length on the "universal spirit". The work is difficult to understand.

It has been catalogued by all leading authorities under the name of Jacques de Nuysement. As I have mentioned earlier however, Bugaj has translated and analysed the work, and shown that it ought to be included in the Sendivogian corpus. It is significant that Sendivogius himself referred to *Harmony* several times. (30) Table 3 gives a summary of all known editions of *Harmony*. It was

Table 3

Known editions of *Harmony*

no.	date	place	name of author under whose name published	language
1.	1618	Paris	Nuysement	French
2.	1620	Paris	Nuiselement	French
3.	1621	Paris	Nuiselement	French
4.	1621	Paris	Nuiselement	French
5.	1639	The Hague	Nuiselement	French
6.	1651	Kassel	Nuysement	Latin
7.	1652	Kassel	Sendivogius	Latin
8.	1657	London	Nuiselement	English
9.	1658	London	Ludwig Combach	English
10.	1667	Nuremburg	Monte Cubiti	German
11.	1671	Leyden	Nuysement	Latin
12.	1672	Leyden	Nuysement	Latin
13.	1716	Frankfurt	unknown	unknown
14.	1757	Dresden	Nuysement	German
15.	1778	Berlin	Nuysement	German
16.	1787	Leipzig	Nuysement	German

## Note

The bibliographic summary of *Harmony* only contains details of different printings. It does not include any other works which were bound in the same volume.

Further details of each printing are given in the Appendix on pages 282-285.

prepared by Roman Bugaj and by myself. Two points are of particular interest:

1. Both the 1618 and 1639 French editions are bound in the same volume as the *Treatise on the Philosophers' Stone*. Details are given in the Appendix on pages 258 and 263.

2. The two 1621 (nos 8 and 10 in table 2) editions are identical in all respects, except that the title pages are different. One of these contains a reference to *Le Cosmopolite* whereas the other does not.

##### 5. *Treatise on Salt*

This constitutes the third of a trilogy of works which was published five times in French under the general heading *Les Oeuvres du Cosmopolite*. The dates of publication were: 1669 (twice), 1691 and 1723 (twice) - further details of these French editions are given in the Appendix on pages 263-266. The other two main works with which the *Traité du Sel* appeared were: *Traité du Mercure* (This included the *Treatise on the Philosophers' Stone* and the *Dialogue of Mercury, the Alchemist and Nature*) and the *Traite du Soulfhre* [Treatise on Sulphur].

Although this work is listed in all catalogues, no notice has been taken of it, presumably on account of uncertainty concerning its authorship or origins. Ferguson, for example, was convinced that the real author's name was Harprecht (31), and Roger maintained that it is most unlikely to have been written by Sendivogius, even though it was published with two of his better known and authenticated works, on account of its style, which was evidently different from other works published under the

general authorship of *Le Cosmopolite* (32). An additional difficulty in assigning the authorship is the fact that the work has been published in four languages and has been accredited to three different persons. In order to present a clearer picture, I have prepared details of known editions, which are given in Table 4.

Roman Bugaj has listed the 1652 Kassel edition, but he confused this work with the *Process on the Central Salt*. (33) Duveen on the other hand had recognised the fact that a single work was in question, and he considered, and perhaps rightly, that both French and German editions were translations from a Latin original. (34)

I have translated parts of this work from French into English, and have summarized other parts of it. For this purpose I have used the 1691 edition, which is incidentally, identical to the other three French editions. The translation and summary are given in the Appendix on pages 289-315 and they form the basis for my analysis and discussion of the work, which constitutes the second part of chapter six. I have also consulted the 1722 edition, mentioned earlier in this chapter, which is a contemporary English translation from the French editions. This seems to be available only at Edinburgh University Library, where it forms part of the Ferguson collection. The British Library copy is missing.

#### 6. *Philosophical Letter*

A version of this was published in modern French in 1920 (35), and it was available in print in 1982 (36). As I have mentioned earlier, Bugaj has recently translated it

Table 4

Known editions of the *Treatise on Salt*

no.	date	place	name of author under whose name published	language
1.	1656	Amsterdam	Harprecht/Hautnorthon	German
2.	1657	Amsterdam	Harprecht/Hautnorthon	German
3.	1658	Amsterdam	Hautnorthon	Latin
4.	1669	Paris	Cosmopolite	French
5.	1691	Paris	Cosmopolite	French
6.	1722	London	Cosmopolite	English
7.	1723	Paris	Cosmopolite	French
8.	1727	Nuremburg	Hautnorthon	German

## Note

The bibliographic summary of the *Treatise on Salt* only contains details of different printings. It does not include any other works which were bound in the same volume.

Further details of each printing are given in the Appendix on pages 286-288.

from French into Polish, and subsequently analysed it. He has shown that the letter constitutes part of the Sendivogian corpus but he has not yet published his results.

The letter appears to be an open one to members of the cabalistic society of unknown philosophers. It deals with general aspects of natural philosophy, making several references to the Holy scriptures.

#### 7. 55 *Philosophical Letters*

These letters have been known to historians of chemistry, but as with some of the other Sendivogian works, their authenticity has been doubted (37). This doubt has been caused mainly by their inconsistent dating and by their unlikely places of origin. In Manget's edition for example (38), nine of the letters bore dates - they were all supposedly written within a short time span in 1646 in Brussels, ten years after Sendivogius' death.

Bugaj has translated these letters from Latin (Manget's 1702 edition) into Polish (39) and he has reaffirmed that they were written by Sendivogius. He suggests that Sendivogius probably wrote them between 1616 and 1636 i.e. during the latter part of his life and he believes that they were written to a Frenchman living in Paris. The letters explain in greater detail certain ideas which were put forward in his *Treatise on the Philosophers' Stone, Treatise on Sulphur, and Harmony*.

It is important to point out that Bugaj had confused these letters with the *Philosophical Letter* which had been published separately in 1671 (40), and he had failed to



take notice of the *Statutes of the Unknown Philosophers* with which they were published in 1691. This is because his only source of information on that particular edition had been from the very sketchy information provided by Dufresnoy's *Histoire de la Philosophie Hermétique* (Paris, 1742). It should be noted additionally that in the first letter, Sendivogius mentions that he is enclosing with it a Latin set of statutes for their society. (41) I have translated these statutes (from the French) and analysed them in the present thesis.

The letters were published together with the *Statutes* as an example of the sort of correspondence which may take place between members of a secret philosophical society. The existence of this particular 1691 edition in which both the letters and the *Statutes* were published side by side provides an important starting point for my own contribution concerning Sendivogius' role in the early period of philosophical societies.

I have also seen four manuscript copies of these letters. Two of them constitute part of the Ferguson collection which is housed at Edinburgh University Library. Manuscript 92 is in French and it has the following title: *Extrait des lettres de Michel Sendivogius ou de Jean Joseph Ida, nommé Cosmopolite*. There are 60 of these letters. The manuscript also contains the *Statuts des Philosophes Inconnus* to which is appended a short work entitled: *Le Sceau hieroglyphique de la Société des Philosophes Inconnus*. All of these three works appear together in the 1691 printed French edition, but they were not reprinted in

the 1723 edition of works under the general heading of *Les Oeuvres du Cosmopolite*.

The second manuscript, number 25, is in English. It is entitled: *Letters of Michael Sendivogius to the Rosey Crusian Society found in an old manuscript by Ebenezer Sibly MD 1791*. It contains 55 letters and a short section entitled: *The Hieroglyphical Seal of the Society of Unknown Philosophers* which is further followed by another section entitled: *The mysteries contained in Sandivogius on the generation of metals explained. Communicated in a letter to a friend. By Theophrastus Paracelsus. Providentially obtained by E Benezzer Sibly MB 1789*.

The British Library manuscripts of these letters are in Latin, Sloane MS 1724, and English, Harley MS 6937. I can confirm that the letters contained in both these manuscripts both have the same contents as the published 55 letters of Sendivogius. The dating of the letters is somewhat inconsistent, but Bugaj had already noted that since these dates are all 1646 or 1647, they were almost certainly inserted by their copyists. The Sloane manuscripts additionally contain the *Sigillum seu Hieroglyphicum Societalis Philosophorum incognitorum* and the *Statuta Philosophorum incognitorum*. All these manuscripts are catalogued under the name of Sendivogius.

I have not had the opportunity to study any of these manuscripts in detail. It is clear nevertheless that they are all the same as the works which appeared together in the 1691 French edition of *Les Oeuvres du Cosmopolite*. Bugaj was not aware of the existence of any of these

manuscripts.

In his recent article on Sendivogius and the Rosicrucians, Rafał Prinke has taken note of the French edition of 1691 which contains both the letters and the statutes. He has also noted the existence of another English manuscript version of the letters (42).

Judging from these recent discoveries it is clear that there is scope for further research into the topic of Sendivogius and his possible role in the early history of the Rosicrucians.

#### 8. *Process on the Central Salt*

As mentioned earlier, this was first published in Becher's *Chymischer Glücks-Hafen* in 1682 and it had four reprints. It is a relatively short work and Bugaj believes that it was written while Sendivogius was employed at Rudolph II's court. (43)

This work is very interesting from the standpoint of practical chemistry and it demonstrates Sendivogius' excellent command of the subject. I have used Bugaj's translation for an English summary which appears on pages 316-321 in the Appendix.

Sendivogius describes there the preparation of the Philosopher's Stone. While the processes, in the light of modern chemistry, could not have succeeded in 'multiplying' gold, that does not necessarily imply a deliberate intention to deceive - indeed C. Nieuwenburg has written a short paper in which he explains how alchemists may have misinterpreted their observations to the extent that they could have believed in transmutation on the basis of their

practical experience. (44)

#### 9. *Statutes of the Unknown Philosophers*

In addition to the printed edition of 1691, I have also seen the French and Latin manuscript version of these, as mentioned above. Rafał Prinke informs us that the French scholar Robert Adamou has discovered a further Latin manuscript version of the *Statutes*. (45)

I have translated the *Statutes* from French into English and my discussion and analysis of them appears in chapter six. The translation is given in the Appendix on pages 322-343.

In this work, Sendivogius proposes a set of rules for a cabalistic society of unknown philosophers, whose aim is to prepare the Philosopher's Stone, and to help others. Secrecy and a genuine desire to work are the key characteristics of its members. The organisation of the Society is discussed, together with details of how to become a member, the initiation ceremonies, and criteria for membership.

#### 10. *Operations on the Philosophical Elixir*

This short work was discovered some 30 years ago in the archives of Count Wiktor Baworowski in Lwów, by Roman Bugaj. Bugaj informs us that it was copied by Hieronim Pinocci, who was one of Sendivogius' contemporary biographers, in 1586. (46) The *Operations* are of particular interest since they constitute one of the earliest alchemical manuscripts written in Polish. Bugaj first published his modern Polish version of them in 1968, and again in 1971. (47)

My summary of Bugaj's translation (1971 edition) is given in the Appendix on pages 345-346.

In the *Operations*, Sendivogius, who was then just 20, describes twelve experiments which he had conducted, trials to prepare the Philosopher's Stone. Sendivogius admits that the experiments all failed but this short work nevertheless gives us an insight into his knowledge of practical chemical techniques.

#### Manuscripts of further possible works

I have found one manuscript in the Ferguson collection which I hope to analyse in future. It appears in manuscript 47, which bears the title: *(Book of recipes) 16th Century 98pp. Italian. One of the recipes is entitled: Lapidis Philosophorum dilucidatio, sive Lumen indeficiens, fugans mansionum teneas Uniuersas ex Philosopho Santiuogio, et qua Plurimis.* The latter part of this title is not easily translated, but the following loose interpretation is suggested: *The Stone of the Philosophers explained, or the perpetual light, which explains the fleeing universal being, as explained in the philosophy of Sendivogius and many others.* The work is 15 sides long and is written in a mixture of Latin and Italian. My initial investigations suggest that it is different in content from any of the known printed works of Sendivogius.

Another manuscript which relates to Sendivogius is mentioned in a catalogue entitled: *Stanislas de Guaita et sa Bibliothèque Occulte.* (48) On page 194 we find entry no. 1580: *Dans ce fort interessant manuscrit sont contenus les traités siuivants:... Traité de la matière et du feu des*

*philosophes, par Sandivogius.* [The following treatises are contained in this very interesting manuscript... Treatise on matter and on the fire of the Philosophers, by Sandivogius] According to a communication from the Bibliotheque Nationale, this collection of manuscripts was purchased by an American some years ago.

#### Summary

I have used Roman Bugaj's very thorough bibliographic research on the works of Michael Sendivogius as a basis for my own further research in this field. I have found several imperfections in his work caused by his neglect of certain important bibliographical sources, which were not available in East Europe at the time of his research, his lack of access to certain key French editions, and his lack of knowledge of the French language. A command of French, and the excellent library and communication services currently available, have enabled me to compile a comprehensive summary of all the known French editions. Furthermore, with the cooperation of Roman Bugaj, I have been able to include four further works of Sendivogius which have not until now been generally known to the scholarly world.

The Sendivogian works can be broadly classified as follows:

A. Works in which he attempts to establish a general synthesis of Nature. These are:

- (i) *Treatise on the Philosophers' Stone*
- (ii) *Treatise on Sulphur*
- (iii) *Treatise on Salt*

Each of these works is accompanied by a dialogue, in which certain points are emphasized. An important issue was his concept of air, its role in combustion and respiration, and its relationship to nitre.

B. A work in which his ideas on air and its role in Nature are fully developed: *Harmony*

C. Works in which he demonstrates his considerable experience and knowledge of practical chemistry:

*Operations on the Philosophical Elixir*  
and *Process on the Central Salt*

D. Works in which he explains some of his ideas in more detail: the *55 letters*

and the *Philosophical Letter*

E. The *Statutes of the Unknown Philosophers* in which his opinions concerning the "seekers of the truth",

(1) their relationship with their work

and (2) the means of communication among themselves are clearly expounded.

Sendivogius' writings demonstrate a wide range of interests which today could be classified as branches of medicine, psychology, geology and biology. It is also clear that he greatly respected and was influenced by the teachings of Aristotle, Geber and Paracelsus. But he presented an original theory based on experiments, which was widely studied throughout Europe for two hundred years. This theory is discussed in chapter five.

## Notes

1. R. Bugaj, *Michał Sędziwój* and *Traktat* respectively. Details are given on page 9. In the first of these two works, Bugaj concentrated on biographical and bibliographical details but also included translations of the two works which he had discovered, and summaries of four other works. In the 1971 edition however, complete translations of all the six works known to Bugaj were given, with only a small amount of space given to the historical background and to biographical details.
2. P. Borel, *Biblioteca Chimica seu Catalogus Librorum Philosophorum Hermeticorum* (Paris, 1654).
3. L. Dufresnoy, *Histoire de la Philosophie Hermétique* 3 vols. (Paris, 1742).
4. J. Partington, *A History of Chemistry* 4 vols. (London, 1959).
5. J. Ferguson, *Bibliotheca Chemica* 2 vols. (Glasgow, 1906).
6. H. Kopp, *Die Alchemie in älterer und neuerer Zeit* (Heidelberg, 1886).
7. Č. Zibrt, *Bibliographie česke historie* (Prague, 1906), 3, 523-526.
8. T. Żebrowski, *Bibliografia piśmiennictwa polskiego z działu matematyki i fizyki oraz ich zastosowań* (Krakow, 1873).
9. K. Estreicher, *Bibliografia Polska* 27 (Krakow, 1929).
10. R. Bugaj, *Michał Sędziwój*, 281.
11. *ibid.*, 281-283.
12. Some confusion exists to this day over Nuysement's identity. The British Library Catalogue lists all entries under the authorship of Nuysement and Monte Cubiti (Vigilantius de) under the name of Clovis Hesteau. The Wellcome Institute Library on the other hand lists the same entries under Nuysement. There is added confusion in that there appear to have been two Nuysements: "By Schmeider he is called Jaque Nuysement, and in the British Museum Catalogue he is entered as Jacques Nuisement, Baron. He himself states that he was receiver general of the county of Ligny, in the duchy of Bar. He was regarded by the true philosophers as a mere compiler. He must not be confounded with Clovis Hesteau, Sieur de Nuysement, who published a volume of poems at Paris, 1578." J.Ferguson, *Bibliotheca Chemica* (Glasgow, 1906), 2, 148.
13. R. Bugaj, "'Saletra Filozofów' a odkrycie tlenu"



["Philosophers' Nitre" and the discovery of oxygen]  
*Kwartalnik Historii Nauki i Techniki*, 3-4, (1986),  
757-758.

14. R. Bugaj, *Michał Sędziwój*, pg. 282 notes 4 and 5.
15. *ibid.*, pg. 293 note 48.
16. *ibid.*, pg. 298 notes 60 and 61.
17. M. Sendivogius, *Cosmopolite. A Philosophical Account of Nature in General, And of the Generation of the Three Principles of Nature, viz. Mercury, Sulphur, and Salt, out of The Four Elements. Translated from the French by JOHN DIGBY, Esq;*, (London, 1722). Preface to the *Treatise on Salt*, pg. 261.
18. M. Sendivogius, *A New Light of Alchymie*, (London, 1650), Preface to the *Treatise on the Philosophers' Stone*.
19. In the 1604 edition of the *De Lapide Philosophorum*, the author's name is given as follows: "Autor sum, qui DIVI GENUS LESCHI AMO".
20. In the 1616 edition of the Cologne edition of the *Treatise on Sulphur* the title page contains the following heading: "Tractatus de Sulphure altero Naturae Principio, ab authore eo, qui et primum conscripsit principium. Non nobis Domine non nobis, sed nomini tuo da gloriam. ANGELUS DOCE MIHI IUS. Vt possim dijudicare inter verum et falsum. Coloniae, apud Ioannem Crithium sub signo galli. Anno M.DC.XVI."
21. Many French editions of his works give the author as "Le Cosmopolite". An example is the 1691 Paris edition which was entitled: *Cosmopolite, ou Nouvelle Lumière Chymique*.
22. R. Prinke, "Michael Sendivogius and Christian Rosenkreutz The Unexpected Possibilities", *The Hermetic Journal*, (1990), pg. 88.
23. The following titles all refer to one work:  
    *De Lapide Philosophorum* (Prague, 1604)  
    *A New Light of Alchymie* (London, 1650)  
    *Traite de Mercure* (Paris, 1691)  
Also the following two titles refer to one work:  
*Sal Lumen et Spiritus Mundi Philosophici or the dawning of the Day discovered by the Beams of light, shewing the true Salt and Secret of the Philosophers, the first and universal spirit of the World, Ludvic Combachins*, (London, 1657) and *Traitez de l'Harmonie et Constitution generale du Vray Sel, secret des Philosophes, et de l'Esprit Universel du Monde... receuilly par Jacques de Nuysement*, (Paris, 1621).

24. Each of the following three works is different:  
 J. Becher, "Processus D. Michaelis Sendivogii super centrum universi, seu Sal centrale" *Chymischer Glücks-Hafen* (Frankfurt, 1682), 231-240.  
 J. Nuysement, *Tractatus de vero sale secreto philosophorum, et de universalis spirito mundi* (Lugduni Batavorum, 1672).  
 Le Cosmopolite, *Traité du vrai sel des Philosophes* (Paris, 1691).  
 Rudolph Glauber's "Novum Lumen Chymicum", pp.75-81 in *The Works of the Highly Experienced and Famous Chymist, John Rudolph Glauber* (London, 1689), bear no resemblance to Sendivogius' work with the same title. Glauber's short work gives descriptions of methods for chemically extracting gold from different sands.
25. J. Beguin, *Novum Lumen ad Tyrocinium Chymicum...*, (Coloniae Agrippinae, 1625). This work is mentioned in Duveen on page 62. It contains the *Treatise on the Philosophers' Stone*.  
 P. Müller, *Miracula et Mysteria chymico-medica* (Wittenberg, 1614). Sendivogius' *Novum Lumen Chymicum* appears anonymously between pages 369 and 493. Three further editions of this encyclopedic work appeared in 1616, 1623 and 1656. Bugaj has listed the 1623 edition.
26. B.J.T.Dobbs, *The Foundations of Newton's Alchemy* (Cambridge, 1975), 157-159.
27. R. Bugaj, *Traktat*, 150-211.
28. S.J. Linden, "Jonson and Sendivogius: Some New Light on 'Mercury vindicated from the Alchemists at Court'", *Ambix* 24 Part 1, March 1977.
29. M. Sendivogius, "Treatise on Sulphur", *A New Light of Alchymie* (London, 1650). Several passages occur: 82 lines 7-17, 88 lines 13-33, 89 lines 25-33, 90 lines 1-28, 93 lines 30-33, 94 lines 1-4.
30. see, for example, the Preface to the "Treatise on Sulphur".
31. J. Ferguson, *Bibliotheca Chemica* (Glasgow, 1906), 1. On page 369 the *Tractat vom Philosophischen Saltz* is listed under the author HAUTNORTHON, JOSAPHAT FRIEDERICH. Ferguson discusses the story of the origin of this work, with special attention to the origin of the initials "J.F.H.S." which appear in the German title. These have been discussed by several writers, as Ferguson points out, and he himself writes: "Now while the initials have been elucidated by the user of them himself, it has been gathered from other sources that Hautnorthon is a pseudonym, and that the author was Johann Harprecht."
32. B. Roger, (ed) *Le Cosmopolite, Nouvelle Lumière*

*Chymique, Bibliotheca Hermetica* (Paris, 1976)  
On page 24 of the Preface, Roger writes: "La Nouvelle Lumière Chymique, ou Traité de la Nature en général, ou Douze Traités, le Traité du Soufre, le Traité du Sel, la lettre philosophique dite de Sendivogius, l'Idée d'une nouvelle Société de Philosophes et les cinquante-cinq lettres de Sendivogius ou de J.J.D.I., tels sont les textes, d'auteurs évidemment différents, que la renommée et les editeurs ont attribués au mystérieux "citoyen du Cosmos", le Cosmopolite, dont le nom, fait assez étrange, ne semble avoir été imprimé que dans les éditions françaises..."

33. R. Bugaj, *Michał Sędziwój*, pg. 282 notes 44 and 45, and pg. 292 notes 44 and 45.
34. D. Duveen, *Bibliotheca Chemica et Alchemica* (London, 1949), on page 546 he discusses the origin of the French edition "Traité du Sel": "Caillet (10133) suggests that the third treatise is not ascribable to Sendivogius and may be a French translation of a work by Harprecht, of which he has no copy available for comparison. I have compared the text with J.F. Hautnorthon (usually taken as being the same person as Harprecht, cf. Ferguson 1, 369), "Tractat vom philosophischen Salz," 1656 ("Hermetisches A.B.C." 1778) and in fact the texts do correspond though not word for word, possibly due to their both being free translations from a common Latin original."
35. Catalogue entitled: *Libraire de l'Art Indépendant* (Paris, 1920). See entry 4550 on page 473 in: *Bibliotheca Esoterica Catalogue* (Paris, 1988).
36. *Libraire LA TABLE D'EMERAUDE, Catalogue de Vente par Correspondance* (21, rue de la Huchette, 75005 Paris, Octobre 1982).
37. J. Ferguson, *Bibliotheca Chemica* (Glasgow, 1906), 2. On page 369 Ferguson gives some biographical details about Sendivogius. He gives some information regarding the origin of his various works and writes: "In addition there is a collection of fifty-five letters which are assigned to Sendivogius. They have been regarded as spurious and they do not generally appear with the other works."
38. J.J.Manget, *Bibliotheca Chemica Curiosa* (Geneva, 1702) 2, 493-516, "Apographum Epistolarum hactenus ineditarum M. Sendivogii I.I.D.I. Cosmopolitae vulgo dicti."
39. R. Bugaj, *Traktat*, 296-393.
40. R. Bugaj, *Michał Sędziwój*, 282 note 49.
41. Manget, op.cit., 493, "hunc ergo ob finem ad te mitto

hilari animo, quae a me petis dictae societatis nostrae latino idiomate expressa statuta quorum observationem religiosam habeas futurisque sodalibus commendatissimam facias quaeso."

42. R. Prinke, op.cit., According to notes 23 and 24 on page 97 of his paper, Prinke states that he has received information regarding the English manuscripts of these letters from Adam McLean (no further details given) and from the Manly Palmer Hall collection - *A Comprehensive Bibliography of the Manly P. Hall Collection of books and Manuscripts*, (Los Angeles, 1986), 297.
43. R. Bugaj, *Michał Sędziwój*, on p.183 Bugaj writes about Sendivogius' period of employment at Rudolph II's laboratory: "Jest bardzo prawdopodobne, a nawet pewne, że *Traktat o Soli Sędziwoja* pochodzi właśnie z tego laboratorium i że alchemik w czasie swego pobytu w Pradze około r.1598 przekazał osobiście cesarzowi Rudolfowi opis procesu będący jego zdaniem 'wielką tajemnicą' i objaśniający prawidłowo hermetyczne 'wielkie dzieło'". [It is very likely, or even certain, that Sendivogius wrote the *Treatise on Salt* while he was employed at Emperor Rudolph's laboratory in Prague. Sendivogius most probably gave him the manuscript personally in the year 1598 or thereabouts. He would have explained that this is an account of a process which is a 'great secret' and which explains correctly the hermetic 'great work'.]
44. C.J. van Nieuwenburg, "The Chemical Composition of the Philosopher's Stone", *The South African Industrial Chemist* 17 (1963), 132-133.
45. R. Prinke, op.cit., on page 97 Adamou's source is given as: "Le 'Philosophe inconnu' et les 'Philosophes inconnus'" in *Les Cahiers de la Tour St. Jacques*, 1961,7.
46. R.Bugaj, *Traktat*. On p.96 he writes: "Rękopis Sędziwoja przepisany prawdopodobnie przez Hieronima Pinocciego. Znajduje się obecnie w dawnych zbiorach hr. Wiktora Baworowskiego we Lwowie." [This Sendivogian manuscript was probably copied by Hieronim Pinocci. It is currently in the collected alchemical works of Count Wiktor Baworowski in Lwow.]
47. *ibid.*, pp. 97-127.
48. This was published in Paris by the Libraire Dorbon in 1899. Stanislas de Guaita was a well-known collector of alchemical works. See, for example: C. McIntosh, *The Rosicrucians* (Crucible Books, 1987), 105-107.

## Chapter Four

### Air, Salt, Nitre and the Universal Balsam

#### Introduction

Before commencing on a discussion of Sendivogius' chemical theory which related to nitre and its role in Nature, I have summarized some ideas of other authors, on similar topics. These authors were more or less contemporaries of Sendivogius. By summarizing their views, it will be subsequently easier to assess and compare Sendivogius' theory.

During the sixteenth and seventeenth centuries, potassium nitrate, otherwise known as saltpetre or nitre, played an important role in the development of certain aspects of chemical philosophy. This role can be attributed to its wide variety of properties, its ready accessibility and its numerous applications.

In his work translated into English as *The True & perfect spagerike preparation of Minerals, animalles, and vegiatables with theyr use*. (London, 1591), Joseph Quercetanus summarized the properties and uses of nitre as follows:

#### Sal nitri

This salt is a kind of salt of urine the which is taken forth of the earth by art, and is verie profitable against many infirmities, and worketh two contrarie effectes, the first is, that it cooleth greatly, as yee may see in sommer when the weather is most hot, how that for to coole their wine presently they take *sal nitri*, and mixe it with water, and therein shake or move their bottelles of tinne or glasse being full of wine, presently it waxeth as cold as Ise: also laid upon the tong, it cooleth marvellouslie. To the contrary, if ye drink the waight of 3 i. it will heat the bodie marvellouslie. Also a water made of *sal nitri* and rock allome according to air is of such extreme heat that it will dissolve silver, copper, Iron, steele, and all other sortes of mettalles presently into water. Moreover being mixed with cole and sulfur, it maketh gunpowder. Also

*sal nitri* being calcined 30. days with as much tartar, and circulated with the spirites of wine mixed with the spirites of cinamom, ginger, and cloves, it will bee a most rare medicine to cure the Etisie, and dropsie & such like diseases. (1)

Nitre was thus used as a component of cooling mixtures, medicines, gunpowder and a liquid which could dissolve metals. It is therefore not surprising that it appealed to chemical philosophers as a subject of some interest.

The object of the present chapter is to show how nitre's role in the chemical philosophy gradually changed over the period in question. This will be achieved by examining the works of the following authors: Paracelsus (1493-1541), Palissy (1508-1589), Du Chesne (1544-1609), Drebbel (1572-1633), Nolle (fl. 1609-1616) and Le Febvre (1610-1669). The first three of these published their works before Sendivogius, whereas the latter three published after him. Many other important authors such as Robert Fludd (1574-1637), Johann Baptista van Helmont (1579-1644), Johann Glauber (1604-1670) and Robert Boyle (1627-1691) could be added to this list. Such a study however, would overshadow the main purpose of the present work, and it has, moreover, already been undertaken by several scholars who have worked in this field. These scholars include John Partington (2), Henry Guerlac (3), Allen Debus (4), Robert Frank (5) and Roman Bugaj (6).

In the present thesis, I shall give a more detailed consideration of the writings of the six authors mentioned, with special reference to their comments on air, salt, nitre, and the universal balsam. This consideration will assist in making a more informed assessment of Michael

Sendivogius' contribution in this field.

### Paracelsus (1493-1541)

Paracelsus, or Philippus Theophrastus Aureolus Bombast von Hohenheim as he was otherwise known, was a controversial figure in the history of chemistry. His outspoken manner and his contempt for authority earned him many enemies and critics. He was a prolific writer, but his works are particularly difficult to understand. Scholarly research by Darmstaedter (7) and Pagel (8) has nevertheless established that Paracelsus made very important contributions to the development of certain branches of natural philosophy - notably iatrochemistry, the use of chemical remedies to treat diseases. His most important works in this field were the *De Praeparationibus* and *Archidoxae*. An additional indication of his importance was the fact that he established a large following of physicians, chemists and natural philosophers throughout Europe during the sixteenth and seventeenth centuries. (9)

Paracelsus' chief aims were to cure diseases, to strengthen the bodies and souls of humans, and to prolong life. He believed that both disease, which was a punishment, and cures, were sent to us by God. God had provided Nature with medicines, which people must discover, develop, and use for their own benefit.

The Paracelsian concept of medicine (*Arznei*) was very broad and mystical; it stemmed from his ideas on the unity of the world, the presence of God and the harmony of Nature, and the relationship between what were understood to be at that time the macrocosmos and the the microcosmos.

Astronomy, philosophy, alchemy and the individual merits of the physician were considered to form the basis of medicine, and of them, alchemy was the most important.

All living beings constitute part of the world, whose "spirit" pervades them and acts in them as a continuous driving force. Paracelsus called this "spirit", or "alchemist of Nature", the Archeus. Acting in the stomach, the Archeus was able to distinguish between good and bad foods which entered the body. It acted upon the foods and was able to utilise the 'good' ones and reject the 'harmful' ones. Were the Archeus to function incorrectly, it would fail to carry out the necessary separation of foodstuffs, resulting in illness; if it were to function sluggishly or inefficiently, death would follow. Paracelsus believed that the art of healing, given to us by God, would serve to improve the functioning of the Archeus.

A material substance, or arcanum as Paracelsus called it, was the remedy which would bring about the cure. The mode of operation of the arcanum was a key issue, to which Paracelsus attached a great deal of importance. Just as food in the stomach was broken down into simpler substances which served the functions of the body, so Paracelsus reasoned that the three naturally occurring constituents of any arcanum - animal, plant or mineral - must also be broken down if they were to function effectively.

In accordance with accepted ideas on matter theory, he accepted the existence of primary elements, out of which all matter is composed. In contrast to traditional views,



he named them the three principles: SALT, SULPHUR, and MERCURY. These names did not represent the compound sodium chloride and the elements sulphur and mercury as we know them today, but they formed a complementary way of looking at the already well established four Aristotelian elements. The approximate relationships are given below:-

element	principle
fire	sulphur
air	sulphur or mercury
water	mercury
earth	salt

The introduction of these three principles by Paracelsus was an important contribution to the transformation of alchemical ideas. It formed a useful basis for interpreting changes, and was readily accepted by many alchemists, including Sendivogius.

Paracelsus reasoned that, in the same way as noble metals can be made from the three principles, so medicines can also be made from them. This idea was one of his key contributions to natural philosophy and it formed the basis of the science of iatrochemistry.

Paracelsian alchemy thus explained both the breaking down of substances into primary matter, and its subsequent reconstitution into different substances. In his view, alchemy was the indispensable key to understanding nature and putting nature's resources to the best use.

The introduction of SALT as a primary principle, together with SULPHUR and MERCURY as the two other principles, naturally brought with it a fresh outlook on a wide range of substances which were generally classified as

salts. In his short work entitled: *The Economy of Minerals*, Paracelsus writes on "The virtues and properties of salts in Alchemy and Medicine". He opens the chapter by stating that:

"God, in His goodness and greatness, willed that man should be led by Nature to such a state of necessity as to be unable to live naturally without natural Salt. Hence its necessity in all foods. Salt is the balsam of Nature which drives away the corruption of the warm Sulphur with the moist Mercury, out of which two ingredients man is by Nature compacted."

A few sentences later he writes about the three kinds of salt:

"..which are considered specially useful for man's life. The first of these is Marine Salt, the second is Spring Salt, and the third Mineral Salt. Spring Salt is chiefly conducive to health; in the second place, Mineral Salt; and, lastly, Marine Salt." (10)

In the first of these two quoted sentences, he states the well-known fact that salt is a vital ingredient of food and then draws the corollary that salt, as a principle, is a vital element for life. In the second of the two quotes, he is evidently talking about corporeal substances, but it is difficult to ascertain which, if any of them, is nitre. Indeed, in his discussion of salts in the work entitled *Concerning Salt and Substances comprehended under Salt*, the identity of these salts is made no easier:

"I have said of salt that it is the natural balsam of the living body... But there are three kinds of salt. There is sea salt, which is salt of itself, not salted by others... Secondly, there are some springs which are sweet yet salt at the same time... Thirdly, there are also mineral salts, with the appearance of a stone, of a different kind from metals and minerals." (11)

This statement is certainly consistent with the earlier quoted one, and we can further deduce from it that by "salt", Paracelsus was actually referring to classes of

substances for which he used the general descriptions marine, spring, and mineral. It is additionally quite clear from the passages quoted so far, that Paracelsus believed that salt, as a concept or as a substance, was necessary for man to live.

Chapter XII of the first work is entitled *Concerning Salt Nitre*. It begins thus:

"There is another kind of salt called nitre. It is composed naturally of the natural salt of animals' bodies, and the salt of nutriment in those bodies combined. One salt having thus been formed from two, the superfluity is decocted into urine, and, falling on the earth, is again decocted in due course. The two constituents are more and more closely united, so that from them results one single and perfect salt through the chemical separation brought about by artificial decoction from the earth." (12)

This explanation of the formation of nitre was relatively well-known and Paracelsus himself had used variants of it in his other works. (13) He continues further:

"In alchemy its use is very frequent... it was compounded with sulphur, whence it has been deservedly called terrestrial lightning." (14)

The reference to terrestrial lightning is of particular significance since, as we shall shortly see, he subsequently expanded this idea to aerial lightning, which led to the important idea of an aerial nitre.

The passage which follows gives Paracelsus' explanation for the formation of saltpetre which, it appears, is different from nitre:

"In the same way, from the salt of the liquor of the earth, which is a universal natural balsam, by which all things are built up in their special combinations, returning at length from this by resolution into the earth again - there is produced, as was stated above, a single salt, which afterwards percolating through the pores of the earth is coagulated in the form of cones of ice adhering to the rocks, from which circumstance it changed its name of Nitre into saltpetre. Neither the one nor the other is particularly useful as a medicine, except in the way of

reducing too obese bodies;" (15)

He further relates to nitre and saltpetre in his work entitled *Concerning Salt and substances comprehended under salt*. Judging from his text however, it is very difficult to ascertain exactly how the two differ:

"Salt nitre and saltpetre, however, are distinguished by a certain difference. In the probation of salt the nature of each can be easily discriminated. A certain difference, too, can be observed in the species and powers of salt, so far as they relate to health and other matters. At the same time, I do not think it advisable that the salt which is formed from the salt nitre and saltpetre for food should be given man to eat, unless you wish to make him lean and dried up. Otherwise, it is very useful for gunpowder. It acquires another spirit, a different nature and condition."  
(16)

Even though this text does not appear to help to clarify the difference between nitre and saltpetre, it shows that Paracelsus was consistent in his description of their effects on human bodies. It is also significant that Paracelsus referred to the idea of a "universal natural balsam" which gives rise to nitre, or saltpetre.

At the end of chapter XIII of his *Economy of Minerals*, Paracelsus comments on the most useful salt of all:

"We now pass on to that salt which is more mineral in its character, and is named Vitriol. It excels all others by its utility, both in Alchemy and in Medicine." (17)

This type of usefulness, which clearly implies practical situations, was inevitably different, however, from the importance which Paracelsus attached to nitre, which he discusses at greater length in his general work on salts. He first explains the origin of nitre from urine, then its subsequent extraction and purification, and finally he describes some of its characteristics:

"No salt in the universe is like this one. Alchemy found it lying hid in nitre, reduced it to the form of a coagulated

salt, and then evolved the latent virtue from it, only for purposes of Alchemy and the manual art." (18)

At this stage it becomes clear that Paracelsus is attaching much more than just a physical or chemical significance to nitre - he is clearly implying that there are some additional mystical or spiritual powers associated with it. It is as if though he is suggesting that nitre is the physical embodiment of certain unique and universal properties. The passage continues:

"They tried to distil sulphur and salt nitre together, but this could not be accomplished on account of the violent chemical action produced. Having accomplished this afterwards by the addition of carbon, the Alchemists discovered gunpowder, and gradually so augmented this by new inventions that now it breaks through walls like a thunder-bolt. Hence it is with good reason called terrestrial lightning. By means of this salt many of the arcana of Alchemy are brought about which need not be described here. We have not yet got at the true foundation or any good end. It is best, therefore, not to write on this subject at all, so that no one may be led astray."

It is precisely this sort of writing, in which the author suggests that there are further mysteries to be unravelled, which would have inspired its reader to investigate the topic of nitre further, and to carry out more experiments with it, in order to try to find out about these "arcana of Alchemy" and "the true foundation".

From the passages quoted, we have thus been able to see that Paracelsus clearly attached a great deal of importance to nitre on the basis of its chemical characteristics, but, even more significantly, this had led him to develop further ideas about the role of nitre at a more sophisticated, or metaphysical plane. Perhaps the most important of these ideas from our point of view was his theory of an aerial nitre. In his paper entitled *The*

*Paracelsian Aerial Nitre*, Professor Debus informs us that:

"Paracelsus repeatedly explained thunder and lightning in terms of an aerial, windy, or aetherial niter and sulphur. In the *Grossen Wundarznei* he stated that: 'The matter of thunder and lightning is a Saltpeter-Sulphur of the Firmament. In the same way that Sulphur and Saltniter grow out of the earth and therefore become ordered together in one mass and substance, the heavenly materials behave. As an example: As Water grows in the heavens and then falls on the earth, so may also Fire grow in it. And as snow grows in the Heavens, so may also Salniter and other things grow out of the fire. Therefore from such things we should understand that the heavenly lightning is of a heavenly composition made out of the same materials as spring out of the earth and which through the stars are ordered in such a behaviour and way.'" (19)

In this passage Paracelsus clearly relates to one of the Hermetic precepts of the *Tabula Smaragdina* as his basis for the idea of an aerial nitre. He drew the analogy between the role of sulphur and nitre in gunpowder, and deduced that they too must somehow be involved in the meteorological phenomena which resemble gunpowder exploding - thunder and lightning.

#### Summary

From his works, we can deduce that Paracelsus was aware of a unique variety of properties of nitre which made it such a very useful and versatile substance. Through his hermetico-occultistic vision of the world in terms of his salt-sulphur-mercury theory, he elevated the role of nitre from merely that of a versatile substance with many practical applications, to one with a much more profound significance.

He wrote of its vital role as a salt in living organisms. Furthermore, he drew parallels between his observed behaviour of gunpowder and of thunder and lightning. From these, he deduced that if an "earthy" nitre

and sulphur were responsible for the explosive violence of the man-made gunpowder, then an "aerial" nitre and sulphur must be responsible for the God-made phenomena of thunder and lightning.

Two quite distinct approaches may be discerned in the writings of Paracelsus, which lend themselves to two entirely different interpretations of nitre:

1. It is a substance with a diverse range of properties, which makes it very useful for a variety of applications.

2. It is the physical embodiment of the universal concept of SALT which is associated life and with air.

#### Bernard Palissy (1508-1589)

By the late sixteenth century, the importance of salts, both in the chemical sense and in the philosophical sense, had become well established. The French natural philosopher Bernard Palissy, who "...lectured to learned audiences on natural history, chemistry, agriculture, exhibiting specimens and charging a modest fee." (20), had no doubt about the importance of salts. In his *Discours Admirables* in which he wrote extensively on spring waters, their location and beneficial uses, one of the chapters was entitled *Des Sels Divers* [On Diverse Salts]. In this chapter, as indeed in the rest of the work, the text is in the form of a dialogue between "Practique" and "Theorique". At the beginning of this chapter, "Practique" asserts that:

"...I wish to show you that nothing exists without salt... I tell you that there is such a great number of them that it is impossible for any man to name them. Moreover, I tell you also that there is no thing in this world which does not have any salt, be it man, beast, trees, plants or other forms of vegetation. Look further at metals, and say also, that no vegetation would be able to live without the action of salt, which is present in seeds..." (21)

The last phrase is of particular interest, since Palissy was drawing the implication that, since salt is present in all beings, and in all metals, then it must also be present in all seeds. In a subsequent chapter entitled *Les Vertus des Sels* [The Virtues of Salts], he illustrates how salts can act as seeds by means of an example relating to the use of compost by farmers:

"...look how the labourer had brought compost onto his field and had put it there in small piles. A few days later he came to spread it on the fields, without leaving any at all on the small heaps. After such a field had been sown with wheat, you would have found that the best wheat, which was greenest and had grown the thickest, would have been on the sites of the small piles of compost, and not anywhere else. And this happened because when rain fell, it leached the salt out of the compost and transferred it to the soil. You can now understand that it is not the compost which is responsible for the generation of the wheat, but the salt which the seeds had put in the ground." (22)

Further on, Palissy reiterates his point that when God made the earth, he filled it with all sorts of seeds, and that these seeds required salt in order to grow. Thus he believed that salt was a necessary food for seeds, and that consequently it was also necessary for generation:

"...salt is a fixed body which is palpable, and has its own characteristics. It conserves and generates all things, and is found in other things such as wood and all species of plants and minerals. It is an unknown body which is invisible like a spirit. It is always present in a certain fixed place and it sustains the body in which it is enclosed..." (23)

Palissy mentioned nitre, but did not seem to attach any special significance to it. He listed nitre together with several others salts such as copperase, vitriol, alum, borax, sugar, tartar and sal ammoniac, but only mentioned its practical application with reference to its use by Egyptians thousands of years ago:



"Stories tell us that they embalmed with nitre and with aromatic herbs. You must note that nitre is a salt which conserves, and which hinders putrefaction..." (24)

### Summary

Palissy has evidently been influenced by some of the Paracelsian ideas concerning the universality of salt and its necessity for life. Whereas Paracelsus had used the idea of a universal balsam to express this idea, Palissy had extended this to a concept of universal seeds. Salts in Palissy's view were thus a necessary constituent of all animals, plants and minerals, and thus they played a vital role in the generative processes of these three classes of beings.

Joseph Du Chesne, otherwise known as Quercetanus, (1544-1609)

Du Chesne was a well-known French iatrochemist, who was appointed physician to Henry IV, king of France, in 1593. He wrote several works on a wide variety of topics including chemistry, medicine and natural philosophy. He acquired fame as a strong supporter of the new Paracelsian approach to the treatment of illnesses and was outspoken in his criticism of traditional Galenic philosophy.

His writings reflect a thorough practical knowledge of a wide variety of substances and also their applications. One of his most important works was *The Practise of Chymicall, and Hermeticall Physicke, for the Preservation of health*, which was published in London in 1605. This appeared under the authorship of Joseph Quercetanus, and was an English translation, by Thomas Tymme, of a selection of his earlier writings. Throughout this work, which is in

two main sections: the "chymicall" and "hermetical" ones, a strong emphasis on the interpretation of natural phenomena in terms of the three Paracelsian elements salt, sulphur and mercury, is apparent.

Du Chesne opens the second chapter of *The Practise of Chymicall Physicke* with the statement that:

"There are three principall things mixed in every Naturall bodie: to wit, Salte, Sulphur, and Mercurie. These are the beginnings of all Naturall things." (25)

Like Paracelsus, he also stressed the importance of salt for all animals:

"Salt (where of hath bene spoken before at large) is a thing of such qualitie, and so excellent in it selfe, that all creatures by a certaine natural instinct, doe desire the same as a Balsam, by which they are preserved, conserved, & doe grow and increase. They love it, and like it so wel (I say) that they long after it, and doe drawe it unto them by their breath, and doe licke it with their tongue out of walles, and old rubbish." (26)

Viewed in this sense, salt is a universally occurring substance which is necessary for life, and which animals take in through their mouths and lungs.

In chapter V of the *Chymicall Physicke*, which is entitled *Concerning Salt*, Du Chesne describes the complex tasks of the "skillful salt makers", or the people who extract and purify salt from the ground. He writes about the different kinds of salt, and how they can be separated by the action of heat:

"Which three distinct differences of Saltes, as they are to be found in every fat kind of earth, so out of both the saltes, namely the marine and fixed, and the Niterus volatile, they may be thenceforth separated. For those Saltes, being put into a retort together, or apart by themselves, with a receiver, first by the force of fire stilleth forth a Volatile Salt, sower, sharpe and Mercurial; then, with a greater heate, commeth forth a Salt Sulphurus and Niterus, and sweete; the third Salt, which is Salt upon Salt fixed, will not moue with any force of fier, but remaineth constantly in the bottome of the glasse." (27)

From this passage we may infer that when the three salts, the "marine", "fixed" and "niterus volatile" are heated, either separately or together, then three different salts are produced, which are responsible for three kinds of taste. We can see by means of a passage such as this, how the imagination of Du Chesne was stimulated by the attractively simple explanation of a chemical phenomenon. Whilst it is certainly possible to envisage the chemical changes described, the references to taste require a much broader interpretation in order to make satisfactory sense. The idea of "three" of something was also a common one, and it recurred several times Du Chene's writings.

In order to appreciate Du Chesne's writing it also becomes necessary to interpret the meaning of the word "salt" in either a broad conceptual sense, as a Paracelsian primary element, or in the strictly chemical sense, or as seems to be the case in many of his writings, both senses simultaneously. In the section entitled *The effects of Salt in the aier*, Du Chesne clearly alludes to a dual interpretation, when he mentions the way in which "philosophers" view the world: (28)

"Who seeth not this in the very aier also, by the sublimations of the spirits of the same nature of Salt, which spirits being sublenated into aier in the said spring time, doe fal againe in forme of a deawe, upon corne and all things that spring out of the earth? And who seeth not that these deawes arysing from the earth, and falling againe from the aier, is a cause of vegetation and growing? But that the dewe is the spirit of the foresaid Salt, and indued with Salt, they which thinke themselves great Philosophers, against their wils and not without shame, do confesse, when they see that the true Phylosophers doe extract out of the deawe a Salt, which dissolueth corall and pearles, no lesse then doth the Salt which is extracted out of common Salt, out of Salt-Peeter, out of Niter, or out of other Salts which are prepared for the same end."

Du Chesne then, is describing an aerial salt which originated in earth, and which can be condensed back to a dew which makes plants grow. He differentiates however, between the people who merely speculate or philosophise, and those who actually carry out experiments to test their hypotheses. He further uses the idea of an aerial salt in his explanation of meteorological phenomena such as thunder and lightning:

"For in that fierie flame which breaketh forth is Sulphur: In the windy spirit, & moystnesse is Mercury: and in the thunderbolt or stone of the lightning, is salt fixed." (29)

Once again he uses the three Paracelsian principles to explain phenomena which were well known, but not well understood.

Du Chesne's most interesting references to the salt nitre occur in chapter II of *The Practice of Hermeticall Physicke* which is entitled: *The three principles of all things are contained in Salt, extracted out of the earth.* In it, he clearly suggests that nitre is a salt which has associated with it certain most important properties, which are not immediately apparent:

"But to shewe now more particularly those things whereof we have spoken generally, namely, that Salt doe participate with the animal, vegetal, and mineral nature, wee wil use a common example, to which notwithstanding, being exactly and diligently waighed and considered by a true Phylosopher, is a notable mistery. The which, albeit it bee taken from out of the earth, yet it may lift up our eyes to heaven.

I mean to speake of Niter, which men commonly cal Salt-Peeter. I let passe the detestable and pernicious use thereof, invented for the destruction of men: And yet I must confesse that it deserveth great admiration, in that it sheweth forth so great, and incredible effects. When as we being in these lower parts, it representeth thundrings and lightnings, as if they were in the aire aloft. But if we should consider what it is, and of what quality, in his owne nature and composition, what divers faculties, and qualities, and effects there are in a thing so visible and

so common, it would no doubt make us to wonder out of measure." (30)

He then describes its origin in pigeon dung, urine, rubbish grounds and stables, and also its extraction and purification by "salt-peeter" men who repeatedly wash it and finally recrystallize it from a concentrated solution. Following this, he returns to the three-in-one theme, but on this occasion he writes about the three salts contained within saltpeter:

"Also in this comparison of Salt, we may beholde three distinct natures, which neverthelesse are and doe subsist in one and the same essence. For the first nature is Salt common, fixed, and constant: and the other nature is Volatil, Salt, the which alone, the Sal-peeter-man seeketh after.

This volatil or flying Salt, containeth in it two kindes of Volatil Salt: the other full of Sulphur, easily catching flame, which men call Niter: the other Mercurial, watery, sower partaking of the nature of Salt Armoniac.

Wherefore in that most common essence of earth, these three several Salts are found, under one and the same nature of the which three, all vegetables and animalls whatsoever doe participate. And we determine to place our three hypostatical and substantial beginnings, upon these three Salts, as upon the fundamental grounds, in that our worke, concerning the hidden nature of things, and the misteries of Art, the which we had thought to have published before this time: whereof we thought it convenient to say some thing by the way, because the groundworke and beginnings of Medicines depend upon them." (31)

A strong mystical component is apparent in this passage - the three-in-one theme had strong religious connotations, for it related to the Holy Trinity. Du Chesne was clearly convinced that he had achieved an important breakthrough in his interpretation of nitre's vital role in nature. He stresses however, that this special significance of nitre is not something that anyone will be able to readily understand:

"But what doe I meane to open the gate of passage into the orchard of the *Hesperides*, in speaking so plainly of

salt-peeter, giving thereby a free accesse unto the selfish and ignorant? Be not therefore deceived, in taking my words according to the letter. Salt-Peeter of the Phylosophers or fusile salt (whereof at the first came the name of *Halchymie*) is not Salt-Peeter, or that common Niter: yet neverthelesse, the composition and wonderful nature thereof, is as it were a certain example, and *Lesbian* rule of our worke. Nowbeit I have spoken more plainly & manifestly unto you of this matter, then any other which hath gone before me hath done." (32)

### Summary

Du Chesne has evidently followed Paracelsus in his comments on salt as a balsam, and on the importance of an aerial salt in thunder and lightning. Furthermore, he has highlighted the special role of a philosophical nitre in the chemical and natural philosophy.

As in the case of the Paracelsian writings, it has been possible to discern two alternative styles of writing: a straightforward descriptive one, and a more mystical allegorical style, which was clearly designed for inspired philosophers.

### Cornelius Drebbel (1572-1633)

Drebbel was a Dutch inventor who was born in Alkmaar in north Holland, and died in England. During his lifetime he enjoyed a considerable reputation as a skilled technologist, and was therefore invited to work at the courts of several influential heads of state. Among these were Emperor Rudolph II, at whose court Drebbel was principle alchemist from 1610 to 1612, and the English kings James I and Charles I. Drebbel is credited with a number of interesting inventions, including a variety of perpetual motion machines, a tin salt mordant for the bright scarlet dye extracted from cochineal, several optical, barometric and pyrotechnic devices, and a

submarine which reputedly sailed underwater from Westminster to Greenwich. (33)

The submarine is of particular relevance to the present thesis, since Drebbel had apparently devised an ingenious, but secret method for freshening, or revitalising the air in this vessel. The possibility that Drebbel may have used oxygen gas in this situation was the focus of a debate for many years (34). As evidence in favour of the idea that Drebbel did use oxygen, Tierie has quoted a passage from one of Drebbel's two printed works, which suggest that he was aware of the nature of the products of the thermal decomposition of nitre. The passage occurs in the *Treatise on the elements of Nature, by the treatment of winds, rain, and the origins of thunder and lightning etc.* This was first published in Dutch in 1608, and was subsequently translated into German (1612), Latin (1621) and French (1672). The passage relating to the thermal decomposition of nitre occurs, not surprisingly perhaps, in Drebbel's account of the origin of thunder:

"Very dry, subtle or warm air, which then very quickly penetrates the coarse, heavy clouds, expands them, makes them subtle and thin, and again changes them into the nature of air, whereby its volume is increased an hundredfold in a moment, which brings forth the terrific motion which, cracking and bursting, sets the air alight and moves it, until volume and density are equal, when there is rest. Thus is the body of the saltpetre broken up and decomposed by the power of the fire and so changed in the nature of the air, or as when a wet hand or cloth is waved about on a hot iron, or molten lead, which by expansion or enlargement due to heat cracks and bursts with a noise like thunder." (35)

In his short account of Drebbel's contribution to chemistry, Partington has dismissed the possibility that Drebbel could have made oxygen. He wrote that:

"Boyle in 1661 reported that he was told 'that Drebbel conceived, that it is not the whole body of the air, but a certain quintessence (as Chymists speak) or spirituous part of it, that makes it fit for respiration; which being spent, is unable to cherish the vital flame residing in the heart... he would, by unstopping a vessel full of this liquor (a chemical of his invention), speedily restore to the troubled air such a proportion of vital parts, as would make it again, for a good while, fit for respiration.' This was probably a concentrated solution of caustic alkali to remove carbon dioxide, if the story is true. " (36)

From the evidence which is at present available, it is not possible to deduce the exact method by which Drebbel freshened the air in his submarine, if indeed, he had ever done so. I feel, however, that the following issues ought to be borne in mind in connection with this topic:

It is possible that Drebbel may have known that when nitre is strongly heated, it gives off a spirit which assists in respiration, or enhances combustion. This, of course, would not necessarily imply that he knew how to make oxygen, or that he had discovered oxygen, as some writers have suggested. Neither would it imply that Drebbel's understanding of the processes involved was similar to the modern interpretation. It would imply however, that Drebbel was aware of chemical phenomena which were not widely known. This naturally raises the question: how did Drebbel discover the thermal decomposition of nitre, and the properties of the spirits which were evolved? Roman Bugaj has provided a suggestion which, I believe, is plausible, and which could also provide a topic for further investigation:

"The Dutchman corresponded with the patron of alchemists, Emperor Rudolph II, and he was subsequently involved in the education of Emperor Ferdinand II's sons. Michael Sendivogius had a full time post at both of these Emperors' courts. It is clear that both alchemists must have known each other well, and that Drebbel knew Sendivogius' *De lapide*



*philosophorum* which was published in Prague in 1604, and also his theory of an aerial nitre." (37)

This theory of an aerial nitre forms the topic for the next chapter.

#### Summary

The only firm evidence of Drebbel's interpretation of nitre and its role in nature comes from the one sentence on it in his *Treatise on the Four Elements*. Inasmuch as the sentence occurs in a section which deals with the origin of thunder, it is possible to discern a connection with the Paracelsian aerial nitre principle; but in his suggestion about the nature of air as a product of the effect of heat on nitre, Drebbel was on entirely different terrain.

#### Henry Nolle (fl. 1612-1619)

Little is known about this German author. Ferguson describes him as follows:

"Heinrich Nolle, or Noll, or Nollius, flourished in the first quarter of the seventeenth century. He was a teacher at the Gymnasium at Steinfurt in Westphalia, professor of philosophy at the newly-founded university of Giessen, and pastor in Darmstadt. He had studied not only philosophy and theology, but had devoted himself to chemistry and medicine, and was a devoted follower of Paracelsus. His works relate chiefly to hermetic medicine and philosophy." (38)

In 1619 his work entitled *Naturae Sanctuarium: Quod est, Physica Hermetica*. [The Sanctuary of Nature: that is, Hermetic Physics] was published in Frankfurt. This was a substantial book consisting of some 686 sides, and it was bound with his four further treatises, bringing the total number of sides in the volume to 838.

The *Sanctuary* consists of eleven chapters on topics such as elements, stars, meteors, minerals etc. Throughout the work, Nolle made references to several authors such as

Geber, Lully, Severinus, Basil Valentine, Paracelsus, Drebbel and Sendivogius. The impression he thus gives, is that he had read widely himself, and that he was, in essence, summarizing the views of the most important authors. Chapter three of book II (*On Elements*) was entitled: *On Air*. This begins as follows:

*Accept these axioms concerning air.*

1.

*There is nothing in the world that is able to exist without air.*

Since all substances are composed of air; 2. since the other elements, which are necessary in the world, take their being of air; 3. since air sustains animal life; it therefore regulates the warmth of the heart when it is drawn in by breath, it nourishes the warm moisture of existence, it provides matter for vital spirits, it provides the ample space for birds to fly and it is the medium through which animals on this earth both see and hear. Without air there is neither seeing nor hearing. In the world nothing would grow if there were not the power of air, of air which penetrates and shifts, bringing with itself regenerative nourishment. As the true philosopher Michael Sendivogius says in the epilogue of his twelve treatises on the Philosophers' Stone: Man, though made of earth, must live of air too. For there is in air a hidden food of life which we call dew at night, and rarified water by day. When the invisible spirit of this food is condensed, it is nobler than any earth." (39)

This was one of several references to Sendivogius' writings, other quotes being taken from his *Treatise on Sulphur*. The fact that air is necessary for life was, of course, well known. The Sendivogian idea of a "hidden food of life" however, was one which had not been previously suggested.

In the chapter on salt, Nolle followed established Paracelsian ideas:

"On Salt

*Salt is the strong, fixed, and fundamental principle of all things.*

...Because they have their basis in salt, Sulphur and Mercury draw their proper sustenance from Salt, and they work upon it for however long [it may take] until they

have transmuted the ordinary form of fixed Salt into the volatile form. They continue this until they have drawn it through from a lower to a higher, and glorious state. In this way they themselves constitute an everlasting benefit for Salt, without which they themselves could not have existed. Salt itself, triumphing and exulting in the marvellous and glorious operations of Sulphur and Mercury, with joy wishes fame and glory for all adepts." (40)

Earlier, Nolle had written about the vital role of air, whereas here he was writing about the great importance of salt in the hierarchy of the three Paracelsian principles. It is significant that the Sendivogian reference to air did not contain any mention of Sulphur or Mercury, unlike the comment on Salt.

#### Summary

Only fifteen years after its first appearance, Sendivogius' treatise *De Lapide Philosophorum* was already making a contribution to certain aspects of natural philosophy. The quoted passage is of particular significance, since it shows that his references to the role of air, or a part of the air that is necessary for life, was an area in which his views were considered to present a novel and useful interpretation.

#### Nicaise Le Febvre (1610-1669)

He was also known as Le Febure or Le Fèvre. (41) Not a great deal is known about him and Ferguson informs us (42) that after he had been physician to the French king for 12 years, in 1664 he came to England, where, according to the title page of his *A Compleat Body of Chymistry*, he was "Royal Professor in Chymistry to his Majesty of England, and Apothecary in Ordinary to his Honorable Household". The work, which was first published in 1660 in French under the title: *Traicté de la Chymie*, was in two parts. Its first

part was published in an English translation in 1662 under the heading: *A Compendious Body of Chymistry*, and in 1664 the whole work was available in English under the heading *A Compleat Body of Chymistry*. Another edition of this translation was published in 1670. Le Febvre apparently wrote only one other work.

The *Compleat Body of Chymistry* is a substantial work, occupying a total of 606 sides. The introductory 70 sides deal with philosophical issues underlying the subject. They include discussions on the scope of chemistry, the four Aristotelian elements, the three Paracelsian principles, and matter theory. The idea of a universal spirit features prominently in this part, and is clear that it was at the forefront of Le Febvre's interests.

On page 14 he gives the various definitions of universal spirit which have been used by different authors: vital substance, spirit of life, light, balsam of life, vital mummy, natural heat, universal spirit and mercury of life. To Le Febvre, it seems that the universal spirit was a concept rather than an actual substance, and this was an issue which clearly perplexed him. He considered that it was, like all other substances, composed of the three Paracelsian elements salt, sulphur and mercury, and that it was also somehow linked to a 'Central Salt':

"But that you may not be deceived by the ambiguity of the word *Salt*, you are to know, that there is a certain Central Salt, radical Principle of all things, which is the first body wherewith the Universal Spirit closeth it self, and contains the other Principles;" (43)

The idea of a central salt was further linked to universal seeds:

"This Salt is the fundamental ground of all Nature, being the Center where all her vertues do meet, and the true seeds of all things; being nothing else, but a congealed, well digested and concocted Salt:.... Nature beginneth the production of all things by a central and radical Salt, which she extracts out of the Universal Spirit. The difference between these two Salts is, that the first breeds the other in the Mixt, and that the *Hermaphroditical* Salt is ever a Principle of Life, and the other proves sometimes a Principle of Death." (44)

The 'Hermaphroditical' salt was a term which was used by several natural philosophers of this period and it seems to have related to a "formative salt principle". (45) The Paracelsian principle of salt has thus been further developed to include different aspects of it, which, as we shall shortly see, Le Febvre used to explain the difference between life and death. The idea of a central salt which was extracted from the universal spirit and which was involved in all generative processes was a development of the Paracelsian idea of salt acting as a universal balsam.

In the chapter entitled *Of the Elements of Air*, Le Febvre further follows Paracelsian ideas by relating the idea of a universal spirit to that of heavenly influences and to air, which is vital for living creatures. In his explanation of these ideas, Le Febvre does point out that they are not his own:

"But those that look more narrowly into the nature of things, say, that there is another much more excellent and necessary use thereof, viz. to attract the Universal Spirit, which by the influx of the Heavens, is conveyed into the Air, ere it is endowed with an Idea altogether Celestial, Spiritual, and full of vertue and efficacy; it is converted in the heart into Animal spirit, where it receives a perfect and vivifying Idea, which renders the Animal capable by its help to exercise all the functions of life; For it is this spirit contained in the Air we breath in, which subtilizeth, and maketh volatile, all the superfluities that are found both in the venal and arterial blood,.. " (46)

This passage reflects the great interest which was being

shown at that time, in studies relating to the processes involved in respiration and the circulation of blood in animals. Nevertheless it is possible to discern the strong influence of the Paracelsian cosmology in Le Febvre's interpretation of these processes. He subsequently mentions plants, which also extract a vital spirit from the air, but he notes that they achieve this by means of a certain magnetism, since, unlike animals, they have no lungs with which to draw air.

In his chapter *Of the Principles of Life before Composition*, Le Febvre offers an interesting interpretation, of the difference between life and death. Accordingly, life is defined as:

"...the Universal Spirit impregnated with the Idea of Favourable and amicable Principles to our Nature, and possessing in the Center of its *Hermaphroditical Salt*, a moderate Sulphur, a temperate Mercury, and a sweet Salt:"

whereas death is:

"...this same Spirit, having in it the same *Hermaphroditical Salt* mixt with a sharp Sulphur, a biting Mercury, and a corrosive Salt,..." (47)

In these interpretations, Le Febvre has once again closely followed Paracelsian ideas by incorporating the three elements salt, sulphur and mercury in the explanation of important natural phenomena. Additionally, as we have mentioned earlier, he has involved the concept of the *Hermaphroditical salt*.

The second part of the *Compleat Body of Chymistry* contains a substantial number of medical recipes, and descriptions of various chemicals and their properties. Among these chemicals is nitre:

"For we must confess, that Niter is one of the most

wonderful and powerfulllest Agents which Nature hath lent to Art, as the Sons of Art may have noted hitherto by those Operations wherein we have used it,..." (48)

He has naturally mentioned its use in medicines where it found a multitude of applications,

"...because this Salt hath in it self a Sulphur and subtil Spirit which recreates and strengthens the Archeus, so as to dispose him to meliorate and better qualifie those Functions which it does exercise:" (49)

In the first of these two quotations, Le Febvre has more or less repeated what Paracelsus had written earlier, whereas in the second sentence he has used the well known Paracelsian concept of the *Archeus* - the driving force or architect of Nature.

Although he had provided explanations for nitre's beneficial functioning, Le Febvre was at the same time aware of the fact that there existed a different school of thought associated with the interpretation of this functioning. He was alluding to the other theory which had gained prominence at that time, in which nitre was considered to be a central or universal salt which had an exceptional place in the chemical philosophy:

"Although there are many that take Salt-peter to be an Universal Salt, believing that it possesses in it self the Soul of the World; yet we are of a different Judgement,..." (50)

He is therefore readily admitting that it is possible to confer on nitre certain universal properties, but in this respect these properties have to be considered on an intellectual, or philosophical plane, rather than the sort of considerations which he was offering:

"But if by Niter or Salt-peter be understood a Mysterious Salt, which is the soul of all Physical Generations, a Child and Son of Light, and the Father of all Germination and Vegetation; we confess that Salt in such a respect to

be Universal: But we say at the same time, that it is more to be apprehended by the Intellect than the Senses, and that this Divine Salt cannot be comprehended nor hidden under any other covering or shape, then of the Sulphureous and Mercurial Volatile Salt of all natural Bodies, since this Salt is endowed of all the Essential and Centrick Vertues of Sublunary Mixts." (51).

He finishes by stating:

"But it is not our design to treat generally of Salt-peter, so we will restrain our selves to speak of it here as only a Mineral Salt, which is extracted from fat and fruitful Earth." (52)

### Summary

It can be deduced from a study of the *Compleat Body of Chymistry* that even a century after the publication of Paracelsus' works, Le Febvre was still largely influenced by his interpretation of the role of salt in Nature. He recognised this role of salt in a broad conceptual sense, and additionally used the term 'Central Salt' to denote a universal spirit which is present in air and which is necessary for the generation of plants and animals and which also plays a vital role in their lives.

Le Febvre was aware of the fact that neither his explanations nor those of other philosophers, with which he was evidently familiar, represented the complete story. Whilst his descriptions of a wide variety of medicinal and other preparations involving nitre were of an eminently useful and practical nature, he also accepted that nitre was a substance which held a special place in the chemical philosophy of other authors.

### Conclusion

Paracelsus' writings had a great impact on the development of chemical philosophy during the sixteenth and seventeenth centuries. The interpretation of natural



phenomena in terms of his three principles salt, sulphur and mercury was readily accepted by chemical philosophers, and it served as a starting point for a fresh approach to many well established issues.

One of these was the idea of a universal spirit, or universal balsam, as Paracelsus called it, which was required for life and for generation. Paracelsus focussed his attention on the role of salt in this context. He used the word at two different levels: to represent any solid which was soluble in water and which could bring about useful changes - in this respect he was approximating to the modern interpretation of salt, and he further believed that the reason why these salts could bring about such useful effects was because they had associated with them a certain principle of salt, which was the spiritual power with which they were all linked. This spiritual aspect of salts formed the basis of his iatrochemistry and also explained phenomena which were not immediately accessible to investigation, such as thunder and lightning. Here he drew attention to nitre which was well known for its wide variety of applications, but especially for its use in gunpowder. Paracelsus developed the idea of an aerial gunpowder which was present in thunder and lightning and concluded that an aerial nitre and an aerial sulphur were associated with it.

These ideas were readily accepted by natural philosophers as I have shown, and they continued to be incorporated into scientific theory for some two hundred years after their first publication. Although Paracelsus

drew attention to the importance of salts, to nitre as a particularly remarkable salt, and to an aerial nitre which was responsible for thunder, he did not refer specifically to the effect of heat on nitre, or to the products formed when nitre was heated. Cornelius Drebbel, we have seen, did so, and it was in a context which was markedly different from earlier ones - for Drebbel actually declared that a product of the thermal decomposition of nitre was "the nature of air".

The relatively unknown Henry Nolle, whom Ferguson described as a "devoted follower of Paracelsus", reflected the impact of Sendivogius' writings in his reference to a "hidden food of air". Some fifty years later, Nicaise Le Febvre, another Paracelsian, admitted that "there are many that take Salt-peter to be an universal salt... yet we are of a different judgement." He was thereby indicating that nitre was at the centre of a debate, which, as we shall see, was to develop away from the Paracelsian cosmology.

#### Notes

1. op.cit., pg.52.
2. J. Partington, *A History of Chemistry* (London, 1961), vol. 2.
3. H. Guerlac, "John Mayow and the Aerial Nitre: Studies in the Chemistry of John Mayow - I", *Actes du Septième Congrès d'Histoire des Sciences* (Jerusalem, 1953), 332-349. "The Poets' Nitre, Studies in the Chemistry of John Mayow - II", *Isis* 45 (1954), 243-255.
4. A. Debus, "The Paracelsian Aerial Nitre", *Isis* 55 (1964), 43-61.
5. R.G. Frank, *Harvey and the Oxford Physiologists* (University of California Press, 1980).
6. R. Bugaj, "'Saletra Filozofów' a Odkrycie Tlenu" ["Philosophers' Nitre" and the Discovery of Oxygen] *Kwartalnik Historii Nauki i Techniki* 3-4 (1986), 749-780.

7. E. Darmstaedter, *Arznei und Alchemie. Paracelsus studien.* (Leipzig, 1931).
8. W. Pagel, *Paracelsus* (Basel - New York, 1958).
9. See for example: A. Debus, *The English Paracelsians* (New York, 1966).
10. Paracelsus, *The Hermetic and Alchemical Writings of Paracelsus.* Translated by A.E. Waite (London, 1894), 1, 98.
11. *ibid.*, 259.
12. *ibid.*, 100.
13. These variants are listed in the footnote at the bottom of page 100. They include: in pens and stables where cattle make water, ... for all urine is salt; Nitre is excrement and the dead body of esile [sic] and nutrimental matter; it is an essential spirit and excrement of all salts.
14. *ibid.*, 101.
15. *ibid.*, 101.
16. *ibid.*, 263.
17. *ibid.*, 101.
18. *ibid.*, 263.
19. *op.cit.*, 46.
20. J. Partington, *A History of Chemistry* (London, 1961), 2, 69.
21. B. Palissy, *Discovrs Admirables, De la Natvre des Eaux et Fontaines, Tant Natvrelles Qv'artificielles, des metaux, des sels & salines, des pierres, des terres, du feux & des emaux.* (Paris, 1580), 163-164. The French original reads: "Car ie te veux montrer qu'il n'est nulle chose sans sel... Ie te di qu'il y en a vn si grand nombre qu'il est impossible à nul homme de les pouuoir nommer, & te dis d'auantage, qu'il n'y a nulle chose en ce monde, qu'il n'y aye du sel, soit en l'homme, la beste, les arbres, plantes, ou autres especes de vegetatif: voire mesme és metaux: & di encores plus, que nulles choses vegetatiues ne pouroyent vegeter sans l'action de sel, qui est és semences;..."
22. *ibid.*, 169-170. The French original reads: "regarde quand le laboureur aura porté du fumier en son champ, il le mettra (en deschargeant) par petites pillles, & quelques iours apres il le viendra espandre parmi le

champ, & ne laissera rien à l'endroit desdites pilles: & toutesfois apres qu'vn tel champ sera semé de bled, tu trouueras que le bled sera plus beau, plus verd & plus espois a l'endroit ou lesdites pilles auront reposé, que non pas en autre lieu. & cela aduient par ce que les pluyes qui sont tombees sur lesdits pilots, ont prins le sel en passant au trauers & descendant en terre. par la tu peux connoistre que ce n'est pas le fumier qui est cause de la generatiõ: Ainsi le sel que les semences auoyent pris en la terre."

23. *ibid.*, 177-178. The French original reads: "...le sel est vn corps fixe, palpable, & conneu en son particulier, conseruateur & generateur de toutes choses, & en autruy, comme és bois & en toutes especes de plantes & mineraux. C'est vn corps inconneu & inuisible, comme vn esprit, & toutesfois tenant lieu, & soustenant la chose en laquelle il est enclos,..."
24. *ibid.*, 167. The French original reads: "Les histoires disent qu'ils les embaumoyent de nitre & d'epiceries aromatiques. Il te faut noter q̃ le nitre est vn sel conseruatif; & qui empesche la putrefactiõ:"
25. J. Quercetanus, *op. cit.* B3 recto.
26. *ibid.*, *The Practise of Hermeticall Physicke*, D3 recto.
27. *ibid.*, *The Practise of Chymicall Physicke*, D3 recto.
28. *ibid.*, *The Practise of Hermeticall Physicke*, Chapter I, paragraph 4.
29. *ibid.*, *The Practice of Chymicall Physicke*, Chapter XII, H2 recto.
30. *ibid.*, P verso, paragraphs 1 and 2,
31. *ibid.*, P2 verso, paragraphs 8-10.
32. *ibid.*, paragraph 18.
33. G. Tierie, *Cornelis Drebbel* (Amsterdam, 1932), 86-90.
34. *ibid.*, 65.
35. L. E. Harris, *The Two Netherlanders Humphrey Bradley and Cornelis Drebbel* (Cambridge, 1961). In the twelfth chapter of this book, Harris writes about the controversy surrounding Drebbel and the submarine. He concludes the chapter on page 181 by writing: "If Drebbel did in fact revive his air in this way then it is almost a conclusive probability that the agent employed was oxygen. Robert Boyle believed that he did, as also Sir Kenelm Digby, Leibniz and Papin, and many

others of lesser note. Why, therefore, should we disbelieve it all?"

36. J. Partington, *op.cit.*, 322.
37. R. Bugaj, *op.cit.*, 767. The Polish original reads:  
"Holender prowadził korespondencję z mecenasem alchemików, cesarzem Rudolfem II, później zaś był wychowawcą synów cesarza Ferdynanda II, a na dworach obu tych cesarzy stałą służbę pełnił Michał Sędziwój. Jest to ożywiste, że obaj alchemicy wielokrotnie osobiście kontaktowali się, i że Drebbel znał traktat *De lapide Philosophorum* Sędziwoja wydany w Pradze w 1604r., a więc i jego teorie powietrznej saletry."
38. J. Ferguson, *Bibliotheca Chemica* (Glasgow, 1906), 2, 140.
39. H. Nolle, *op. cit.*, 139. The Latin original reads:  
"*De aere haec axiomata accipite.*  
I.  
*Nihil est in mundo, quod aere ad sui conservationem carere possit.*  
Quia omnia Elementata ex aere constant. 2. Quia reliqua Elementa propter vniuersi structuram ex aere viuunt. 3. Quia aer animalia refocillat: Nam [sic] temperat feruorem cordis inspirando attractus, fouet humidum radicale, praebet materiam Spiritibus vitalibus, volucris commodum exhibet volandi spacium, & est medium per quod animalia his in terris tum vident tum audiunt: Sine aere nec visio auditio quicquam est. In orbe nihil cresceret, si non esset vis aeris penetrantis et alterantis, attrahentisque secum nutrimentum multiplicatiuum. Homo creatus de terra, inquit verus Philosophus Michael Sendiuogius in Epilogo duodecim tractatum de lap. Phil. ex ex aere viuit: Est enim in aere occultus vitae cibus, quem nos rorem de nocte, de die aquam vocamus rarefactam, cuius Spiritus inuisibilis congelatus melior est quam terra vniuersa."
40. *ibid.*, 183. The Latin original reads:  
"*De Sale*  
*Sal est principium firmum, fixum et substantificum rerum cunctarum.*  
....Sulphur & Mercurius quia in Sale fundantur, ex Sale suum nutrimentum hauriunt, atque tamdiu in illud agunt, vsque dum vniuersam Salis fixi naturam in volatilem transmutauerint, atque ex inferiori statu ad superiorem & gloriosum perduxerint, vt ita Salis, sine quo diu stare non potuissent, beneficio perpetuo starent, Salque ipsum in admirandis & gloriosis Sulphuris Mercuriique operationibus summa cum delectatione triumphans sibi de summa adepta gloria gratularetur."
41. See the article by Owen Hannaway in the *Dictionary of Scientific Biography* (London, 1975), 7, 130-131.

42. J. Ferguson, *Bibliotheca Chemica* (Glasgow, 1906), 2, 17.
43. N. le Febure, *A Compleat Body of Chymistry* (London, 1670), 27.
44. *ibid.*, 27.
45. N.E.Emerton, *The Scientific Reinterpretation of Form* (Cornell University Press, 1984), 214.
46. N. Le Febure, *op.cit.*, 37-38.
47. *ibid.*, 43.
48. *ibid.*, 252.
49. *ibid.*, 253.
50. *ibid.*, 251.
51. *ibid.*, 251-252.
51. *ibid.*, 252.

## Chapter Five

### Michael Sendivogius' Chemical Theory

The object of this chapter is to carefully analyse the writings of Michael Sendivogius in order to establish the basis for his theory concerning nitre and its role in the chemical philosophy. Using this theory, and my brief review of the writings of other chemical philosophers of the sixteenth and seventeenth centuries, it will be possible to perceive in what respects the Sendivogian theory may have broken new ground. Furthermore, by referring to the writings of other seventeenth century authors, I hope to show how Sendivogius' works were received by his contemporaries, and also to shed more light on the issue of why his name has subsequently lapsed into relative obscurity.

Before commencing on a detailed analysis of his writings, a few general points ought to be made, concerning the interpretation of alchemical texts from this period.

(1) They present specific problems for the following reasons:

a) The nature of alchemy

Alchemy, by its very nature, involved a physical, or practical aspect and a metaphysical, or theoretical aspect. The practical aspect related to the manipulation and handling of substances whereas the metaphysical aspect related to experiences of the mind only. Carl Jung has written about these different ways of interpreting alchemical writings. (2) The language used in each approach was frequently similar, and this therefore raises the

question of whether a given passage relates to a physical or spiritual process.

b) Secrecy in Alchemy

Alchemists frequently employed a complex and obscure style of writing, in order to communicate only to a certain select few who could, so to speak, "operate on their wavelength".

c) Terminology

On account of the lack of a system of nomenclature, alchemists frequently used many names to denote one substance. Conversely, they could use one name to denote different substances.

In view of these difficulties, it may be argued that a modern chemical interpretation of seventeenth century alchemical texts is entirely unjustified, and in any case, in view of the completely different conceptual framework, impossible. Such a view cannot be upheld however, since it would exclude the possibility of any historical research in this discipline. The analysis of works by men such as Geber, Lull, Valentine and Paracelsus has shown that it is possible to trace the development of chemical reactions and chemical concepts over a long period of time. It is therefore reasonable to suppose that the ideas of Sendivogius could also be analysed from a chemical standpoint.

In order to thus analyse Sendivogius' works, it would make good sense to show initially that he could coherently report chemical facts and names in such a way that they can be interpreted using today's terms. To put it more



simplistically, if we can demonstrate that Sendivogius, like many authors before and after him, could furnish an answer to the question "WHAT is it?" with reference to chemical phenomena, we would have grounds for attempting to analyse his efforts to answer the questions "HOW?" and "WHY?" these phenomena occur. By establishing that this is indeed the case, we would then have grounds for giving some serious treatment to his chemical ideas.

The Sendivogian work which is most suitable for a chemical interpretation is his *Process on the Central Salt*. As mentioned in chapter three, this has recently been discovered and translated into Polish from German/Latin by Roman Bugaj. I have translated a characteristic passage from it below (3), and my analysis of it follows subsequently:

"Firstly on Nitre

This process is carried out in no other way than boiling, filtering, evaporation and spitting, which normally occurs when nitre is boiled. The substance, however, must be purified to a high degree so that the nitre appears in a completely transparent form, and is also more shiny than the crystals. When this happens, the soil residue from a previous process should be heated to redness three or four times in order to get rid of all residual moisture. To one part of the purest nitre add three parts of this previously calcined soil, mix it all thoroughly, and place it into a strong fireclay retort.

Caution. You should, at any rate, not put in more than six pounds at a time i.e. mix 1.5 pounds of nitre with 3.5 pounds of calcined soil. Distil this into a receiver as with aqua regia. Into the receiver add about two pounds of distilled rain water, so that the dark red spirit which is produced will enter it and settle there. The receiver vessel must be carefully soldered in order to prevent any spirits from escaping. When this distillation is thus properly accomplished, cool the furnace each time, take the product out carefully and store it. If the retort is still intact, you may use it again, otherwise use another one for a fresh distillation. Having taken a new sample of nitre and freshly calcined soil we firstly weigh the components, since the amount of distillate will be determined by the amount of nitre which is placed in the retort. Collect the spirit which is released during this distillation in water,

which had earlier been introduced into the apparatus. Distil in an alembic on a water bath.

Note: the receiver should first be calibrated by placing two pounds of water into it, in order to determine the level to which it rises. These two pounds of water should then be removed from the receiver, and its absence will simply indicate the amount of spirit evolved. The distillation ought to be stopped when the spirits have been removed from the liquor on the water bath. This will be apparent as soon as colourless spirits cease to be evolved. Although neither the spirits of verdigris nor those of nitre rise readily from a water bath, a knowledge of this fact is necessary since it provides better information about the process. Next, remove the flask from the bath and after it has been carefully soldered, place it on a sandbath, and gradually distil all the spirits from it (all openings in it must be sealed to prevent the escape of red spirits from it). After this, carefully cool everything and store the red spirit in a closed vessel in a cool place. Note however, that the vessel should be only half filled, in order that the spirits can move freely around."

#### Analysis of the text, from a modern chemical standpoint

The processes of boiling, filtering and evaporation were well known throughout the chemical literature of the seventeenth century, and they refer to practical techniques which remain essentially the same today. Spitting frequently occurs when a solution which is being boiled to dryness becomes very concentrated. This occurs as a result of bubbles of saturated solution bursting at their boiling point. Besides spitting, the phenomenon which may have been described here is that of decrepitation. This is a loud crackling of certain crystals when heated, due to mechanical stresses set up in them. Whilst potassium nitrate in a pure state is not known to decrepitate, small quantities of impurities in it could easily cause it to do so. Bugaj suggests that the presence of small quantities of hydrated postcrystalline alkali would easily cause decrepitation to occur on heating (4).

Sendivogius mentions the importance of purity, and the

fact that the nitre must appear in a transparent form. Pure potassium nitrate is a white crystalline solid, and crystals of it are both transparent and have a high lustre.

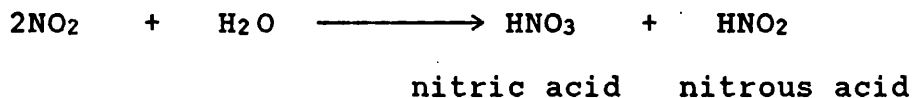
The repeated heating of any substance to a high temperature in order to get rid of moisture, known for thousands of years, is termed calcination. When calcined soil is strongly heated with potassium nitrate, as is suggested in the recipe which follows, a dark red vapour is evolved, which settles above the water in a collecting vessel. The fact that the entire apparatus has to be carefully sealed suggests that the red vapour was to dissolve in the water, and not escape from the apparatus. From the viewpoint of modern chemistry this process could effectively represent the reduction of nitrogen in potassium nitrate from the +5 to the +4 oxidation state, which is manifested by the formation of dark red nitrogen dioxide gas. The reduction of the potassium nitrate in this reaction would have to be achieved by means of a reducing agent present in calcined soil. The actual composition of a calcined soil is naturally complex, and will depend on the location of the soil and its vegetation cover. Nevertheless, it is very likely to have contained reducing agents such as carbon which would be strong enough to bring about the reduction under the conditions described. The equation for this reaction or series of reactions would undoubtedly be complex, but an overall simplified equation illustrates the general idea:-



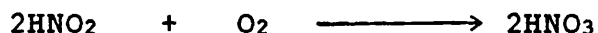
Bugaj suggests that the reducing agent was kaolin, or china

clay,  $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ , containing carbon of organic origin. (5)

The nitrogen dioxide gas, being denser than air, "settles" or dissolves in water to form a strongly acidic solution, which is a mixture of nitric and nitrous acids. This reaction can be represented as:-



On standing in air, nitrous acid is further oxidized to nitric acid:-



The nett result is that a solution of nitric acid is eventually obtained. In Sendivogius' account, he stresses the importance of allowing the vessel to cool down after the reaction is complete. This makes sense in view of the fact that gases are generally more soluble in cold water than they are in hot water. Thus the dissolution of nitrogen dioxide in water would be facilitated by the lowered temperature. Storing the solution as suggested would give time for the oxidation of nitrous acid to take place effectively, as indicated by the equation above.

The process is then to be repeated, using the same retort flask, "if possible". Clay retorts which were used in these processes were quite brittle, and could fracture easily during strong heating, or as a result of pressure building up inside them.

To repeat the process, Sendivogius advocates the use of freshly calcined soil i.e. not one which was calcined some time ago, and which could have absorbed moisture

through the presence of deliquescent compounds such as potassium carbonate or hygroscopic silicon dioxide. The absence of moisture would have been conducive to the existence of a reducing environment within the soil.

Sendivogius then suggests that the amount of distillate would be in proportion to the amount of nitre used. This is in exact accordance with known principles. The calcined soil was undoubtedly present in large excess, since it was much easier to obtain, and thus the amount of nitrogen dioxide evolved would depend on the amount of limiting reagent - in this case potassium nitrate. After the solution of nitric acid from the initial reaction has thus been prepared, it is then redistilled on a water bath. The technique of using a water bath in order to concentrate an aqueous solution was well-known during the seventeenth century.

In order to put this distillation into perspective, Sendivogius compares the relative ease of distilling the spirits of verdigris and the spirits of nitre on a water bath. He observes that neither the spirits of verdigris nor the spirits of nitre are easily distilled. If it is understood that the substances in question are acetic and nitric acids respectively then the comparison is indeed justified. Pure nitric acid boils at  $84^{\circ}\text{C}$  and acetic acid boils at  $118^{\circ}\text{C}$ . By distilling aqueous solutions of either of them on a water bath, it would thus only be possible to achieve a partial separation.

In the final slow distillation of the product on a sandbath, the higher temperature used would have caused a

more concentrated solution of nitric acid to distil over as the final product.

### Conclusion

Sendivogius seems to have described a method for making a strong solution of nitric acid using the following stages:

- a) dry distillation of calcined soil with potassium nitrate to give nitrogen dioxide which is subsequently dissolved in water.
- b) distilling the dilute nitric acid thus obtained on a water bath in order to concentrate it.
- c) subsequent distillation of the resulting nitric acid to produce a more concentrated solution.

Whilst this account is by no means unambiguously identifiable with our modern chemical processes, it nevertheless contains many significant steps and observations, which enable us to conclude that Sendivogius was very familiar with practical chemistry, and that he was capable of describing processes and observations in a manner which can be interpreted using the language and concepts of modern chemistry.

### The Theory

Since the *Treatise on the Philosophers' Stone* and the *Treatise on Sulphur* were the first Sendivogian works to make an impact on European society, these works will be used as the main sources for the elucidation of his chemical theory. For the purpose of the present work, I have used citations from the 1650 English edition which was entitled: *A New Light of Alchymie*. This was an accepted

translation, by John French, of an earlier Latin edition. I have given the Latin original for certain important fragments.

Like all other philosophers of his time, Sendivogius believed in the transmutation of metals. Indeed, it was the quest for the unique transmuting agent, or philosophical elixir, that prompted him and other philosophers to chemical experimentation. It is therefore no great surprise, that in his *Treatise on the Philosophers' Stone*, a fair proportion of space is devoted to metals.

During the seventeenth century it was generally accepted that metals, like other minerals, were alive and that they grew deep down in "the bowels of the earth". According to Sendivogius, metals arose from metallic seeds which were acted upon by the Archeus of Nature, and which were expelled from the centre of the Earth, and worked their way towards its surface. Depending on the type of rocks that they encountered, these seeds grew into more perfect or less perfect metals. In the third chapter of the treatise Sendivogius writes about the "real primary matter of metals". The chapter begins with the sentence:

"The first matter of Metalls is twofold, but the one cannot make a metall without the other. The first and principall is the humidity of the aire mixed with heat; and this the philosophers called Mercury, which is governed by the beams of the Sunne, and Moon in the Philosophicall sea: " (6).

The idea of the moisture of the air mixed with heat, which was called Mercury, and which is "ruled by the sun's and moon's rays in our philosophical sea", was a characteristic Sendivogian concept, to which he subsequently returned on several occasions. We see here the beginnings of his active

interest in air.

The fourth chapter explains the origin of metals in the bowels of the earth and stresses once again that all metals arise from the same seed. The penultimate paragraph of this chapter is particularly interesting:

"Now in the winter when the air is cold, that unctuous vapour is congealed, which afterward when the spring returns, is mixed together with earth, and water, and so becomes a Magnesia, drawing to it self the Mercury of air, like unto it selfe, and gives life to all things through the concurrence of the beams of the Sun, Moon and Stars, and so it brings forth grass, flowers, and such like things." (7)

The introduction of a "magnesia" which attracts the mercury of air to itself is once again a characteristic Sendivogian theme. He is suggesting here clearly that magnesia is a substance which contains the "mercury of air", which is vital for life. Although Sendivogius' ideas at this stage are not entirely clear, it is reasonable to consider that he is referring to material substances that are necessary for life. The appearance of this passage, which is not specifically on metals, in a chapter on metals, is entirely in keeping with the tenor of the natural philosophical writings of the period. It also shows Sendivogius' gradual shift in interest from the chemistry of the metal and mineral world, to processes involving air and plants.

The ninth treatise deals with the mixing of metals and "the extraction of the metallic seed". In the penultimate paragraph of this treatise, Sendivogius defines a substance which has the property of being unaffected by the sun and moon (i.e. gold and silver), but which is ameliorated by them. He calls this substance "chalybs". In the final



paragraph, we read:

"There is another Chalybs, which is like to this, created by it selfe of Nature, which knows how to draw forth by vertue of the sun beams (through a wonderfull power, and vertue) that which so many have sought after, and is the beginning of our work." (8)

This second chalybs is clearly of considerable importance in Sendivogius' system. Bearing this in mind, it is therefore hardly surprising that he has carefully concealed its identity. Bugaj suggests (9) that this chalybs is in fact the same substance as "magnesia", which Sendivogius also termed "sal centrale" in other passages in his works. In Bugaj's view these terms all relate to potassium nitrate,  $KNO_3$ .

The eleventh treatise is concerned with the practical preparation of the Stone. Having described what seems to be a typical "recipe" for the preparation of the Stone, Sendivogius digresses to discuss Nature and the elements. In fact the discussion occupies three quarters of the treatise. He eloquently expresses his awe for the way in which nature operates:

"O wonderfull Nature, which knows how to produce wonderfull fruits out of water in the earth, and from the aire to give them life. All these are done, and the eyes of the vulgar doe not see them; but the eyes of the understanding, and imagination perceive them, and that with a true sight. The eyes of the wise look upon Nature otherwise, then the eyes of the common man." (10)

Clearly, Sendivogius believes that only a small elite of philosophers are capable of correctly interpreting the mundane occurrences of Nature. Among these is the life-supporting property of air. This theme is once again evoked in the twelfth treatise, where, in a passage about motion and fire, Sendivogius writes:

"Motion therefore causeth heat, heat moves the water, the motion of the water causeth aire, the life of all living things." (11)

The final paragraph of this twelfth treatise makes a specific reference to the central salt:

"And know that the Centrall salt Nitre doth not receive more of the Earth then it hath need of, whether it be pure or impure: but the fatness of the water is otherwise, for it is never to be had pure; art purifies it by a twofold heat, and then conjoins it." (12)

Whilst the precise interpretation of this passage is not easy, it is nevertheless clear that the central salt constituted an important part of Sendivogius' theory.

The epilogue of these treatises contains a summary of Sendivogius' main points and it is discussed in the Appendix on pages 279-281. Sendivogius continues to stress the fact that to comprehend the workings of Nature is extremely difficult, and that only a very small number of people are able to do so. He held strong views on the dignity, creation and and generation of humans, but decided that only one aspect was relevant for inclusion in the current work:

"I could here discourse largely, and Philosophically of the dignity of Man, his Creation and Generation: but seeing they are impertinent to this place, I will passe them over in silence; only I will treat a little concerning the Life of Man. Man was created of the Earth, and lives by vertue of the Aire; for there is in the Aire a secret food of life, which in the night wee call dew; and in the day rarified water, whose invisible, congealed spirit is better then the whole Earth." (13)

This statement is immediately followed by the exclamation:

"O holy, and wonderfull Nature, who dost not suffer the sons of Wisdome to erre, as thou dost manifest in the life of man daily!" (14)

These two fragments display Sendivogius' exultation in his discovery that air contains in it a substance he called

"the food of life". A few sentences later, he returns to the topic of nitre, life and air:

"it is the water of our dew, out of which is extracted the Salt Petre of Philosophers, by which all things grow, and are nourished: the matrix of it is the center of the Sun, and Moon, both celestial, and terrestiall: and to speak more plainly, it is our Loadstone, which in the foregoing Treatises I called Chalybs, or Steel: The Aire generates this Load-stone, and the Loadstone generates, or makes our Air to appear, and come forth." (15)

The "Loadstone" to which Sendivogius refers here is, as we shall see later, his central nitre, or essentially our potassium nitrate. We may also note that he himself admits using three terms to denote what was only a single substance: loadstone, chalybs and steel.

Sendivogius attached particular importance to this epilogue. In relation to the twelve treatises themselves, he writes:

"and with serious meditation read over this book oftentimes, especially the Epilogue of there twelve Treatises: alwaies considering the possibility of Nature, and the actions of the Elements, and which of them is the chiefest in those actions, and especially in the rarefaction of water, or aire, for so the heavens are created, as also the whole world." (16)

Air and water thus have a special significance in his works. He goes on further:

"Therefore when there is raine made, it receives from the aire that power of life, and joins it with the salt-nitre of the earth (because the salt-nitre of the earth is like calcined Tartar, drawing to it self by reason of its drynesse the aire, which in it is resolved into water: such attractive power hath the salt-nitre of the earth, which also was aire, and is joined to the fatnesse of the earth) and by how much the more abundantly the beams of the Sun beat upon it, the greater quantity of salt-nitre is made, and by consequence the greater plenty of Corn grows, and is increased, and this is done daily." (17)

The foregoing description of a cycle which occurs in nature gives further evidence of Sendivogius' new centres of interest - air and nitre. He is suggesting that there is

a part of air, which is necessary for life, which is absorbed by rain, and which eventually forms part of nitre. This active part of air is then once again made available to plants to help them grow. He compares this attraction of "the power of life" to nitre with the attraction of moisture to calcined tartar. When potassium tartrate is strongly heated, or calcined, it decomposes to give anhydrous potassium carbonate as a solid residue. Anhydrous potassium carbonate is deliquescent, and absorbs moisture from the air to form a saturated solution. The comparison of nitre attracting the "power of life" to calcined tartar attracting water therefore has a sound chemical basis.

Whilst maintaining a certain degree of secrecy and mystery in his writings, Sendivogius does occasionally suggest that the substance in question is extremely common:

"Our subject is presented to the eyes of the whole world and is not known." (18)

He also expresses considerable surprise that such "obvious" matters have been missed out by so many people. He quotes from the "ancient Hermes", who had already given a clear indication of the path to follow many centuries earlier:

"O our Heaven! O our Water! O our Mercury! O our salt-nitre abiding in the sea of the world! O our vegetable! O our Sulphur fixed, and volatill! O our Caput Mortuum, or dead head, or feces of our Sea! Our water that wets not our hands, without which no mortall can live, and without which nothing grows, or is generated in the world!" (19)

In spite of these clear indications, no one had followed the ancient philosopher's advice. Only Sendivogius had appreciated its true significance, had studied it in great

detail, and now for the first time had made it available to the adepts of the Art:

"and so thou hast a thing discovered to thee more pretious then the whole world, which I plainly tell thee is nothing else but our sea water, which is congealed in silver, and gold, and extracted out of Gold, and Silver by the help of our Chalybs, by the Art of philosophers in a wonderful manner, by a prudent son of Art." (20)

He continues: "By this my writing I make my self known to the adopted sons of Hermes,... for I have spoken all things cleerly: Only I have not so cleerly shewed the extraction of our Salt Armoniacke, or the Mercury of philosophers, out of our Sea water, and the use thereof, because I had from the Master of Nature no leave to speake any further." (21)

Thus while he has indicated the "new course" that further studies should take, he nevertheless admits that he has presented his ideas in a somewhat obscure style.

The epilogue of these treatises is followed by a *Philosophical Aenigma or Parabola*, in which Sendivogius puts forward his new ideas yet again, but in a still more obscure manner. Nevertheless certain important points are evident. Essentially the parabola is a story about its author, who had travelled extensively around the globe. One day, landing at the edge of an enormous ocean, he was lulled to sleep by the sound of the waves. He dreamt that he met Neptune, who told him about the seven varieties of trees that grew on the land. Two of them bore magnificent gold and silver fruits. But the land lacked a special pure water, needed by the trees. All attempts by the inhabitants of the land to make, or provide, this water had failed. Neptune then disappeared and another old man, with the name "Saturn" on his forehead, appeared. Saturn demonstrated the extraordinary powers of this miraculous water, which could dissolve both gold and silver fruits silently and

effortlessly. The author, bewildered by the demonstration and the stories he had heard about the water, asked several questions:

"I required again of him, Sir, Doe many know that Water, and hath it any proper name? He cryed out saying, Few know it, but all have seen it, and doe see it, and love it: it hath many and various names, but its proper name is the Water of our Sea, the Water of life not wetting the hands. I asked yet further, Doe any use it to any other things? Every creature (saith he) doth use it, but invisibly. Then I asked, Doth anything grow in it? But he said, Of it are made all things in the world, and in it they live: but in it nothing properly is, but it is that thing which mixeth it self to everything." (22)

He then asked more questions: "I began to intreat him, Sir I pray, Name it to mee by such a manifest name, that I may have no further doubt about it. But he cryed with a loud voice, so as that he awakened me from sleep; Therefore I could ask him no further, neither would hee tell me any more, neither can I tell any more. Be satisfied with these, and beleve mee, that it is not possible to speak more cleerly. For if thou dost not understand these things, thou wilt never be able to comprehend the books of the Philosophers." (23)

Thus we see that the substance which is invisible, is everywhere, is necessary for life and is used by all living things forms a key part of this story. For the alchemical philosophers of Sendivogius' time, this passage would probably related to the "mercury of the philosophers", "quintessence", or "anima mundi", but to a modern chemical reader the substance in question would seem to be air, or a part of the air.

The second major work to be considered in this discussion is the *Treatise on Sulphur*. Throughout this work, Sendivogius continues to elaborate and expand on his theories which relate to the properties of air. In the preface he writes, referring to the reader:

"and if by my writings, Counsell, Examples, he shall not know the operations of Nature, and her ministring vitall spirits constringing the aire, as also the subject of the

first matter, hee will scarce understand them by *Raimundus Lullius*. It is a hard thing to beleve that spirits have such a power and force in the belly of the wind." (24)

The idea of a powerful spirit in the "belly of the wind" is expressed in the fourth precept of the *Tabula Smaragdina*: "Its father is the Sun, its mother the Moon; the wind carries it in its belly, its nurse is the earth." In mentioning Lull on matters concerning the role of air in life processes, Sendivogius was additionally showing that his new interpretations were related to the teachings of an established authority.

His most important assertions naturally appear in the chapter on air:

"It is volatil, but may be fixed; and when it is fixed, it makes every body penetrable. Of its most pure substance the vitall spirits of living creatures are made;..." (25)

The idea of a "penetrable body" is clearly linked to the ninth precept of the *Tabula Smaragdina*: "This has more fortitude than fortitude itself; because it conquers every subtle thing and can penetrate every solid." The implication here is quite clear: there is a component of air which is necessary for life. The fact that this component of air can be obtained in the solid state (i.e. fixed) is in exact accordance with what we know now: the life-supporting component of air, which is oxygen, is chemically combined in nitre, or potassium nitrate. Potassium nitrate is readily soluble in water and is thus available in solution form for absorption into plants for example, through their roots. It is a well known fact now that nitrates are necessary for the healthy growth of plants.

In keeping with the generally accepted panvitalistic views of his times, Sendivogius also deduced that the life-giving component of air was necessary not only for minerals, plants and animals, but also for other elements:

"In it is also the vitall spirit of every Creature, living in all things, penetrating, and constringing the seed of other Elements, as Males do in Females. It nourisheth them, makes them conceive, and preserveth them; and this daily experience teacheth, that in this Element not only Mineralls, Animalls, or Vegetables live but also other Elements. For wee see that all Waters become putrefied, and filthy if they have not fresh Aire: The Fire is also extinguished, if the Aire be taken from it:" (26)

Indeed, he continues to draw the implication of ideas that air forms the basis of all life:

"In briefe, the whole structure of the world is preserved by Aire. Also in Animals, Man dies if you take Aire from him &c. Nothing would grow in the world, if it were not a power of the Aire, penetrating, and altering, bringing with itself nutriment that multiplies." (27)

The chapter on air concludes with the statement:

"Let this suffice that wee have said, that this Element is the most worthy of the three in which is Seed, and vitall spirit, or dwelling place of the soule of every Creature." (28)

There is no doubt doubt that Sendivogius considers air to be the 'primus inter pares' of the elements, on account of its life-sustaining properties.

Following his chapters on each of the four elements, Sendivogius writes a chapter on the three Paracelsian principles i.e. salt, sulphur and mercury. He draws attention to the great importance of salt, which, as we have seen in the previous chapter, had become widely accepted:

"But because wee said before, that the ancient Philosophers named only two Principles, lest the Searcher of the Art should erre, hee must know, that although they did not describe any other but Sulphur, and Mercury, yet without salt they could never have attained this work, since that



is the key and beginning of this sacred Science: it is that, which openeth the gates of Justice; it is that which hath the keys of the infernall prisons, where Sulphur lies bound, as hereafter shall be more fully showed in the third Treatise of the Principles, of Salt." (29)

It is difficult, on the basis of this passage alone, to determine whether the salt in question is just the Paracelsian principle of salt, or whether Sendivogius is referring to his central salt, or nitre. Bearing in mind his comments on the importance of the central salt in his other works however, it would seem very likely that the material nitre is the salt in question.

The dialogue which is entitled *On Sulphur* is an extension of the *Dialogue of Mercury and the Alchemists*. The introduction of this dialogue is about an alchemist who was involved in the dispute with many other alchemists. He became alienated from them, and decided that he would try to obtain the Philosopher's Stone from sulphur, on his own. After toiling away for many years, and at great expense, he achieved nothing. One day, while walking aimlessly, he came across a forest which was teeming with life. Having walked around this forest for a while, he sat down and began lamenting once again his failure to obtain the Stone from sulphur. He posed the following question to himself:

"What is this, all men say it is a thing common, of small esteem, easy, and I am a learned man, & I cannot find out this wretched Stone." (30)

Then he continued to curse sulphur. A voice then addressed him, and the conversation which ensued contains the following:

"*Alch.* Sir, They say that Sulphur is a Medicine. *Vox*, Yea, and the Physitian himselve, and to them that set him free from prison, by way of thankfulnesse he gives his blood for a Medicine. *Alch.* Sir, the universall Medicine being had,

how long may a man preserve himselfe from death? *Vox*, Even to the term of death: but this medicine must be taken cautiously, for many wise men have been destroyed by it before their time. *Alch.* And what say you Sir, Is it poison? *Vox.* Hast not thou heard that a great flame of fire destroyes a little one? There were many Philosophers which received the Art from other mens experience, which did not so thoroughly search into the vertue of the Medicine; yea, by how much the more powerfull, subtiler the Medicine was, it seemed to them to bee more wholesome; and if one grain of it can passe through many thousands of Metalls, much more Mans body." (31)

The sulphur, which forms the subject of this conversation, is an allegorical name for the Sendivogian Philosopher's Stone. It is possible to interpret the conversation as envisaging that the active part of air, which we now know as free oxygen in air, or "fixed" (imprisoned) oxygen in compounds such as potassium nitrate or metallic oxides, is synonymous with sulphur. The conversation continues:

"*Alch.* Is hee imprisoned so in all Metalls? *Vox*, In all; but not alike, in some not so strictly. *Alch.* Sir, And why in Metalls in such a tyrannicall manner? *Vox*, Because hee would stand in awe of them no longer, when hee shall once come to his Kingly palaces, for then hee can be seen, and looke freely out of the windows; because there he is in his proper Kingdome, although not yet as hee desires. *Alch.* Sir, and what doth hee eat? *Vox*, His meat is wind, when hee is at liberty, it is decocted; but in prison hee is constrained to eat it raw." (32) and: "*Alch.* Sir, in what subject is this Sulphur? *Vox.* Know for certain that this sulphur is of great vertue, his Mine are all things in the world, for hee is in Metalls, Hearbs, Trees, Animalls, Stones, and Mineralls." (33)

Thus according to Sendivogius the ubiquitous sulphur is most important, and it occurs both freely, and combined in other substances.

The conclusion of this dialogue contains an explanation of the relationship between sulphur and mercury:

"but Sulphur is that which coagulates Mercury; which Sulphur indeed is most difficultly prepared, but more difficultly found out. For in the Sulphur of Philosophers this secret consists, which also is contained in the inward

rooms of Mercury, of whose preparation, without which it is unprofitable, Wee shall discourse hereafter in the third Principle of Salt, seeing here wee treat of the vertue, and originall, not Praxis, of Sulphur." (34)

The "Sulphur of the Philosophers" is thus clearly a substance which is quite distinct from vulgar or material sulphur. From the evidence which Sendivogius has given, the modern chemist would be tempted to conclude that oxygen, either free or chemically combined in nitre, could fit the descriptions well.

In interpreting these fragments from Sendivogius' *Treatise on Sulphur*, there is no simple clear cut answer to the exact meaning of the substances, terms and concepts involved. There is nevertheless considerable evidence to suggest that Sendivogius was aware of the active portion which was present in air, and also in nitre. His *Process on the Central Salt* will now be used to show that his ideas expressed there give further evidence in support to the present suggestions.

Unlike any of Sendivogius' other works, the *Process on the Central Salt* is concerned with descriptions of chemical operations which can reasonably easily be recognised. In addition, the work contains several important pointers to Sendivogius' ideas.

The title itself suggests that Sendivogius attached a great significance to the central salt, or nitre. His reasoning is explained in the opening paragraphs:

"It should be known that the earth contains in itself all bodies, their functioning and virtues. It is also the foundation of all bodies and is subject to the influence of the stars. It becomes saturated with the other elements and the sky, and forms the basis and the support of all things, as well as being their mother. After its creation the Earth was cleaned, purified, and situated under the open heavens.

In this location it is subject to the influence of all celestial virtues, forces and actions. As a result of these, it spontaneously gives rise to the sperm of roots, herbs, minerals and metals. For the Earth contains within itself a great mystery. In addition it conceals the primary heavenly spirit of Nature.

Note. It is for this reason that the reader ought to know that in its centre, the Earth conceals a virgin soil. This soil must be purified from its impurities with the aid of fire and water. Its three elements also have to be purified by this same means, and subsequently combined together. This forms the basis of our philosophical operations, which are described as follows.

There are three important salts concealed in the aforementioned Earth: Philosophical nitre which has been obtained in the soil through the action of the Sun, Moon and other stars. The more active the Sun's rays are, and also those of other sources, the more Central nitre is formed. This however applies to philosophical nitre and not the common variety. Secondly there exists a celestial and visible God of Nature, which is a spirit of the world that is concealed in a certain volatile salt of this virgin soil.

Finally there is planted in it by God a solid salt which is the seat and body of the other two salts. The earth thus contains within itself three salts whose extraction is described in the following paragraphs." (35)

This introduction is then followed by twenty short sections, in which the various chemical processes are described. Whilst it is not clear at this stage of the text exactly which, if any, substances Sendivogius had in mind, it becomes probable on reading the work that the substances which would suggest themselves to a modern chemist are: potassium nitrate (central salt), ammonium chloride (volatile salt) and potassium carbonate (fixed salt). A detailed summary of the twenty sections is given in the Appendix (pages 316-321), but a brief synopsis of the processes described is given here, since it illustrates clearly the chemical basis of Sendivogius' theory. Synopsis of the practical procedures described in Sendivogius' *Process on the Central Salt*:

1. Extraction of nitre, the Central Salt, from farmyard

soil.

2. Preparation of the volatile salt by dry distillation of farmyard soil, nitre and calcined soil.
3. Preparation of the fixed salt by calcining soil from the earlier described processes and leaching out the alkali with water.
4. The combination of the two salts mentioned above, with spirits of nitre, to make the universal solvent.
5. Preparation of the Philosopher's Stone from gold, mercury and the universal solvent. (36)
6. Use of the Stone for the purpose of multiplying gold.

This rough sequence of operations is presented twice, i.e. the twenty short sections are split into a group of eleven and a group of nine. The titles are similar for each group. Whereas the first group of paragraphs essentially contains practical details of various processes, the second group contains more explicit details of Sendivogius' ideas in addition to practical details.

In this second section the first paragraph is entitled "The preparation of nitre from secondary virgin soil". After the straightforward description of this preparation which involves water standing in contact with straw for 24 days in wooden barrels and subsequent filtration and evaporation, Sendivogius continues:

"Pure salt of the Earth, otherwise known as nitre, is formed in the cauldron. This now has to be dissolved and concentrated, and purified and rinsed, until it becomes beautifully transparent and crystalline. It then acquires the name nitre of the philosophers' earth, our salt, which rises in the sea of the world, WATER WHICH DOES NOT WET HANDS, without which nothing in this world can be born or come to exist.

Thus you have in your hands the secret of all Philosophers and the source of the spring, or the hiding

place of Nature. It is in this secret that the aforementioned Spirit of Nature, and the whole world resides. Both life and health proceed from this. We shall discuss it in more detail in the passage which follows." (37)

This next paragraph is entitled: "Modo intrabimus laboratorium chymicum" [Thus we enter the chemical laboratory]. The reference to a laboratory suggests clearly that physical processes with physical substances are being discussed. The section reads:

"Our nitre is thus obtained from virgin soil. Although it appears to be one body, it actually contains within itself three different salts and as such it constitutes a valuable and philosophical salt in which the spirit of the Earth is concealed. This is not solid but of an intermediate nature. Secondly it contains within itself an ammoniacal, or volatile salt. Thirdly it also contains the alkaline, or solid salt. Our salt is therefore three-in-one and in this respect it resembles our Creator. In the preparation of this salt everything will be made clear as is shown subsequently." (38)

This passage unambiguously states an important part of Sendivogius' theory - that nitre contains within itself the Spirit of the Earth which is not solid, the ammoniacal salt, and the alkaline salt. Bearing in mind the practical descriptions for the latter two of these, we can identify them as already mentioned, with ammonium chloride and potassium carbonate. Ammonium chloride, which decomposes on heating into two gases, is effectively a volatile solid. It is industrially still purified by resublimation. Potassium carbonate is present to an appreciable extent in wood ash, and can be obtained from it by extraction with water, in which it is soluble to form an alkaline solution. Potassium carbonate is not decomposed by heat - hence the term "fixed" salt. The "spirit of the Earth", which is not solid, could be identified with oxygen in this situation.

It can be deduced from the text that Sendivogius was very experienced in practical techniques and that he had an excellent command of them. Since he was able to obtain the substances we would now recognise as ammonium chloride and potassium carbonate through chemical processes involving both nitre and soil, his conclusion about the relationship between these substances is completely justified. Seen in this light it is the result of an empirical inference. The third salt which we would possibly identify as oxygen, could not possibly have been more accurately described, given the fact that the concept of gas as an individual substance was still some decades away. (39) Bearing in mind Sendivogius' laboratory expertise there is every reason to suppose that he would have been familiar with what we now call the thermal decomposition of potassium nitrate, and the properties of its products. Although pneumatic chemistry had not yet been established, Sendivogius would certainly have had the opportunity to observe enhanced combustion in the presence of the gaseous product, as well as experiencing its beneficial effect on respiration.

Through his *Process on the Central Salt* we are thus able to perceive:

a) the precise nature of his theory in greater detail

and b) the fact that it was based on sound practical experience.

The universality of the Central Salt was further illustrated by its vital role in the transmutation of

metals. In a subsequent paragraph entitled "The joining of the three philosophically prepared salts," Sendivogius describes the preparation of the universal solvent. He begins by stating:

"Until now you have had the body, soul and spirit of our virtuous stone, but all separately. You shall now be able to unite them in a most excellent and illustrious manner."  
(40)

The modern reader may interpret the body, soul and spirit as references to potassium carbonate, ammonium chloride and spirits of nitre, which are mixed together in the right proportions, to yield the universal solvent. Whilst the mixture of ammonium chloride, potassium carbonate and nitric acid described is not the modern "accepted" mixture for aqua regia, the mixture described will dissolve gold, since it contains a very high concentration of hydrogen ions in the presence of both nitrate and chloride ions. It is of interest to note that nowhere in his writings does Sendivogius use the expression "aqua regia" which was already well established in his time. The reason is possibly that his universal solvent had a different composition, hence the different name. The text continues:

"...truly you have in your hands and your power the most secret key to the whole of the philosophy of Nature. With this key you will be able to open every gate, untie all knots, close all metals, minerals, precious and ordinary stones and discover and keep all the greatest secrets and treasures of Nature." (41)

Through this statement Sendivogius is suggesting that the universal solvent, which is derived from the central salt, or nitre, can act as an intermediary for the transmutation of metals.

From the standpoint of modern chemical knowledge, and



indeed the technical chemical writings of his time, Sendivogius' *Process on the Central Salt* makes good sense. What is naturally difficult to interpret are the sections which relate to the fermentation and multiplication of gold. Whilst it is not the aim of the present work to discuss the "Philosopher's Stone" and the "transmutational" aspects of Sendivogius' works, it should nevertheless be mentioned that this particular aspect has been given attention by historians of chemistry. Two important contributions in this field are: the paper entitled "The Chemical Composition of the Philosopher's Stone" by C. J. van Nieuwenburg (already mentioned on page 50), and the book: *Alchemy, Child of Greek Philosophy*, by A. Hopkins (New York, 1934) which gives special attention to the colour sequences which were described during "preparations" of the "stone".

#### Summary

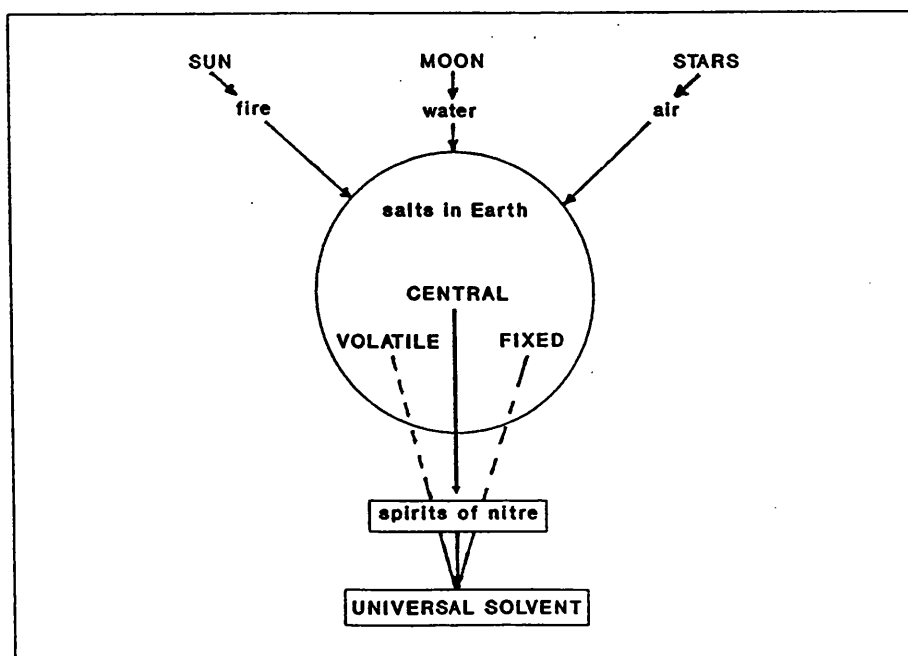
Three aspects of Sendivogius' writings have been given particular attention:

- (a) his interest in air and its role in life processes and combustion
- (b) the Central Salt, or nitre, as the substance which contains within itself that part of air which is necessary for the above mentioned processes
- and (c) the Central Salt, or nitre, from which the universal solvent can be prepared, and hence the Philosopher's Stone.

The works discussed have shown that Sendivogius wrote more extensively, and in more detail on the subjects of air and

nitre, than any of the authors discussed in the previous chapter. He developed the Paracelsian concepts of salt and sulphur into his own theory which was centred on nitre. The theory, as we have seen, was supported by Sendivogius' own practical expertise and experience. Unlike Paracelsus, Du Chesne and Palissy, who had written before him, Sendivogius repeated his ideas on nitre and its vital role in the universe, several times and with reference to varying situations.

Although the language and terminology used by him is by no means unambiguous and is frequently difficult to interpret on account of its complex style, there is sufficient evidence to show that he was the author and originator of a grand new theory which was based on the chemistry of "Central Nitre" or potassium nitrate. This theory was developed as the result of Sendivogius' practical experience. It is summarized diagrammatically below:



1. Nature produces the Central Salt which plays a vital role in the life cycle of plants and animals.
2. Man uses the Central Salt to produce the universal solvent, from which the universal seed of metals can be formed, which enables the transmutation of base metals to gold to be accomplished.
3. The Central Salt provides a link between "what is up there" and "what is down below."

The central salt (or potassium nitrate) therefore provides the key to all phenomena relating to life in the universe.

A contemporary interpretation of Sendivogius' theory is given in the woodcut which was printed in Stolcius' *Viridarium Chymicum* in 1624.

The picture shows two persons, and a forest in the background. Michael Sendivogius is the figure on the left, dressed in a Polish nobleman's costume. On the right is an old cripple supporting himself with a crutch, and watering a young tree. The perforated bottom of the watering jug causes the water to issue in the form of a miniature rainfall. Two of the trees in the forest are embellished with alchemical symbols: the seven personified star shapes represent the seven metals known to alchemists, and the six concentrically orientated faces on one tree represent the Sun, Moon and Mercury (celestial bodies), and the fruits of the Hermetic tree: gold, silver and mercury. These are the components of the Philosopher's Stone which is made in the philosophical egg.

The rain falling from the watering jug represents the heavenly dew, or rain, which contains the aerial salt which



*D. Stolcius, Viridarium Chymicum figuris cupris incisus  
adornatum, et poeticis picturis illustratum, Frankfort:*

*L.Jennis, 1624, figura xxvii.*

does not wet our hands, and which occurs in the sea of the world - air. this is an allegorical representation of nitre, which enhances the growth of all living organisms: plants, people and animals. This is the nitre which fertilizes soil, causes plants to grow, and plants to have colours. This nitre is absorbed and dissolved in rain, and then transferred to the soil, where it is taken up by plants.

The chemical basis of many of the ideas encompassed by Sendivogius' theory can be confirmed today, and he appears to have been an important influence in shifting the attention of the alchemists and chemists of his time to the study of air and its role in combustion and respiration.

Alchemy had been preoccupied with metallic transmutation. Paracelsus had already redefined its objective as primarily the preparation of chemical remedies to cure all manner of diseases. Sendivogius, stimulated in part by Paracelsian teachings, played an important role in directing attention to a part of the air involved in generation, growth, and the maintenance of life. Fifty years after the first publication of his major work, it was to be given particular attention by John Mayow.

**How were Sendivogius' ideas received by his contemporaries?**

In order to be able to assess fully the reception of Sendivogius' ideas among philosophers and writers of the seventeenth century, I have selected a few writings of this period which illustrate the authority that he succeeded in establishing. This short selection of quotations will show that Sendivogius was undoubtedly held in high esteem.

Additionally it also opens up further questions concerning some other facets of his life.

The six authors which I have chosen are: Daniel Stolcius (1624), Arthur Dee (1650), Jo. Gadbury (1651), Sir Kenelm Digby (1660), John Langins (1669) and Claudio Germain (1672).

(a) In his *Viridarium Chymicum* (Frankfurt, 1624), mentioned already, Daniel Stolcius included Sendivogius in his list of the twelve greatest chemical philosophers of all time. Others included Hermes, Democritos, Avicenna, Villanova, Aquinas, Lull and Roger Bacon. Of Sendivogius, who was referred to as "Sarmata Anonymus", he wrote (42):

Though this name in the past  
Has been kept in oblivion,  
Its praise now penetrates the darkness,  
As it ought to be, indeed.

Prague in Bohemia  
Has well acknowledged his works.  
He has written twelve books  
And taught accordingly.

He said: Saturn  
Himself must water the earth  
If it, dear sun and moon,  
Shall bear your beautiful flowers.

This poem accompanies the wood carving which was reproduced on page 123.

(b) The *Fasciculus Chemicus* by Arthur Dee (son of John) was published in London in 1650. In the second work contained in it, entitled "Arcanum or, the grand Secret of Hermetic Philosophy", we find the following paragraph on page 169:

"As for that clear water sought for by many found by few, yet obvious and profitable unto all, which is the base of the philosophers work, a noble Polonian not more famous for his learning then subtilty of wit (not named, whose name not withstanding a double Anagram hath betraied). In

his *Novum Lumen Chymicum*, *Parabola* and *Aenigma*, and also in his tract on Sulphur, he hath spoken largely and freely enough; yea he hath expressed all things concerning it so plainly, that nothing could be more satisfactory to him that desireth more."

(c) In the Preface to an English edition of *Harmony*, which was entitled *Sal lumen & Spiritus Mundi Philosophici* (London, 1657), (ref. 8 in Table 3 on page 43) we find the following poem by Jo. Gadbury:

Expect not (Sir) that I should amply treat  
Of this Discourse, (that cost you pains and sweat)  
Nor hope for yet, from my more duller pen,  
Your Sal should be described to Englishmen  
The sublime secrets of your chymick-skill  
May prosper better from your learned quill.  
My fancy's raw, my brain is not endu'd.  
With Art enough to talk of humours crude,  
Nor yet of th'Epilepsie, or the Gout,  
Consumption, Asthma's, or the rabble-rout.  
Of Physick-Terms: I study other things:  
Ergo, I'll leave these unto Chymist-Kings.  
These high-born fancies do appear to me,  
Like great Sir Urquart's Genealogy.  
Nor dare I without Sendivogius' Torch,  
Approximate you neerer then the Porch  
Lest I (presumptuous) should be gaz'd upon  
By those that have their Wedding-Garments on:  
But, as man oft feels heat, and sees no fire,  
So I (unskil'd) this learned Work admire.  
The Learn'd Physitians, who years consume.  
In finding out a Medicine for the Rheume,  
(And when they think themselves to be at rest)  
They dare not write on it, probatum est.  
May learn by this (could they but find the cause)  
To cure diseases by the Chymists Laws:  
Nor need th'ingenious Operator doubt.  
Of perfecting what 'ere he goes about:  
The lofty Secrets of this book laid down,  
(Once understood) will save him many a Crown,  
There is a secret higher yet in this:  
For here is taught what anima mundi is:  
For which the Learned oft have beat their brains,  
And gained nought but labour for their pains  
If men would learn this quicker way, & share  
In Chymick-skill, deal in learn'd Turner's Ware.

(d) On 23rd January 1660, Sir Kenelm Digby delivered a short paper entitled: *A Discourse concerning the vegetation of plants* at Gresham College, to a "Meeting of the Society for promoting Philosophical Knowledge by Experiments." The

paper was published in 1669 in a volume entitled: *Two Treatises*, which contained two major works and several shorter ones.

In this paper, Digby discussed the growth and development of plants, which was clearly a topic that embraced several leading questions at that time. One of these questions was concerned with the nature of the substances which cause plant growth. He first mentioned the well-known fact that a "nitrous salt" plays a vital role in plant growth, and then went on to explain how it functions:

"The Salt-peter, there is like a Magnes which attracts a like Salt that foecundates the Air, and gave cause to the Cosmopolite to say, *there is in the Air a hidden food of life*. Such Airs, as are most impregnated with this benign fire, are healthful to live in: Others, which abound with Earthy exhalations or Marishy vapours, and have little balsamick Salt in them, are as unfound. This is the food of the Lungs, and the nourishment of the Spirits. *Cornelius Drebel*, having contracted a great quantity of this into a narrow room, could recreate and revive his languishing guests in his straight house under water; when they had fed upon all the balsome that was in the air shut up with them: by [sic] by opening a Phiol, that dilated it self with fresh spirits into that stale depredated and exhausted Air. This spirit, then, that is in the Air is drawn (as it were by a Loadstone) by the Saline Liquor which is imbibed into the Seed which is full of it. My own eyes are witnesses of the wonderful corporifying of it: I have seen it grow in a strange proportion." (43)

(e) The enigmatic Eyraeneus Philaletha or Cosmopolita, alias George Starkey, was clearly influenced by Sendivogius. (44) In his *Secrets Reveal'd, or An Open Entrance to the Shut-Palace of the King, containing the greatest Treasure in CHYMISTRY, Never yet so plainly discovered* (London, 1669), we find in the Preface of John Langins to the reader:

"...and then withal the candour and perspicuity of the Writing, as it were a continued style of Sendivogius, whose footsteps this author doth everywhere closely follow, yea sometimes excel,..."



(f) In the *Icon Philosophiae Occultae sive vero Methodus Componendi magnum antiquorum Philosophorum Lapide* [The Image of Occult Philosophy, or the Recipe for the great Stone of the Ancient Philosophers] by Claudio Germain (Paris, 1672) who was physician to Queen Marie Louise of Poland, we find a reference to Sendivogius on the first page (45):-

"...Sendivogius, Noble Knight of Poland and most skilful exponent of the Stone of Physic, has furnished me with a most illuminating beacon of light midst the great and dark shadows, for such they be, of philosophy..."

From the preceding six references to Sendivogius' contribution to natural philosophy, it can be seen that he had achieved a position of some prominence among the writers of his time. With the exception of Kenelm Digby's reference however, none of the other authors had given any indication as to what aspect of natural philosophy Sendivogius had excelled in. It is also interesting to note that in the one case where a specific mention was made of an aspect of Sendivogius' "central nitre" theory, the name of the author was simply given as the "Cosmopolite". (Henry Guerlac has discussed Digby's reference to the "Cosmopolite" in his paper entitled *John Mayow and the Aerial Nitre.*) (46)

The absence of Sendivogius' name in connection with any specific achievements, or the lack of mention of any specific achievements in connection with Sendivogius' name naturally points to the question: Did Sendivogius intentionally conceal his name, and if so, why? As we have seen, the answer to the first question was provided by

Daniel Stolcius, but the answer to the second question has, as yet, not been provided by anyone. In the next chapter I shall provide evidence for a possible answer to this question when I shall discuss, for the first time, Sendivogius' *Statutes of the Unknown Philosophers*.

### Conclusion

In the present chapter I have brought a modern chemist's understanding to bear upon the actual laboratory processes of Sendivogius, insofar as they can be identified through the sometimes purposely obscure description he provided. In doing so, it is, of course, necessary to avoid the "whiggish" temptation to find intimations of modern discoveries in work undertaken in a very different context of ideas than that of contemporary chemistry.

The period in which Sendivogius lived and worked was a transition period from alchemy to chemistry. Accordingly, as we have seen, his works share the allegorical style of alchemical literature, and the customary narration of travels, wanderings, disappointments, and of dreams and revelations in which it abounds. Additionally, his references to 'sun' and 'moon', the 'belly of the wind', and the 'mercury' drawn down by 'magnets' to work in terrestrial generation, and other processes, all reveal the characteristic employment of the *Tabula Smaragdina* as an alchemical Genesis text, describing the divine work in creation, whose secret meaning the alchemist was to penetrate through divine grace and his practical labours in order to imitate it. He would thus succeed in applying to alchemical endeavour the supreme secret which enabled each

kind to be brought to its perfection.

The writings of Sendivogius also reflect the influence of Paracelsian doctrines. They elevated salt, sulphur and mercury as the principles involved in the constitution of all bodies. Paracelsus enjoined the discovery of analogies between processes in the macrocosm of the universe, the geocosm of the earth, and the microcosm of the human frame: he had himself made a major contribution to that type of thinking by pointing to the analogy between thunder and lightning in the sky, and explosions produced by gunpowder, and hence between an aerial and a terrestrial 'nitre'. Stimulated by these parallels, as we have noted, a series of thinkers speculated on the 'nitre' which was responsible for life processes on earth. But while Sendivogius may not have been wholly original in focusing upon this theme, he brought something novel to it. That seems to be amply testified by the great vogue of his works through much of the seventeenth century and beyond. The principle hinted at in the *Tabula*, supposedly known to the writers of the classic texts of alchemy, and searched for in vain by alchemists through the centuries, was for Sendivogius the 'aerial food' or the Central Nitre.

#### Notes

1. See also the discussion in: M.P. Crosland, *Historical Studies in the Language of Chemistry* (Heinemann, 1962), 3-42.
2. C.J. Jung, *The Integration of the Personality* (London, 1940). Chapter five is entitled: "The Idea of Redemption in Alchemy" and on pages 223-225 there is a particularly interesting discussion of Sendivogius' (to whom Jung refers as "The anonymous author of the treatise *De Sulphure*") alchemical language.
3. The passage in question occurs in Bugaj's *Traktat*

4. *ibid.*, 131, note 8.
5. *ibid.*, 130, note 4.
6. M. Sendivogius, *op.cit.*, 9.
7. *ibid.*, 13, lines 23-31. The Latin original for this passage which occurs on pages 27-28 of the 1639 Geneva edition entitled: *Novvm Lvmen Chymicum E Naturae fonte & manuali Experientia depromptum CVI ACCESSIT Tractatus de Sulphure Authoris Anagramma Divi Leschi Genus Amo* reads as follows:  
"Hyeme vero, cum aere frigidus terram constringit, congelatur etiam ille vnctuosus vapor; qui postea, redeunte vere, vna cum terra & aqua miscetur; & fit Magnesia trahens ad se sibi similem Mercurium aeris, qui dat vitam omnibus rebus, per radios Solis, Lunae & stellarum, & sic gramen, flores & similia profert:"
8. *ibid.*, 28, lines 2-7.
9. R. Bugaj, *Traktat*, 395. The Polish original of Bugaj's glossary of Sendivogius' terms reads:  
"CHALYBS (łac. = stal) - alegoryczna nazwa używana przez Sędziwoja dla określenia saletry potasowej, azotanu potasowego, która to substancja odgrywa podstawową rolę w jego systemie alchemiczno-hermetycznym." [CHALYBS (latin = steel) - Sendivogius' allegorical name for the nitre of potassium, or potassium nitrate, which played a key role in his alchemico-hermetic system.]
10. M. Sendivogius, *A New Light of Alchymie* (London, 1650), 32, lines 28-33; 33, lines 1-2.
11. *ibid.*, 38, lines 7-9.
12. *ibid.*, 38, lines 26-30.
13. *ibid.*, 40, lines 18-28. The Latin original (pg. 67 of the 1639 edition) for this passage reads as follows:  
"Possem hic prolixè & Philosophice disserere de hominis dignitate, creatione eius, & generatione: Sed cum eiusmodi non sint huius loci, silentio praetereunda sunt; de vita eius solummodo paucis agam. Creatus homo de terra, ex aere viuit: est enim in aere occultus vitae cibus, quem nos rorem de nocte, de die aquam vocamus rarefactam, cuius spiritus inuisibilis congelatus melior est quam terra vniuersa."  
The latter part of this quote was used, as I have shown in note 39 on page 92, by Nolle.
14. *ibid.*, 40, lines 28-30.
15. *ibid.*, 41, lines 16-24.

16. *ibid.*, 42, lines 17-24.
17. *ibid.*, 43, lines 23-33; 44, line 1.
18. *ibid.*, 44, lines 6-7.
19. *ibid.*, 44, lines 7-14.
20. *ibid.*, 44, lines 17-23.
21. *ibid.*, 45, lines 7-15.
22. *ibid.*, 55, lines 23-33; 56 line 1.
23. *ibid.*, 56, lines 5-14.
24. *ibid.*, 77, lines 26-33.
25. *ibid.*, 95, lines 5-8.
26. *ibid.*, 96, lines 3-12.
27. *ibid.*, 96, lines 16-21. The Latin original (pg. 149 of the 1639 edition) reads as follows:  
 "In summa tota structura mundi aere conseruatur. Etiam in animabilibus, Homo necatur cui adimitur aer, &c: in orbe nihil cresceret si non esset vis aeris penetrantis, & alterantis, attrahentisque secum nutrimentum multiplicatiuum."
28. *ibid.*, 98, lines 12-15.
29. *ibid.*, 113, lines 14-24.
30. *ibid.*, 129, lines 5-8.
31. *ibid.*, 133, lines 11-28.
32. *ibid.*, 134, lines 20-30.
33. *ibid.*, 136, lines 8-12.
34. *ibid.*, 144, lines 24-33.
35. R. Bugaj, *Traktat*, 128, 130.
36. *ibid.*, 401-402. In his glossary of alchemical terms, Bugaj defines the universal solvent as follows:  
 "ROZPUSZCZALNIK UNIWERSALNY (lac. menstruum universale, menstruum solvens, alkahest) - uniwersalny rozczynnik rozpuszczający wszystkie ciała. U Sędziwoja pojęcie to oznaczało specjalnie preparowanego Merkuriusza filozoficznego (- merkurialny płyn filozoficzny), który podczas produkowania kamienia filozoficznego służył do rozpuszczania złota lub srebra. Zwany był także wodą filozoficzną." [UNIVERSAL SOLVENT - a universal solvent which can dissolve all bodies. Sendivogius used this term to denote a specially prepared

philosophical Mercury (- a mercurial philosophical liquid), which dissolved gold or silver during the preparation of the philosopher's stone. It was also known as philosophical water.]

37. M. Sendivogius, *A New Light of Alchymie* (London, 1650), 141, lines 1-12.
38. *ibid.*, 141, lines 13-23.
39. Van Helmont is generally accepted as having introduced the concept of a gas. His works were published posthumously in 1648. See, for example, J. Partington *A Short History of Chemistry* (London, 1965), 49.
40. R. Bugaj, *Traktat*, 143, lines 6-8.
41. *ibid.*, 143, lines 29-31; 144, lines 1-3.
42. The Latin original reads as follows:  
"Suppresso tacitus quam vis hic nomine vixit,  
Fama sed e tenebris protulit hocce nigris.  
Praga triurbs primo scriptum conspexit, opus que,  
Bissenis scriptis quod docet ille suis.  
Humectat terram Saturnus, dixit, habentem  
Phoebe tuos flores, & Vaga Luna tuos."  
The translation of this verse which I have used comes from: Paul Allen (ed.), *A Christian Rosenkreutz Anthology* (Blauvelt, 1981), 461.
43. The passage quoted occurs on pages 223-224 of the 1669 edition of Sir Kenelm Digby's works which were published under the general heading:  
*Of Bodies and of Man's Soul. Kenelm Digby MDCLXIX.*
44. For a recent discussion on the pseudonym "Cosmopolite", see: W. Newman, "Prophecy and Alchemy: The Origin of Eirenaeus Philalethes", *Ambix* 37 part 3 (Nov. 1990), 97-115.
45. The Latin original reads:  
"facem lucidissimam in tantis & tam opacis  
Philosophorum tenebris mihi praeferente Nobili illo  
Sendivogio Equite Polono, ingeniosissimo Lapidis  
Physici elaboratore,"
46. H. Guerlac, "John Mayow and the Aerial Nitre: Studies on the Chemistry of John Mayow - 1", *Actes du Septième Congrès d'Histoire des Sciences* (Jerusalem, 1953), 332-349.

## Chapter Six

### A Study of the *Statutes*, and the *Treatise on Salt*

Two important aspects of the *Statutes* are treated in this chapter:-

- a) their authorship
- b) their significance

#### a) Their Authorship

In discussing the authorship of a work which was published some three hundred years ago, it is not possible to establish "beyond proof" that their author was Sendivogius. However, bearing in mind:

- (1) historical evidence
- (2) the testimony of other authors

and (3) the style and content of the work itself when compared with Sendivogius' other works,

I shall put forward a case for its authorship by Sendivogius.

#### (1) Historical Evidence

As I have mentioned earlier on page 34, the *Statutes* have only appeared in print once. This was in 1691 under the general heading *Les Oeuvres du Cosmopolite* in which other, better known works ascribed to him, were also published. They were printed together with *Cosmopolite's* 55 letters, exemplifying the kind of relation through letters, which could exist between "senior" and "junior" members of the Cabalistic Society of Unknown Philosophers. The title page of these *Statutes* also contains the words "Nouvellement découverts" [newly discovered], suggesting that this was a first printing of this particular work. The 55 letters were subsequently republished six times (1),

but without the accompanying *Statutes*.

It is significant that the name of Sendivogius appears nowhere as the author of any of the French editions. Instead, the author is given as "Le Cosmopolite". It is well established that since the appearance in print of the *Treatise on the Philosophers' Stone* in Prague in 1604, Sendivogius always used various methods of concealing his true identity, by means of anagrams or pseudonyms. The pseudonym "Cosmopolite" was first used by Sendivogius in 1604 and seems to have been adopted by himself and the editors of his subsequent editions (2) as his hallmark.

Sendivogius must have had a good reason for using a pseudonym, and especially this particular one. The use of of a pseudonym was obviously to conceal his identity. The fact that he used the word "Cosmopolite" suggests, as we have mentioned earlier, that he was a "citizen of the world" - a man whose outlook and disposition were not limited by race, creed or nationality.

## (2) The testimony of other authors

Any list of important authorities in the field of the history of chemistry and alchemy must include:- Pierre Borel (1620-1689), Lenglet Dufresnoy (1674-1755), Hermann Kopp (1817-1892), Arthur E. Waite (1857-1942), John Ferguson (1837-1916), Lynn Thorndike (1882-1965), John Partington (1882-1965), and Denis Duveen (1910- ).

Each of these authors deals with Sendivogius and his work, but except Duveen (3), none of them has even chosen to mention the *Statutes*. Indeed, it is quite clear from their accounts, that both Borel and Dufresnoy were confused



in their assessment of Sendivogius (4), about his reputed relationship with Alexander Seton, and about the writings attributed to "Le Cosmopolite". It would appear that Kopp, Ferguson, Waite, Partington, Duveen and Thorndike all accepted the opinions expressed by the Frenchmen, and whilst they did not entirely dismiss Sendivogius as a fraud, they did not subject to greater and more critical scrutiny the accounts surrounding his life and his works. Thus their accounts of Sendivogius and his works seem to contain very little original material. In his *Manuel Bibliographique des Sciences Psychiques ou Occultes*, Caillet mentions the *Statutes* (5), but makes no further comment on them.

Three other authors have expressed an opinion on the authenticity of the *Statutes*. In the 1976 modern edition of the *Les Oeuvres du Cosmopolite*, Bernard Roger suggested that Sendivogius could not possibly have been their author. His arguments were discussed earlier on page 44.

In the *Bibliotheca Esoterica Catalogue* (no author given, Paris, 1988), the following entry exists on page 162 under the name of Faber, to whom Sendivogius referred in his second letter (6):

"Michael Sendivogius, dit le Cosmopolite, Grand Maître de la Rose-Croix et fondateur de la branche des Rose-Croix particulièrement adonnée a l'alchimie sous la dénomination de "Société des Philosophes Inconnus", faisait le plus grand cas de ce médecin de Castelnaudary". [Michael Sendivogius, otherwise known as the Cosmopolite, Great Master of the Rosey-Cross and founder of the alchemical branch of the Rosey-Cross which was called the "Society of Unknown Philosophers", held in very high esteem this doctor from Castelnaudary]

The author of this statement clearly implies that Sendivogius not only wrote the *Statutes*, but that he also

founded the alchemical branch of the Rosicrucians.

In 1702 Sendivogius' letters were published in J. Manget's *Bibliotheca Chemica Curiosa*. The title to the letters reads as follows:

"*Apographum Epistolarum hactenus ineditarum M. SENDIVOGII, seu I.I.D.I. Cosmopolitae vulgo dicti. Clarissimo ac novo Cabalae Philosophorum incognitorum dignissimo Sodali T.S.P. M.S.*" [A collection of hitherto unedited letters by M. Sendivogius, or I.I.D.I. Cosmopolita as he is commonly known. For the most excellent and most worthy new member of the Cabale of the Unknown Philosophers T.S.P. M.S.]

Manget then, did not doubt that Sendivogius had a very important position in the Cabale of the Philosophers.

From the foregoing discussion, we can see that the varied biographical details of Sendivogius which have been available to historians of chemistry and alchemy during the last three centuries, must have affected assessments of the authenticity of his works. The shroud of secrecy, combined with many doubtful and contradictory aspects of Sendivogius as portrayed in his biographies, would naturally have caused people like Roger and Duveen to keep an open mind about the authorship and even the authenticity of a work such as the *Statutes*. One aspect of the early biographies of Sendivogius, which raised various doubts as to his integrity (as I mentioned at the beginning of chapter two) was his reputed relationship with the Scottish alchemist Alexander Seton.

Only in recent years has careful research by Bugaj shown that:

- a) Many of the facts concerning dubious aspects of Sendivogius' life as portrayed by des Noyers, are false.
- b) Sendivogius, and not Seton, was the author of the *Treatise on the Philosophers' Stone*.

c) Only Sendivogius, and not Seton, ever used the pseudonym "Cosmopolita".

These three issues have been major stumbling blocks in assessing the works attributed to Michael Sendivogius.

With Bugaj's new evidence which is now available, as I have mentioned earlier, it is sensible to reconsider the *Statutes* in the light of Sendivogius' other writings.

(3) The *Statutes*, in the context of Sendivogius' other works.

(My complete translation of these appears in Appendix G on pages 322-344.)

The discussion of the text is divided into two parts:-

(A) The Preface

(B) The *Statutes*

(A) The Preface

The preface is six pages long - about 1000 words. It opens with an allegorical story concerning the author sailing across the unknown seas of the "Ancient Philosophy" for a long time, and finally arriving at a port. This would suggest that the author has reached an important conclusion (which would relate in this case to his new theories about air and the "central nitre"). Being a fervently religious man, he assumed that anything good could only be achieved with the help of God, and that consequently this good must be used only for the benefit of others. Hence the statement: "It would therefore be a crime to hide in secret such a gift received from heaven." (7) He then goes on to remark that times are bad and that there exist a multitude of dangers as he himself has experienced. This would obviously fit in with Sendivogius' Mühlenfels episode (see

page 23), for example. He also talks about the "dangers which threaten our Republic". (8) Between 1569 and 1795, Poland was united with Lithuania to form the Polish-Lithuanian Republic. From 1587 until 1632 the Swedish-born king of this Republic was Zygmunt III Vasa. In 1617 Sweden invaded the Republic and the ensuing war lasted for twelve years. Between 1618 and 1648 the whole of Europe was plagued with the Thirty years War. It is hardly surprising that he should have written : "We are currently living in extremely bad times." (9)

Sendivogius was clearly very concerned that what he regarded as true knowledge should be reserved for a few select people, who are fully aware of the implications of any discoveries which they may make. This, he felt, could be best achieved by forming a secret society or Cabale, which would be organised in such a way that only qualified people would be allowed to participate in its exclusive activities.

"After some deliberation I have come to a clear solution: we should establish among ourselves a certain Philosophical Society in which the true identity of members will be concealed.... All Associate members will thus be wise and sensible propagators of the precious treasures of the Hermetic Science." (10)

He then informs us that he has chosen a group of founder members and that he has written some texts which "my experience has taught to be useful" (11) and that these would become available to people throughout the world.

It seems reasonable that having placed such great stress on the need for secrecy, Sendivogius should have published his works under a pseudonym. Sendivogius presented himself, moreover, as a practical person who

believed that conclusions must be based firmly on the results of laboratory operations. The emphasis on secrecy and the necessity of a practical part were, of course, common themes in alchemical works.

In the final two paragraphs he mentions that some of his works have already become available while he has withheld publication of the others until a later date. This would once again fit in with the known facts - both the *Treatise on Salt* and the *55 letters* were published posthumously for example.

On the basis of the Preface we may now summarize the evidence in favour of the authenticity of Sendivogius' *Statutes*:-

- (a) the firm belief that he has made a discovery of profound significance for the benefit of mankind, but which may nevertheless have disastrous results if it gets into the wrong hands;
- (b) very strong religious convictions;
- (c) an acute awareness of the contemporary ascendancy of evil influences in the world;
- (d) the importance of keeping not only the knowledge of these discoveries, but also the identity of their discoverer, secret;
- (e) the importance of conclusions based firmly on empirical evidence;
- (f) the acknowledgement that he has written some books which have already been published and that others which he had written have been temporarily withheld from publication.

The evidence thus presented has shown that the *Statutes* are consistent with the style and content of the other works of Sendivogius. Moreover, they were published under the name of Cosmopolite, which was Sendivogius' principal pseudonym. Thus on the evidence so far, there are strong grounds for believing that he was their author.

(B) The *Statutes*

The *Statutes* are divided into six chapters and each chapter is split into several articles. The headings are given below:-

chapter article sub-heading

- |   |      |   |
|---|------|---|
| 1 |      | The organisation of the Society                                   |
|   | I    | The nationality of members  |
|   | II   | How the Society should be subdivided                              |
|   | III  | The number of members   |
| 2 |      | Conditions for membership   |
|   | I    | The social status and religion of members                         |
|   | II   | Exclusion of people who have taken holy orders                    |
|   | III  | Sovereigns only exceptionally to be admitted                      |
|   | IV   | Behaviour befitting members                                       |
|   | V    | Members must have a natural curiosity                             |
|   | VI   | Secrecy - an essential condition                                  |
| 3 |      | Procedure for admitting new members to the Society                |
|   | I    | How to become a patron  |
|   | II   | How to gain members   |
|   | III  | The obligation of patrons   |
|   | IV   | The prerogatives of general secretaries                           |
|   | V    | The reception   |
|   | VI   | The name which the new member must adopt                          |
|   | VII  | What the new member must give to his patron in written form       |
|   | VIII | The agreements which the patrons must receive from the new member |
|   | IX   | The obligations of the new member                                 |
| 4 |      | Statutes and rules for all members                                |

- I Anniversary of the reception
  - II Members must avoid discreditable conduct
  - III Working in groups
  - IV Possible to enlighten those who are on the wrong track
  - V How to encourage people to join the society
- 5 On the types of activities which members should conduct among themselves
- I They should meet from time to time
  - II Communication by means of letters
  - III The way in which members should help and correct one another
- 6 How to use the Stone
- I How the person who has already made it should give advice on it.
  - II He must divulge the technique to those that come and ask for it
  - III How to make the Stone
  - IV The use to which the Stone must be put

#### A Summary of the main points

#### Chapter One - The Organisation of the Society

The society is seen as being an international one which is subdivided into countries and empires. The importance of worshipping God is stressed, together with a reaffirmation of the elitist nature of the organisation:

"...the Veritable Philosophy cannot be practised by a multitude of people - and thus we can be sure that the number of members will remain small." (12)

#### Chapter Two - Conditions of membership

The idea is suggested that neither ordained members of the Church nor Sovereigns should be allowed to join. This suggestion may not be well received and a polite explanation follows:

"The Philosophy demands people with free minds and who are free to do as they wish." (13)

The implication of this is clear - men who have taken religious vows are not free to think as they wish.

The idea is also suggested that anyone can be accepted

into the Society, regardless of social status. The only criteria are that:

"they should worship Jesus Christ, that they should all love virtue and have the proper frame of mind for the Philosophy." (14)

This "proper frame of mind" is:

"a natural curiosity and a desire to penetrate the secrets of chemistry." (15)

The importance of honesty and silence are stressed once again.

### Chapter Three - Procedure for admitting a new member

Persons can be admitted to the Society once they have befriended a member, and proved their serious intention and goodwill. This member then becomes their patron. The patron has a considerable responsibility to the Society in that he can only accept someone who, in his opinion, is of a high moral and intellectual calibre.

In order to protect the Society from tricksters and rogues of whom there are many, members must adopt a cabalistic name, which may be an anagrammatic form of their own name.

Every newly admitted member should take part in an initiation ceremony, which should be preferably be a religious one, although this is by no means compulsory.

"If the circumstances are not favourable for such a mode of reception, then the person who is receiving the new member should organise a suitable ceremony." (16)

At the ceremony he is also told in a whispered voice the name of:

"the *Magnesia*, or the true and unique material, of which the Philosophers' Stone is composed." (17)

The new members must become familiar with the rules of



the Society, by copying them out. He should also become familiar with the list of other members of the Society, and he is encouraged to study their writings. A particular emphasis is laid on:

"practical techniques which will give weight to the theory." (18)

#### **Chapter Four - Statutes and rules for all members**

Members should celebrate the anniversary of joining the Society with a religious, or similar ceremony. They should take an interest in the work of unaffiliated experimenters, and help them in a friendly manner to achieve their goals. In this way members will spread the Society's beneficial influence. They should be careful however not to get involved with deceitful or dishonest people, and they should be particularly careful not to use alloys, which "are bad and must therefore be kept away from our members". (19)

If a person is encountered who is considered to be a potential candidate for the Society, he should be introduced to the Society and its activities, but only with great caution.

#### **Chapter Five - On the types of activities which members should conduct among themselves**

Members should meet to discuss their findings, but these meetings must be held in secret, and conducted at the highest level of good manners and behaviour. Outside meetings, members should communicate by means of letters which should be signed with cabalistic names in order to preserve secrecy.

If a member is guilty of misconduct, he should be

gently cautioned. If he fails to accept the caution, he should immediately be banned from the Society.

#### **Chapter Six - How to use the Stone**

Once the Stone has been prepared it will be the duty of the person who made it, to disclose the technique for its preparation, to other members. This can be achieved through an open, undated letter, or better, by personal contact.

Any wealth achieved through the use of the Stone should be distributed in three equal ways:-

- 1) to the Church
- 2) to the poor and oppressed
- 3) to one's own family

#### **Discussion of the *Statutes***

##### **i) The author's general outlook**

The writer of the *Statutes* was a good organiser and clearly had strong views on how to plan the activities of a large body of people. He had a tolerant outlook on life and believed that the study of nature was open to all, regardless of ethnic, religious or social background, provided that they had the correct mental attitude and disposition. This attitude had to be free of any prejudices such as those which may have affected ministers of the Church or members of royal families. A strong faith in God and in one's own actions was nevertheless crucially important. In short, the study of Nature must be unbiased, and based primarily on practical experience.

Bearing in mind Sendivogius' dual role in life as both a diplomat and an experimenter, and as a man who travelled

extensively, it is inevitable that he should have developed a strong sense for organisation and be skilled in dealing with people. He believed that the study of Nature, if it is to be successful, must be carried out in a manner which is as independent as possible from the capricious aspects of the human mind. He saw the "Society of Unknown Philosophers" as an organisation which would be completely uninfluenced by politics, scholastic dogma, or religious controversy. Thus man's understanding of Nature could be advanced more rapidly.

ii) Anonymity

The *Statutes* were written for a "Society of Unknown Philosophers". Hence it is not surprising that their author was also anonymous. He recommended that members should adopt secret, or cabalistic, names which should be anagrams of their own names. Alternatively they should use pseudonyms.

Sendivogius had used the anagrams "DIVI GENUS LESCHI AMO" and "ANGELUS DOCE MIHI IUS" in addition to the pseudonym "Cosmopolite". Thus he himself practised exactly what the *Statutes* suggested.

Sendivogius was an altruist, and believed that in the study of nature, the author's identity is not important. This is because he considered that science is for the benefit of mankind and not for that of any particular person. Thus the only reason for signing a work at all was, in his view, to enable its readers to identify all the works of the same author. Even that was presumably not essential, as he even seems to have allowed his works to be

published under different authors' names. It is interesting to note that some people, such as George Starkey, alias Eyreneus Philaletha Cosmopolita, subsequently imitated his style in that they not only copied the contents of his works, but even imitated his pseudonym (note 44, p.133).

Further evidence of Sendivogius' altruistic approach was provided by the manner in which he suggested that all profits made from any successful chemical operations should be distributed for the benefit of others. This was a well-known ideal of alchemical philosophers.

### iii) His great secret

The numerous references to the Philosopher's Stone, indicate clearly that the author of the *Statutes* had arrived at a positive new result which, he felt, should only be made known to certain people who were capable of interpreting and using it correctly.

Whilst it is difficult to pinpoint the exact physical and chemical significance of the Philosopher's Stone, there is no reason to suggest that it was not directly involved with Sendivogius' theory on the "central nitre", to which he referred on so many occasions throughout his works.

### Conclusion

On the basis of the foregoing summary of the *Statutes* and the discussion and analysis of the "Preface" to the *Statutes*, it may be concluded that the whole tenor of the *Statutes of the Unknown Philosophers* is entirely consistent with Sendivogius' other known works, and his life history. Thus there are strong grounds for believing that Michael Sendivogius, alias Cosmopolite, wrote the *Statutes of the*

*Unknown Philosophers* which were published in Paris in 1691.

b) The significance of the *Statutes*

The seventeenth century in Europe marked the beginning of a period which is popularly known as the Scientific Revolution. It was a period of great excitement and great developments in many fields of natural philosophy. These included the new Copernican cosmology, in which the sun was motionless and the earth orbited it, and the teachings of Paracelsus, which had split the medical profession into two opposing camps: the Galenists and the Paracelsians. Aristotle's authority, which had dominated natural philosophy for almost two thousand years, was now being challenged by the new scientific currents.

The result of these developments was that more people were drawn into natural philosophy and in experimental work. During the the seventeenth century, a large number of scientific societies came into existence to stimulate and co-ordinate co-operative endeavour. (20) This rapid expansion of organised science was largely due to the great increase in communication through books, letters and means of transport. These societies fell into two broad categories: secret ones and non-secret ones.

Their general aim was the pursuit of knowledge of natural phenomena, and its use for the benefit of others. The organisation of these societies was part of a trend to conceive and implement utopian ideas for the benefit of mankind. These ideas were motivated largely through religious convictions. An important difference between the secret and non-secret societies was the issue of who was

qualified to know what. Thus in a secret society for example, only people of high moral calibre were considered suitable for advancing man's welfare through science. In the non-secret societies the principal criterion for membership appears to have been a genuine interest in a given field of study. The morality of a "seeker of the truth" was not considered to be a central issue.

It is interesting to consider how very forward-looking these ideas were. The rapid expansion of science was just beginning, and yet its potential impact on the whole of mankind was already being carefully considered.

#### Non-Secret Societies

The first of these was the Accademia dei Lincei in Italy which lasted from 1600 until 1630. It began with three members in 1600 and by 1609 the number had grown to 32. Interestingly, priests were excluded from this society. Another famous society was the Accademia del Cimento, which was based in Florence from 1657 until 1667. Galilei Galileo was one of its founder members. (21)

The history of the Royal Society has been well documented (22). It is a significant fact reflecting on the quality of English science, that the world's most historic and oldest scientific society today was founded in England. The combination of the organisational ideas and enthusiasm of men such as Samuel Hartlib and Jan Amos Komensky, otherwise known as Comenius, both from Eastern Europe, who came to England in about 1640, together with the philosophical ideas of Francis Bacon, and the strong body of scientists at London and Oxford, all resulted in the

formation of the Royal Society in 1661. This is even more remarkable when one considers that England was plagued by civil war between 1640 and 1660.

The formation of the Royal Society in England was followed by the establishment of the Académie des Sciences in Paris in 1666. Although originally very different in style (the Royal Society was composed of amateur scientists and philosophers, whereas the members of the Académie were professional scientists) the Académie nevertheless continues to occupy a foremost position among scientific societies in the world. (23)

### Secret Societies

These societies naturally present a difficult topic for study on account of their very nature. In the present context, a brief discussion of the Rosicrucians, about whom we still know very little, is relevant. At the beginning of the seventeenth century a great stir was caused, initially in Germany, but soon afterwards in the whole of Europe, by a newly formed secret brotherhood - the Rosicrucians. The pursuit of knowledge through a hermetic form of alchemy, and its exploitation for the benefit of the poor and the sick seemed to be their goals.

The history and aims of the Rosicrucians were published in four works of doubtful origin, supposedly written by Christian Rosenkreuz at the end of the fourteenth century, which appeared in Germany at the beginning of the seventeenth century. Their titles were: the *Fama Fraternitatis*, *Confessio Fraternitatis*, *Die Chymische Hochzeit*, and *Allgemeine Reformation der gantzen*

Welt.

Whilst it has been widely accepted in the scholarly world that Christian Rosenkreutz was a legendary figure, and could not therefore have been their author, there exists some controversy concerning the identity of the author of the manifestos. Nel Eurich has suggested that he may have been the protestant theologian Johann Valentin Andreae (1586-1624) (24). J.W.Montgomery has argued however that Andreae was quite opposed to Rosicrucianism as set out in the *Fama* and the *Confessio*, and could not, therefore, have been their author. (25) Dame Frances Yates has suggested that Rosicrucianism was "a movement ultimately stemming from John Dee". (26) This view was contested by R.G.W.Evans: "I have no evidence to suggest that a cult of Dee persisted in Central Europe, and the bold arguments of Dr. Yates must be rated a fragile hypothesis." (27) Furthermore, although Eurich had suggested that Andreae may have written the manifestos, he conceded nevertheless that:

"The four Rosicrucian publications attracted great attention and were considered the foundation of the movement; hence Andreae has been called their founding father, which is certainly erroneous." (28)

In the footnote to this assertion, Eurich comments:

"Maack says the movement started in Germany under the physician and alchemist Michael Maier (1570-1622)."

On the issue of "who the Rosicrucians were (or were not)",

William Huffman writes that:

"there have been mountains of pages written over more than three centuries, most of which, unfortunately, has done little to clear up this matter... I propose that there was no Rosicrucian Brotherhood of any significance as described in the manifestos of 1614 and 1615," (29)

The most recent contribution to the debate on the



origin of the Rosicrucians has been made by Rafał Prinke in his article entitled *Michael Sendivogius and Christian Rosenkreutz The Unexpected Possibilities*, (see *supra* page 56). He has used Bugaj's recently published biographical details of Sendivogius together with further interesting discoveries of his own, to suggest in his closing paragraph:

"that Michael Sendivogius may have been the model of Christian Rosenkreutz and that he was certainly connected with the Rosicrucian furore that swept Europe in the early 17th century..." (30)

The manifesto of the Rosicrucians was published in the *Fama Fraternitatis* in Kassel in 1614. Six main points from it are summarized below:-

Members are enjoined:

- a) to profess no other than to care for the sick, and that free of charge
- b) to wear no special habit but to follow the custom of the country in which they find themselves
- c) to meet once a year
- d) to find a worthy person to succeed them
- e) to use "C.R." as their seal
- f) to maintain the fraternity secret for 100 years.

It can be seen from these rules and from the Sendivogian *Statutes* that there are clear similarities between them: ideas relating to the international character of the Society had been expressed in chapter one of the *Statutes*, and the idea of regular meetings had been outlined in article one of chapters four and five. These, and many other similarities, point to the possibility that Sendivogius may indeed have played an important role in the

early history of the Rosicrucians, as had been implied by the unknown author of the *Bibliotheca Esoterica Catalogue* and by J.J.Manget. Viewed in this light, the present work on the *Statutes*, as well as the recent article by Rafal Prinke, could provide fresh evidence for historical investigation of the Rosicrucians.

### Summary and Conclusion

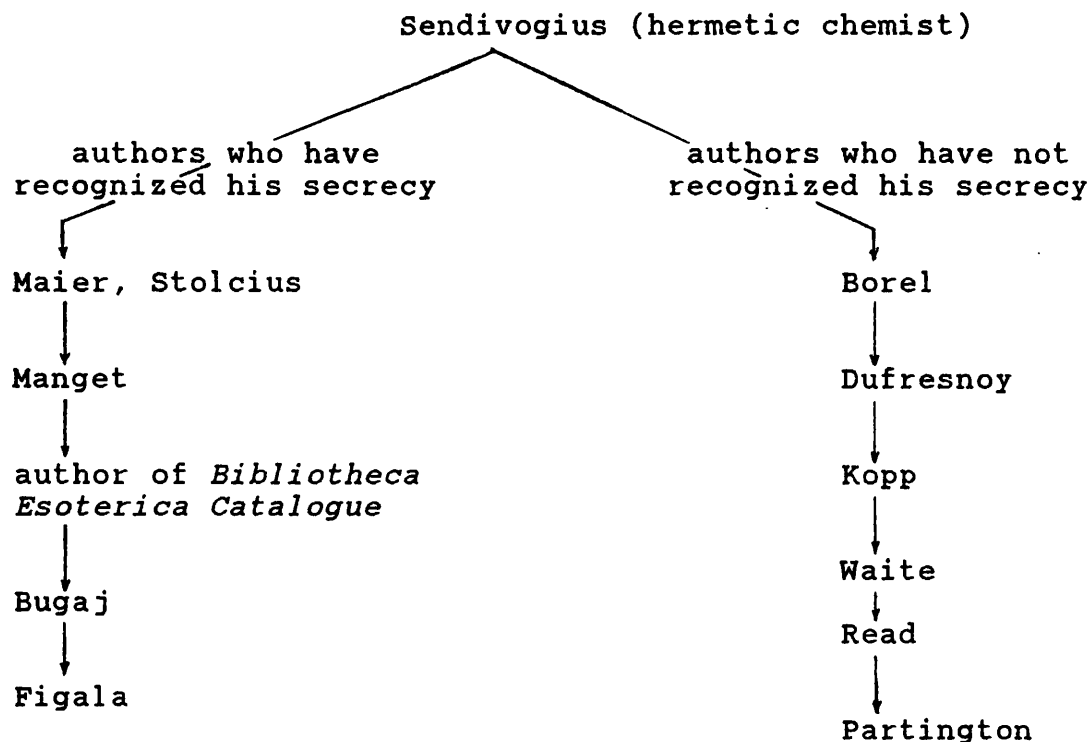
The seventeenth century was a period when apocalyptic ideas played an important role in the development of plans for the organisation of secret societies, such as the Rosicrucians. Such ideas included the conviction that the second coming of Christ was close at hand, and that the last age of preparation for it would be marked by the recovery of the most profound secrets, e.g. the Adamic language which Adam had used in Paradise and the Philosopher's Stone. Such beliefs pervade the Rosicrucian manifestos, and the reforms associated with men such as Andreae in Germany and Comenius in Eastern Europe. Although the current discussion has been prompted by recent investigations of the Sendivogian *Statutes*, it ought to be mentioned that Sendivogius had already expressed a considerable interest in utopian ideas in the Preface to his *Treatise on Sulphur*:

"Now those times are coming, in which many secrets of Nature shall be revealed. Now that fourth Monarchy of the North is about to begin. Now the times are at hand; the Mother of Sciences will come: greater things shall be discovered than hath been done in these three last past Monarchies. Because this Monarchy (as the Ancients have foretold) God will plant by one of his Princes, being enriched with all manner of vertues, whom haply times have already brought forth. For wee have in this Northerne part a most wise Prince, and most warlike, whom none of the Monarchs doth goe beyond in victories, or excell in humanity, and piety. In this Northerne Monarchy God the

maker of all things, will without doubt bring to light greater secrets in Nature, then in those times, when Pagan, and Tyrant Princes reigned. But the Philosophers reckon these Monarchies, not according to the powerfulness of them, but according to the corners of the world: the first was Easterne, the next Southerne; this which they now possesse is Westerne: the last which they expect in this Northerne part is Northerne: but of these further in my booke on Harmony. In this Northern Monarchy, where the attractive pole is (as the *Psalmist* speaks) Mercy and Truth are met together; Peace, and Justice shall kisse each other; Truth shall rise out of the earth, and Justice shall looke from heaven. One sheepfold, and one shepheard. Many Arts without envy: All which I doe earnestly expect. Doe thou also, Courteous Reader, call upon, love, feare God, read over my Writings diligently, and then thou maist foretell to thy selfe good things. And if thou shalt, through the favour of God, and the help of Nature (whom thou must imitate) arrive to the desired haven of this Monarchie; then thou shalt see, and say that all things that I have said to thee, are good, and true." (31)

The present discussion leads us to some further thoughts about Sendivogius and his works. Although he very cleverly succeeded in concealing his identity and his biographical details from certain contemporaries of his, including Borel, there is nevertheless some evidence to suggest that he confided his ideas and his findings to a group of hermetic chemists, who honoured his wish for secrecy. Two of these contemporaries were Count Michael Maier, who knew Sendivogius personally, and Daniel Stolcius. In his *Symbolae aureae mensae duodecim nationum* (Frankfurt, 1617), Maier depicts in the frontispiece twelve of the greatest investigators of Nature including Democritus, Avicenna and Roger Bacon. The only contemporary to have been included among them was "Sarmata Anonymus", who is clearly recognisable as Sendivogius (32). In his *Viridarium Chymicum* (Frankfurt, 1624), Daniel Stolcius also includes Michael Sendivogius as one of the twelve greatest natural philosophers (see *supra* page 122).

We can now present diagrammatically the two different approaches which have been adopted in the interpretation of the Sendivogian works:-



In assessing Sendivogius' writings, the authors listed in the right hand column have all allowed a false image of Sendivogius, based on erroneous biographical accounts, to affect their overall attitude and their final conclusions.

For understandable reasons, there has been hesitation in the past in acknowledging the merits and achievements of "hermetic natural philosophers", or the "hermetic" aspects of those accepted as genuine scientists. Recent extensive studies on the alchemy of Isaac Newton by eminent scholars such as Dobbs and Figala, to quote one celebrated example, have shown that such hesitation, which may be entirely justified, should nevertheless not prevent an assessment of a person's overall contribution to our current body of knowledge. Indeed, such studies should help to establish an

even more accurate picture of attitudes, concepts and ideas of the past.

Michael Sendivogius was a hermetic chemist who succeeded excellently in covering his traces. His *Statutes* discussed here provide a unique link for our understanding of the development of scientific societies, and of Sendivogius himself.

### **The *Treatise on Salt***

The object of the present discussion is to put forward a case for the inclusion of the *Treatise on Salt* in the Sendivogian corpus. By doing so, I shall be reaffirming the decisions of the 1669 and 1691 Parisian editors, who included it in the volume which was entitled *Les Oeuvres du Cosmopolite*.

In quoting fragments of text, I have used the 1650 English language edition: *A New Light of Alchymie* for passages from the *Treatise on Sulphur*, and the 1722 English language edition: *A Philosophical Account of Nature* for passages from the *Treatise on Salt*. I should add that my initial analysis was carried out using the 1691 French edition *Le Cosmopolite*, and I have included parts of my own translation and summaries of this in the Appendix on pages 289-315.

### **Structure of the work**

The *Treatise on Salt* is divided into three sections:

Chapters 1 - 8

Recapitulation

Dialogue of the Vision and the Alchemist

It thus closely resembles both of Sendivogius' other main

works: the *Treatise on Mercury* and the *Treatise on Sulphur*. The format of each of these works is tabulated below for comparison purposes:-

Treatise on	No. of chapters in first section	Title of second section	Persons in the dialogue
<i>Mercury</i>	12	Epilogue, Philosophical Aenigma, Parabola	Nature, The Alchemist Mercury
<i>Sulphur</i>	6	Conclusion	The Alchemist Voice, Saturn, Souls
<i>Salt</i>	8	Recapitulation	The Alchemist The Vision

Table 5. Formats of the Sendivogian Treatises

Each of these treatises is of roughly the same length - about 14,000 words. A feature of the *Treatise on Salt*, which is not common to the other two, is that each chapter is followed by a summary which is presented in the form of a "Discourse translated from verse."

#### References to Authorship

There is no doubt that Sendivogius had planned to write a treatise on salt. He makes four references to such a work in his *Treatise on Sulphur*. The first, and most emphatic, since the title is printed in capitals, is made close to the beginning of the treatise, in the section on the element water. He mentions the role of seeds in Nature, and how they must be fertilized with sperm in order to produce fruit. Then he adds:

"and sometimes there being lack of seed, the sperm enters, but it goeth forth again without fruit: but of this more at large hereafter in the THIRD TREATISE OF PRINCIPLES, viz. IN THAT OF SALT." (33).

The second reference is on page 113. On the subject of

salt, he writes:

"it is that which openeth the gates of Justice; it is that which hath the keyes of the infernall prisons, where sulphur lies bound, as hereafter shall be more fully shewed in the third Treatise of the Principles, of Salt." (34)

A few pages later he refers to the possibilities of multiplication without seeds, but notes that:

"This was never our purpose, to be able to multiply wheat without the seed of wheate, but that the extracted soul bee able in a sophistical way to tinge another Metall, know that it is a thing most false, and that all those who boast of doing it, are cheaters, but of that more fully in the third Principle of Salt, since here is not the place for any further Discourse." (35)

In the conclusion to the work, he summarizes his ideas on sulphur:

"For the house of Gold is Mercury, and the house of Mercury is Water: but Sulphur is that which coagulates Mercury; which Sulphur indeed is most difficultly prepared, but more difficultly found out. For in the Sulphur of the Philosophers this secret consists, which also is contained in the inward rooms of Mercury, of whose preparation, without which it is most unprofitable, wee shall discourse hereafter in the third Principle of Salt, seeing here we treat of the vertue, and originall, not Praxis, of Sulphur." (36)

It is possible that in a passage such as this, the "sulphur of the philosophers" to which the author related, was the Paracelsian principle of combustibility, and that the mercury which was coagulated by sulphur was, in this context, metallic mercury. Bearing such an interpretation in mind, it seems very likely that its author was describing what we would recognise today as the well-known reversible oxidation of mercury at elevated temperatures. When mercury is heated in air, it becomes coated with an orange powder of mercuric oxide. A seventeenth century chemist would almost certainly have interpreted it as a coagulation. On more intense heating however, the oxide is

decomposed into mercury and oxygen. It is very likely that the author of the quoted passage would have observed these phenomena, and thus interpreted them in terms of concepts which were current at that time, such as the "sulphur of the philosophers". As we know, of course, it was a subsequent interpretation of experiments such as this, involving the reversible oxidation of mercury, which prompted Priestley, Scheele and Lavoisier to the formal recognition of oxygen gas at the end of the eighteenth century. We may infer from the passage quoted, that its author was stimulated by chemical phenomena which were related to air and its chemical reactions. This, as I have shown earlier, was an important characteristic of the Sendivogian writings.

On the basis of the foregoing evidence alone, it may seem hardly necessary to prove that a work which was published in certain editions under one of Sendivogius' well-known pseudonyms "Cosmopolite", was indeed by him. This however, is not the case. Two matters arise which require clarification:-

a) the names of two different authors are associated with the same work, which was published independently of any of the other works, earlier than the French editions, and in a different language.

b) fragments from the text suggest clearly that Sendivogius was not its author.

It is these two issues which have confused the great alchemical bibliographers such as Ferguson and Duveen.

a) As I have mentioned earlier on page 46, the



*Treatise on Salt* was first published in 1656 in Amsterdam under the authorship of Harprecht, or Hautnorthon. A year later it was published again, but this time with a different typeface and hence a different layout.

The identity of Harprecht or Hautnorthon has been discussed by Ferguson, mentioned by Duveen, and discussed at length more recently by Joachim Telle. (37) The overall conclusion is that both Harprecht and Hautnorthon were the same person, and that he lived from 1610 until 1680. Hartprecht, and not Harprecht as has been generally accepted, was the real name, Hautnorthon was his pseudonym. Hautnorthon called himself "filius Sendivogii", since he had inherited Sendivogius' ideas directly, and thus considered himself to be an apostle, or "son" of Sendivogius. Similarly, alchemical adepts used to call themselves the "sons" of Hermes.

b) In the opening section of the work, which is entitled: "To the Reader", it is at once made clear that the "writer" and the "author" are two different people:

"Friendly Reader, I INTREAT thee not to be inquisitive after who is the Author of this little Treatise, neither seek to penetrate into the Reason for which he writ it. It is not necessary neither that thou should'st know who I am my self... And because we had a sincere and mutual Kindness for one another, I ask'd him as a Token of his Friendship to explain to me the *three first Principles*, which are the *Mercury*, the *Sulphur*, and the *Salt*. (38)

It can thus be deduced that the writer of this work, one person, has been instructed by its author, another person, and both of them wished to remain anonymous. Additionally, exactly the same opening is used for several German editions of the *Dialogue of Mercury, the Alchemist, and Nature*. This confirms the suggestion that there is a strong

German link involved in the Sendivogian works. It also keeps open the possibility that perhaps a German writer such as Thölde, and not Sendivogius, was the author of these works.

Towards the end of the first chapter there is a direct reference to Sendivogius:

"But if the Reader desires to reap any Benefit and Improvement from this Discourse of mine, and comprehend my Thought, he must first of all read with great Attention the Writings of the other *true Philosophers*, and chiefly those of *Sandivogius*, of whom we have made Mention above..." (39)

Note the use of the words "of whom we have made mention above" with respect to Sendivogius. His name actually appears nowhere else in the text. It is therefore possible that this mention of him could have been as its "unknown author".

The third reference to the identity of the author is given in the second chapter:

"Whoever then has ever had any *Tincture*, either *Philosophical*, or *particular*, has not been able to extract it from this *sole principle*; as says, that great *Philosopher Basil Valentine*, who was a Native of the *Upper Alsace*, and our German Compatriot (who liv'd in my Country about Fifty Years ago) in his book intitl'd, *The triumphal Chariot of Antimony...*" (40)

Basil Valentine has been recognised as the pseudonym of Johannes Thölde (41), whom Sendivogius had met in 1590. Thus from our earlier discussion in this section, we can see that the name of Harprecht, who used the pseudonym Hautnorthon, ideally fits the position of the writer of this work.

#### Contents of the *Treatise on Salt*

The style in which this work is written is more complex than that used in either of the treatises on

mercury and sulphur. Chapter titles such as "Of the Marriage of the Red Servant with the White Woman" give an indication of the more difficult hermetic style which is used throughout. Additionally the "Discourses translated from verse" are difficult to interpret.

Nevertheless, it is still possible to show that many of the ideas expressed in the text are typically Sendivogian, and that they expand on his "central nitre" theory.

The use of a more complex hermetic style is explained by the fact that the writer was Harprecht, and not Sendivogius, and also that Sendivogius would have been in his fifties or sixties when he composed this work. His lifelong obsession with anonymity and secrecy may thus have caused him to adopt an even more hermetic style than in his earlier works.

In the present analysis of the *Treatise on Salt*, I shall focus attention on references to the central salt, nitre, and on its relation to air and its life sustaining properties. The discussion is divided into two sections: the main text, and the dialogue.

#### **The Main Text**

In the first paragraph of chapter one, the author brings to attention the fact that Salt is very important:

"SALT is the *third Principle* of all Things, of which the *antient Philosophers* have not spoken. It has however been explain'd to us, and as it were pointed at with the Finger by *F. Isaac a Hollander, Basil Valentine, and Theoph. Paracelsus:*" (42)

In mentioning salt in this context, the author is showing his awareness of recent important developments, which I

have discussed earlier in chapter four, in the chemical philosophy of his times.

Further on in the same paragraph, the author writes that:

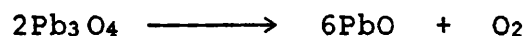
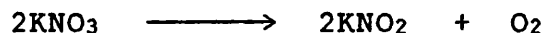
"It is it chiefly which is a third Being, that gives a Beginning to *Minerals*." (43)

As we have seen earlier, Sendivogius believed that all minerals are born from seeds in the ground, and that these seeds can only be produced in certain live metals, which had been formed through the action of the universal salt. In this sense we can appreciate how the salt can give the "beginning" to minerals. In the same sentence, he introduces Saturn for the first time:

"...and which in its Birth has for it's Mother only the *Impression* of *Saturn*, which binds it, and renders it compact, of which the *Body* of all *Metals* is form'd." (44)

It is difficult to pinpoint exactly what the author has in mind, but as we shall see later, further references to Saturn are made.

It is probable that the author had observed that litharge, or red lead, like potassium nitrate, or nitre, decomposes when strongly heated to give off an "aerial" substance which we would identify with gaseous oxygen. These two thermal decompositions can be represented by the following chemical equations:-



He could thus have deduced that there is a relationship between Saturn (lead) and nitre, the central salt. The "mother" and "son" of Saturn, to which several references are made, could thus be identified with substances which

we would now call lead oxide and oxygen respectively.

The second paragraph opens with the statement:

"There are three Sorts of *Salt*." (45)

As I have shown earlier, the idea that there are three kinds of salt had already been suggested by Paracelsus and subsequently by Du Chesne. In his *Proceess on the Central Salt*, Sendivogius too had attached great importance to this idea, and I attempted, in the preceeding chapter, to show how he may have arrived at his conclusions. The three "sorts" of salt discussed in the *Treatise on Salt* however, are not immediately recognised as being the same as the three kinds in the earlier work:

"The first is a *Central Salt*, which the *Spirit* of the World begets without any Discontinuation in the *Center* of the *Elements* by the *Influences* of the *Stars*, and is govern'd by the *Raies* of the *Sun*, and of the *Moon* in our *Philosophical Sea*. The second is a *Spermatic Salt*, which is the *Domicil* or *Seat* of the *Invisible Seed*, and which in a gentle natural Heat, by the Mean of Putrefaction gives of itself the *Form*, and *Vegetable Vertue*,... The *third Salt*, is the last Matter of all Things, which is to be found in them, and which remains in them even after their Destruction." (46)

This is a rather difficult text to interpret. Nevertheless, there are fragments which are very typical of the Sendivogian style: the idea of a "central salt" was unique to Sendivogius, and the text in heavy type is taken verbatim from his *Treatise on the Philosophers' Stone*. These definitions are also particularly interesting, since they all relate to a certain sort of universality - the salts seem to be vital for everything in the universe.

The third paragraph ends with a reminder of the important issues at hand:

"But in this Place we shall say no more on that Head, and shall only treat of *our Salt*, which is the *third Principle*

of *Minerals*, and is moreover the *Beginning of our Philosophical Work.*" (47)

In the final paragraph, the reader is advised to study once again with great care the works of Sendivogius, so that he will be able to understand more fully the contents of the present work.

"For he who knows exactly the *Generation of Metals*, is not ignorant also of their *Melioration* and *Transmutation*: And after he has by that Mean got the Knowledge of our *Fountain of Salt*, he shall here find the remaining Instructions that are necessary for him, to the End, that having address'd himself to the *Almighty* with an *ardent Devotion*, he may through his holy Grace and Blessing, acquire that precious Salt, *white as the very Snow*;" (48)

This passage, with its references to prayer and devotion, is another typical Sendivogian one.

In the "Discourse translated from verse" which follows, the final line reads:

*In the Fountain of the Salt of our Sun and Moon,  
You'll find there the Treasure of the Son of the Sun*

This emphasizes once again, though in a much more concealed way, the importance of the "central salt".

Most of the second chapter, as indeed the rest of the work, is very difficult to understand, on account of the allegorical language which is used. There are characteristic passages however, which are clearly related to air and its life supporting component. It should be noted again that Saturn and the "son of Saturn" are two new terms which are used on several occasions in this text. There is little doubt that by "Saturn" the author is referring to metallic lead. Saturn's "mother" would logically be equated to an oxide of lead, as we have already mentioned. The following passage occurs towards the end of the second chapter:

"yet the best of all the Stones is found in the new Habitation of Saturn, which has never been touch'd; that is to say, of him whose Son presents himself, not without great Mystery, to the Eyes of all the World, Day and Night, and of whom the World makes use when it sees it, and which the Eyes can never attract by any Species, to that Effect that one may see, or at least believe, that *this great Secret* is contain'd in this Son of Saturn, as all the Philosophers assert and even swear it;" (49)

Note the use of the word "new" with reference to the "habitation of Saturn". In saying that this has "never been touched", he is implying that it, i.e. the oxide of lead, as I have suggested, had never before been assigned an important role in the Hermetic philosophy. If the "mother of Saturn" is assumed to be lead oxide, then it would follow that the "son of Saturn" could be oxygen, which is released during the thermal decomposition of litharge. This passage provides further evidence that its author was attaching great importance to a universally occurring invisible spirit, which would probably have been interpreted as air, or a part of air, by contemporary philosophers.

The "Discourse translated from verse", at the end of the chapter, yields further clues:

"It is a Stone, and no Stone,  
In which all the Art consists," (50)

This sentence implies that the important universal spirit can be found either in the form of a stone, or solid, or not in the form of a stone, or solid. The modern chemist would be tempted to identify such a spirit with oxygen, which can occur either as a gas, in air, or in solid compounds such as potassium nitrate or lead oxide,  $Pb_3O_4$ .

The first two paragraphs of chapter five are significant, since they relate to nitre:

"It is not without Reason that the Philosophers call our Salt, the Place of Wisdom: For it is replenish'd with rare Virtues, and divine Wonders: It is from it chiefly that all the Colours of the World may be drawn. It is white like the very Snow in its exteriour; but it contains interiourly a Redness like that of Blood...

As to the invisible Spirit, which resides in our Salt, it is by Reason of the force of its Penetration, like and equal to the Thunderbolt, which strikes vehemently, and which nothing can resist.

From all these parts of the Salt united together, and fix'd in a Being that resists the Fire, there results so powerful a Tincture, that it penetrates all Bodies in the twinkling of the Eye, after the manner of a furious Thunderbolt, and drives away immediately what is an Adversary to Life." (51)

Two points are clear: nitre is important, and it contains an aerial part which is necessary for life.

These are key ideas in Sendivogius' "central nitre" theory.

### The Dialogue

This is about one of the alchemists from the original gathering, as in the *Dialogue of the Alchemist, Mercury and Nature*. According to the introduction, he had read a work by one of the great philosophers and had deduced that a certain virgin "SALT" is the key to the Philosopher's Stone. He realised that common salt (our sodium chloride) is not the relevant one in this case, and that "NITRE" must be the salt in question. But rather than carry out the necessary processes to make the Stone with nitre, he had understood that he could obtain the living water of nitre by digging a hole in virgin clay. Thus in anticipation of his great success as an interpreter of the works of the great philosophers, he made his discoveries common knowledge by writing about them and publicising them. This cost him so much effort and money that he became completely disillusioned with natural philosophy. So he decided to



return to the place where he had conceived his original idea, and to try to dig into the Philosophical Soil.

During this time he fell asleep. While asleep he had a dream, in which a figure called "Vision" addressed him. The essence of the Vision's conversation was that the alchemist had misinterpreted the writings of the great philosophers. According to the Vision, the true Philosopher's Salt was composed of all three principles: salt, sulphur and mercury. It is imprisoned by metals, and it is living. Most metals are dead but the Philosopher's ones are alive. Only these can be useful to philosophers, since they can reproduce.

The alchemist then points out to the Vision that his speech is written in a very complex and obscure style. The Vision agrees with this, and in its final speech it stresses the importance of hard work, diligent study of the works of the great authors, and warns of the dangers of imposters. It then vanishes.

When the alchemist wakes up, he finds that everything is now clear to him, and he summarizes his thoughts in the form of a verse, which is 126 lines long. The first 36 lines of the verse are relatively easy to understand (see Appendix E, pages 312-313), since they refer to a material substance ("it") which can be found everywhere in the world, cures diseases, is combined with metals, and which occurs in a salt. This may seem to fit our modern understanding of the role of oxygen.

Next he writes:

"Now, how must you prepare these two Substances?  
By the Mean of your Salt of Earth,

I dare not write it openly,  
For God will have it conceal'd;  
And one must by no Means give to the Swine  
A Viand made of precious Pearls." (52)

From this point onwards, not surprisingly, the verse becomes incomprehensibly difficult to follow.

### Conclusion

On the basis of the foregoing discussion it is reasonable to suggest that the *Treatise on Salt* may have been conceived and composed by Michael Sendivogius. Since he wished to avoid having it published under his name, he could have passed the contents of the work to Johann Hartprecht who published it under his own name, but spelt "Harprecht", and that of Josaphat Friedrich Hautnorthon. The latter certainly acknowledged the link with Sendivogius by calling himself "filius Sendivogii" - the son of Sendivogius.

The work was subsequently republished by French editors in the Sendivogian volume *Les Oeuvres du Cosmopolite*, and this was translated into English by John Digby and published in London in 1722 with the general heading: *A Philosophical Account of Nature*.

The *Treatise on Salt* is correctly classed as a work of Michael Sendivogius.

### Notes

1. R. Bugaj, *Michał Sędziwój*, 283. The relevant editions are listed under references 62, 63, 68, 70, 73 and 75. References 49 (pg. 282), 65 and 66 (page 283) are incorrect. They relate to Sendivogius' *Lettre Philosophique*, and not to his *55 letters*.
2. R. Bugaj, op.cit., 284. The titles of the three 1604 editions are given as follows:  
"1. *De Lapide Philosophorum Tractatus duodecim, é naturae fonte, et manuali Experientia deprompti. Autor sum, qui DIVI GENUS LESCHI AMO. Anno M.DC.IV.*  
2. *Cosmopolitani Novum Lumen Chymicum é naturae fonte et*

*manuali experientia depromptum et in duodecim tractatus divisum.* Praga Bohemiorum 1604.

3. *Cosmopolitani Novum Lumen Chymicum etc.* Francofurti apud Bitschium 1604."

3. D. Duveen, *Bibliotheca Alchemica et Chemica* (London, 1949), 545. The *Statutes* are mentioned in passing, as one of the works published in the 1691 edition of *Les Oeuvres du Cosmopolite*.
4. P. Borel, *Trésor de Recherches et antiquitez gauloises et françoises* (Paris, 1655), 475-489 and 581-586.  
L. Dufresnoy, *Histoire de la Philosophie Hermétique* (Paris, 1742), 2, 322-369.
5. A. Caillet, *op.cit.*, 3, 516, ref. 10131.
6. M. Sendivogius, *Les Oeuvres du Cosmopolite "Traitez du Cosmopolite Nouvellement découverts."* (Paris, 1691), 44.
7. Appendix G, 322, lines 24-25. The French original reads: "ne seroit-ce pas un crime, que de cacher et tenir renfermé un dépost que nous n'avons reçu du Ciel."
8. *ibid.*, 323, lines 12-13. French original: "des maleurs qui menaçoient nôtre République."
9. *ibid.*, 322, line 23. French original: "car enfin dans des tems aussi miserables que ceux où nous vivons."
10. *ibid.*, 323, lines 16-23. French original: "après une meure délibération, rien ne m'a parû de plus sûr que d'établir entre nous une certaine Societé de Philosophes, dont aucun à la verite ne fût connu en particulier... il ne se trouvât quelqu'un des Associez qui y fût, pour ainsi dire, un sage et liberal dispensateur du precieux trésor de la Science Hermetique."
11. *ibid.*, 324, lines 3-4. French original: "que ma propre experience m'en a appris."
12. *ibid.*, 326, lines 27-29. French original: "la veritable Philosophie ne s'accorde gueres avec une multitude des de personnes, & qu'ainsi il sera toujours plus sûr de se retrancher au petit nombre."
13. *ibid.*, 328, lines 20-22. French original: "la Philosophie demande des personnes libres, et qui soient maîtres d'eux-mêmes."
14. *ibid.*, 327, lines 12-14. French original: "c'est sur tout qu'ils reverent J.C. qu'ils ayment la vertu, & qu'ils ayent l'esprit propre pour la Philosophie."
15. *ibid.*, 330, lines 7-9. French original: "un veritable desir de pénétrer dans les secrets de la Chymie, et une

curiosité qui paroisse venir du fond de l'ame."

16. *ibid.*, 334, lines 1-3. French original: "si la chose ne se peut faire en ce tems, qu'on la differe en un autre, selon qu'en ordonnera celui qui reçoit."
17. *ibid.*, 334, lines 25-27. French original: "le nom de la *Magnésie*, c'est-à-dire de la vraie & unique matiere, de laquelle se fait la Pierre des Philosophes."
18. *ibid.*, 337, lines 1-2. French original: "soit a mettre luy-même la main à la pratique, sans laquelle toute le speculation est incertaine."
19. *ibid.*, 338, lines 14-15. French original: "parce que c'est chose mauvaise, et que nous defendons principalement à nos Associez."
20. M. Ornstein, *The rôle of Scientific Societies in the Seventeenth Century* (Chicago, 1938), 68.
21. M. Ornstein, *op.cit.*, pp. 73-77.
22. see for example: P. Rattansi, "The Intellectual origins of the Royal Society", *Notes and Records of the Royal Society of London* 23, no.2 (Dec.1968), pp.129-143.
23. M. Ornstein, *op.cit.*, 92.
24. N. Eurich, *Science in Eutopia. A Mighty Design* (Harvard University Press, 1967), 121.
25. J.W. Montgomery, *Cross and Crucible: J.V.Andreae (1586-1624)* (The Hague, 1973), 2 vols. See the discussion in vol. 1, pp. 160-255.
26. F. Yates, *The Rosicrucian Enlightenment* (Routledge, Kegan & Paul, 1972), 39.
27. R.G.W. Evans, *The Making of the Habsburg Monarchy* (Clarendon Press, Oxford, 1979), 355 note 23.
28. N. Eurich, *op.cit.*, 126-127.
29. W. Huffman, *Robert Fludd and the end of the Renaissance* (Routledge, London & New York, 1988), 135-136.
30. R. Prinke, *op.cit.*, 95.
31. M. Sendivogius, *A New Light of Alchymie* (London, 1650), 79-80. Two points are of additional interest in this passage: Sendivogius' reference to his *Harmony*, and the identity of the "most wise prince". Bugaj suggests that this was prince Władysław (Ladislaus) IV Vasa, who had great political ambitions. See note 7 on page 237 of his *Traktat*.
32. The word "Sarmata" means a Sarmatian, or "noble

Pole". This expression was common in seventeenth century Poland. The following definition of "Sarmatia" appears in a current edition of the *Oxford Illustrated Dictionary*: "Ancient name of a region N. of the Black Sea inhabited by ancestors of the Slavs, used occasionally by English poets to signify Poland.

33. M. Sendivogius, *A New Light of Alchymie* (London, 1650), 86, lines 2-6.
34. *ibid.*, 113, lines 20-24.
35. *ibid.*, 125, lines 6-13.
36. *ibid.*, 144, lines 23-33.
37. J. Telle, "Zum 'Filius Sendivogii' Johann Hartprecht" *Die Alchemie in der europäischen Kultur - und Wissenschafts - geschichte, Wolfenbütteler Forschungen Band 32* (Wiesbaden, 1986), 119-136.
38. M. Sendivogius, *Cosmopolite, A Philosophical Account of Nature in General*, Translated from the French by John Digby Esq. (London, 1722), 261.
39. *ibid.*, 266, lines 4-10.
40. *ibid.*, 271, lines 12-18.
41. J. Partington, *A Short History of Chemistry* (London, 1965), 55.
42. M. Sendivogius, *Cosmopolite, A Philosophical Account of Nature in General*, translated from the French by John Digby Esq. (London, 1722), 263, lines 1-6.
43. *ibid.*, 264, lines 8-9.
44. *ibid.*, 264, lines 11-14.
45. *ibid.*, 264, line 15.
46. *ibid.*, 264, lines 15-26; 265, lines 5-8.
47. *ibid.*, 265, lines 25-26; 266, lines 1-3.
48. *ibid.*, 266, lines 13-22.
49. *ibid.*, 276, lines 2-16.
50. *ibid.*, 277, lines 21-22.
51. *ibid.*, 290-291.
52. *ibid.*, 343, lines 23-27; 344 lines 1-2.

## Chapter Seven

### John Mayow's medico-physical works - a discussion of his nitro-aerial theory, with particular reference to Michael Sendivogius' ideas

#### Introduction

For a natural philosopher whose work has caused so much controversy in the history of science, John Mayow was relatively young at the time of his death - he died in 1679 at the age of 38. The work in question, his *Tractatus Quinque Medico-Physici*, has been variously described as either a plagiarization and clever summary of other people's work, or as a brilliant theory which anticipated the discovery of oxygen by some two hundred years.

Indeed, since the time of his death, it was only in 1908, when Gotch published his celebrated paper *Two Oxford Physiologists RICHARD LOWER 1631-1691 JOHN MAYOW 1643-1679*, that John Mayow's name appeared alongside those considered to be the best chemists and natural philosophers of his time. This has been attributed to various causes, two important ones being:

a) the development of somewhat different, but nevertheless dominant, ideas of Mayow's contemporary, Robert Boyle, who lived much longer.

b) the emergence of the phlogiston theory of combustion, which rapidly gained popularity throughout Europe.

Gotch's exposition, in which he referred to Mayow's achievements in the highest terms, led to a controversy which continues to this day. It is not my present purpose

to enter into the debate on the significance of Mayow's achievements. The object of the chapter is twofold: to analyse and explain carefully how Mayow derived his theory of nitro-aerial particles, and to ascertain as far as possible the extent to which his ideas were similar to those of Sendivogius. On the basis of the comparison of these two authors' works, it may be possible to arrive at a fairer assessment of Sendivogius' role in the development of this field of chemical inquiry.

#### The Medico-Physical works of John Mayow

There are five of these and they were contained in one volume. The original edition was published in Latin in 1674, but for the present purpose the 1907 English edition (1) is referred to, with occasional references to the Latin original. The titles of the treatises are:

First Treatise : On Sal Nitrum and Nitro-Aerial Spirit

Second Treatise: On Respiration

Third Treatise : On the Respiration of the Foetus in the  
Uterus and in the Egg

Fourth Treatise: On Muscular Motion

Fifth Treatise : On Rickets

It can be seen from these titles that the first treatise is the one which is most relevant to the current discussion. I have chosen the first four chapters (out of a total of fifteen) of this treatise for the present study. This is because these chapters form a short topic in themselves: the natural history of nitre and its composition, and chemical concepts which Mayow derived from his knowledge of nitre's chemistry. Where relevant, I have

drawn on Sendivogius' theory to illustrate possible links in concepts and ideas.

The discussion of Mayow's *Tractatus Quinque* is a relatively simple task, since his chemical language is much easier to interpret for us than that of Sendivogius, on account of its much more open style, its far more logical presentation, and its relatively unobscure nomenclature. The relative ease of interpretation is not merely due to the different linguistic competences of the two authors, but reflects the differences between the aims and methods of alchemy on the one hand, and of early-modern chemistry on the other. Although the theme common to both authors is the composition of nitre, it must be remembered that seventy years separated the publication of their works. During that time, the legacy of Sendivogius' ideas had undergone many adaptations and varying interpretations. More importantly, Sendivogius' discussion of nitre was part of a treatise on alchemy, concerned above all with the secret of the Philosopher's Stone, which was supposed to be accessible not merely through manual experiment (...e Naturae Fonte et manuali experientia depromptu), but for which divine grace was indispensable. Mayow's treatise, on the other hand, formed part of his *Tractatus Quinque Medico-Physici*, which was firmly deprived of quasi-religious overtones. The chemical phenomena which Mayow discusses were interpreted in post-Cartesian terms as inanimate and corporeal, consisting of certain sorts of particles. Thus the different styles of the two authors reflect their different conceptual frameworks. Any



comparison of their writings must therefore consider the different circumstances and contexts of these two works.

My analysis of each chapter will be conducted as follows:

1. Synopsis: a brief summary of the essential points
2. Analysis: a detailed discussion of some of them
3. Conclusion: the principal issues summarized and placed in a historical perspective.

#### Chapter One - On Sal Nitrum

##### Synopsis

Nitre, or potassium nitrate, is discussed with reference to:

- (a) its composition - analysis
- (b) its composition - synthesis
- (c) its production in the earth: partly from earth and partly from air.
- (d) the role of seeds in the earth for the production of nitre.

##### Analysis

In the first paragraph, Mayow states that his object is to show that "...air..., is impregnated with a universal salt of a nitro-saline nature." (2) This statement in itself would not have been unfamiliar to many readers, (3) but Mayow believed that he had a new interpretation to offer, which required a lengthy explanation. Thus he continues: "I think that we should begin with a history of nitre." (4).

This short opening paragraph is of considerable significance, since it makes two points which are

also characteristically Sendivogian. These are:

1. the idea of a universal salt - nitre
2. the idea that there is a component of air which is related to this salt.

Mayow points out that numerous works have already been written on nitre, but suggests that they are of uneven quality. "Yet, meanwhile, the truth seems to be quite obscured by the multitude of writers, and even now nitre lies hid in darkness." (5) He therefore proposes to discuss the composition of nitre and its natural history: "Let us examine briefly, according to our custom, of what elements nitre is composed, and, indeed, from what family it originates." (6) He then goes on to say that: "*sal nitrum* seems to be composed of an extremely fiery acid salt, and, in addition, of an alkali or of purely saline volatile salt, taking the place of the *sal alkali*." (7) Taken literally, the composition of nitre therefore is either given as:-

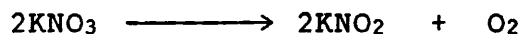
nitre = extremely fiery acid salt + alkali

or nitre = extremely fiery acid salt + purely saline  
volatile salt

If we take the "extremely fiery acid salt" as nitric acid and the alkali as potassium carbonate, then the first alternative, as we shall shortly see, makes good chemical sense in present-day terms. The second alternative however, is difficult to interpret, since the "purely volatile salt" would have to be a compound of potassium. There is no compound of potassium which can be described as "volatile". The lack of certainty in this statement is shown by the use of the word "seems", which suggests that he was by no means

convinced of its accuracy. There may be numerous reasons for the hesitation Mayow expressed in putting forward this conclusion. It seems worth investigating how far that is due to the fact that it was not original with Mayow, but was borrowed from Sendivogius. And indeed, a careful study of Sendivogius' works appears to support that possibility. As mentioned earlier on page 117, Sendivogius himself expressed an opinion on the composition of nitre, which presents some difficulty of interpretation. The difficulty arises principally from Sendivogius' inclusion of the volatile salt (sal volatil, our ammonium chloride) as one of the components of nitre. Furthermore, in the Sendivogian text, the relevant fragment appears in the middle of a work which touches on many different topics, while in Mayow's work the same idea forms the opening gambit for a chapter which is exclusively devoted to nitre.

In subsequent paragraphs, Mayow demonstrates the validity of his suggestions by both analysis and synthesis of nitre. He begins by noting that: "If nitre is analysed by distillation, acid spirit will pass into the receiver, while fixed nitre closely resembling sal alkali, will be left in the retort." (8) We now know that the thermal decomposition of potassium nitrate is temperature dependent. At 336°C it decomposes in accordance with the equation:



The gaseous product is oxygen which, as we know, is a colourless gas. The solid residue is potassium nitrite which is soluble in water and hydrolyses slightly in it to

give an alkaline solution. Potassium nitrite is generally considered to be stable to temperatures of up to about 600°C. It is not commonly known however, that at temperatures above 600°C, potassium nitrite decomposes in accordance with the following overall equation:-



The gaseous products in this case are the oxides of nitrogen which appear as a brown, dense, strongly acidic gas. This further decomposition of potassium nitrate has only been mentioned in passing by Partington (9), and not at all by other historians of chemistry. It has been studied in detail by Leschewski and Degenhard (10), and a knowledge of this complete decomposition of potassium nitrate is vital for interpreting both Mayow's and Sendivogius' writings. Under the conditions of their experiments, which would not have been subject to accurate temperature control, they would have obtained either oxygen, or brown nitrogen dioxide, or a mixture of both of these gases, from the thermal decomposition of potassium nitrate. The actual composition of the gaseous products would depend on the temperature and the duration of the heating. Thus Mayow made the assertion that an "acid spirit" is produced during the dry distillation of nitre. The solid residue, potassium oxide, is strongly alkaline and stable to heat, and in these respects it resembles the "sal alkali", or potassium carbonate.

There next follows a proof that fixed salt (sal alkali) is a constituent of nitre. Mayow observes that "if nitre and tartar, mixed in equal quantities, are kindled by

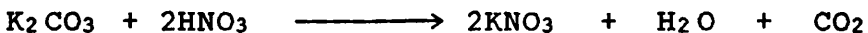
ignited iron or charcoal, fixed salt equal in amount to the whole of the tartar will be found after the deflagration."

(11) He notes that when tartar is calcined on its own, "it consists to a large extent of spirit and a fetid oil which pass off". (12) The presence of nitre however causes sal alkali to be formed. Mayow then reasons that if, on heating, nitre and tartar react to give the sal alkali and, presumably, an acid spirit, then it follows that the sal alkali must be a constituent of nitre. The argument can be illustrated by means of a word equation:



Thus if sal alkali can be made from nitre and tartar, then Mayow presumes that by similar reasoning sal alkali must be a constituent of nitre. Seen in this light, his arguments make good sense to us. The observations described here are known to be correct. Indeed, potassium carbonate continued to be, until recently, manufactured by the calcination of potassium tartrate.

Having shown by analysis that sal alkali is a component of nitre, Mayow then proves the same fact by referring to the synthesis of nitre: "For if the acid spirit of nitre is poured upon any alkali, or, in place of the alkali, upon purely saline volatile salt, from the mutual strife of these two things coming together and the intense action, sal nitrum is generated..." (13) Nitric acid, which is here referred to as the acid spirit of nitre, reacts vigorously with potassium carbonate to yield potassium nitrate, or nitre, and carbon dioxide gas in accordance with the following equation:



The reaction with saline volatile salt, or ammonium chloride, which is presented here as an alternative to sal alkali, does not produce nitre under any conditions. Only if the saline volatile salt were mixed with a potassium compound such as potassium chloride could the formation of nitre be envisaged. This assertion by Mayow is, therefore, certainly puzzling.

He continues: "So that nitre would seem to be born fit for fights and hostile encounters, since it derives its origin from the conflict of opposing elements and from enmity itself" (14). This "conflict of opposing elements" refers effectively to various vigorous reactions in which spirits of nitre is either neutralised or reduced by various reagents. Mayow's lively description of these reactions was thus both accurate and in keeping with the style of his times.

Through both analysis and synthesis, Mayow has shown that nitre is composed of three salts:

the fiery acid salt (nitric acid)

and the alkaline salt (potassium carbonate)

or the saline volatile salt (ammonium chloride)

Once again, it is possible to discern a strong similarity between this idea, and those of Sendivogius which have been described earlier. At this stage there is no mention of a universal life-supporting spirit in Mayow's work, but this is to appear shortly - Mayow is at this stage preparing the groundwork for his own contribution.

In the next four paragraphs Mayow describes the origin

of nitre in the earth. The opening statement of this section is: "the generally received opinion is that the earth as its proper matrix draws *sal nitrum* from the air in virtue of its own attractive force" (15). He then goes on to demonstrate how important air is for the formation of nitre. It is of interest to note that this idea of the earth drawing air towards itself was, according to Mayow, already a well established fact by the middle of the seventeenth century. Although this "generally received opinion" had already been mentioned in Sendivogius' *Treatise on the Philosophers' Stone*, as I have shown earlier, the idea of the earth drawing air towards itself, and the notion of seeds of fixed salts hidden in every fertile soil, were commonplaces of seventeenth century chemical theory. (16) Nevertheless, Figala has recently pointed out that the idea of a magnet or *chalybs* drawing down the mercury out of the air to the earth was gained by Newton himself from his reading of Sendivogius. (17)

Having stated that nitre requires air for its formation, Mayow then deduces that there must be present in nitre two components:- "a more volatile and subtle part" which originates from the air and "...a fixed salt which is not volatilised by the very fiercest fire" (18), which is derived from the earth. From the point of view of modern chemistry this volatile part could be either oxygen or nitrogen dioxide, whereas the fixed salt must be either potassium carbonate or potassium oxide. Mayow goes to considerable trouble to explain how the one substance nitre can be composed of two separate substances, a gaseous one

and a solid one. This was clearly an idea which was then difficult to accept. Hence Mayow gives the following example to illustrate his line of reasoning: nitre is known to be a component of gunpowder. When an ordinary flame burns in air however, it does not continuously explode, but burns quietly. Thus, Mayow argues, "...the aerial nitre, whatever it be,... becomes food for the fire..." (19), but only when combined with "its more fixed part from earth..." does it cause combustion to occur explosively.

The idea that nitre is made up of a gaseous component from air and a "fixed" component from the soil formed another key issue in the Sendivogian system. And indeed, it was Sendivogius who used the word "food" with reference to a part of air.

It is in the third paragraph from the end that we find Mayow's reason for including the volatile salt as one of the components of nitre, for he writes: "...from earth impregnated with fixed or volatile salt, as from stables and also from soil containing quicklime or ashes, sal nitrum is lixivated in greater abundance than from any other soil, because these salts, united in course of time with nitro-aerial spirit in a way to be explained below, are converted into nitre." (20) In this, he is closely following a line of reasoning analogous to that of Sendivogius. In addition, Mayow is aware of the fact that someone may rightly object that nitre can be formed in soils containing none of the above salts. This he attributes to the role of universal seeds: "For as metallic seeds here and there dispersed through the mass of



the earth are in the course of time converted into perfect metals, it is in like manner probable that seeds of fixed salts lie deep hidden in every fertile soil as in a suitable matrix, and that they by long digestion and the influx of air are changed into fixed salts." (21) Two points in it are of interest:

1. Although Mayow accepted the view that metals grow from seeds in the earth - this idea was by no means original to Sendivogius (as already mentioned) he was by no means convinced that this was true of the origin of salts. Hence his use of the word "probable" in describing the origin of (our) inorganic salts.

2. We now know that nitrates are formed in farmyard soils through the gradual oxidation of ammoniacal deposits of organic origin. Indeed, crystals of nitre can literally be seen to grow on such soils by the process of crystallisation. If one considers organic waste products as the "seeds" of nitre, then Mayow's panvitalistic interpretation is remarkably similar to the modern chemical explanation.

#### Conclusion

Mayow conjectured that nitre is composed of three salts, of which one is an aerial salt and the other two are fixed. He illustrated his arguments with carefully chosen and accurately described examples. Being aware of the immense conceptual difficulties that his ideas would pose for his contemporaries, he gave particular attention to the idea of a solid combining with a gas to form another solid. Mayow ultimately, albeit somewhat hesitatingly, ascribed

the formation of nitre to seeds in the ground.

Regarding the chemical aspects of the work he is characteristically modest, and only makes firm assertions when experience and logic have led him to an unquestionable result. Where there is any doubt at all as to the correctness of any statement, Mayow candidly admits that he is only providing a "best solution". Nevertheless, based on his own experience and in accordance with ideas which were accepted during his own lifetime, he has formed a chemical explanation for the composition and natural formation of nitre, or our potassium nitrate. His ideas, which are zealously and logically presented, could be interpreted as a clever and direct extension of the Sendivogian "Central Salt" theory.

Chapter Two - On the Aerial and Igneous part of the spirit of nitre.

It is shown that the Spirit of Nitre is a compound body, and that it is derived partly from the air and partly from terrestrial matter.

#### Synopsis

Mayow was aware that the acid spirit of nitre is the volatile constituent of nitre. Today we would refer to this spirit as nitrogen dioxide which is a brown, dense and strongly acidic gas. At the same time he reasoned that this acid spirit was not actually present in the air, since it was brown and dense, and did not support combustion. He therefore proposed to explain its chemical characteristics in terms of a nitro-aerial salt, a nitrous spirit, and nitro-aerial particles. He also explained the relationship

between these particles and the chemical properties of nitric acid.

The effect of these particles on combustion processes is described in detail with reference to experiments by both Boyle and himself. These experiments serve to illustrate the validity of Mayow's deductions.

#### Analysis

The first and foremost point of interest concerning the details of this chapter is Mayow's use of particles in explaining chemical phenomena. During the middle of the seventeenth century the use of a particulate model to illustrate chemical ideas was a characteristic feature of the new and increasingly popular mechanistic approach to the study of matter. It constituted a significant step in the development of scientific ideas, and Mayow used it with considerable success, as will be shown in the paragraphs which follow.

The composition of the nitrous spirit puzzled him. This is not surprising, since we now know that there are two clearly different gaseous substances associated with the chemistry of nitre. One of these is the brown, dense gas, nitrogen dioxide - the nitrous spirit, and the other is oxygen - the invisible life and fire supporting spirit. It was clearly important to find out how a spirit (i.e. a mixture of varying proportions of oxygen and nitrogen dioxide) with such differing properties could be present in nitre.

We should also remind ourselves that Mayow would have been familiar with the substance which we call nitrogen

dioxide from the decomposition of nitre at elevated temperatures, and he recognised it quite clearly since it is easily visible. Oxygen however, being an invisible gas, would have been much more difficult to recognise as a product of the thermal decomposition of nitre. It would seem, from a modern point of view, that Mayow was familiar with the properties of the substance which we now know as oxygen more as a component of nitre, rather than a gaseous product of its thermal decomposition. Bearing in mind the dense colour of nitrogen dioxide, it is not surprising to find the following statement: "I was for some time in doubt whether nitrous spirit in the state of finest subdivision did not reside in the air..." (22) Since Mayow knew for a fact that nitre is formed in soil which is impregnated with air - this had been one of Sendivogius' important assertions - he reasoned that the nitrous spirit which nitre produces under certain conditions could only have come from the air in the first place. That is why he thought it might be present in air in, a state of finest subdivision.

There are two possible ways of interpreting this statement. It could either mean that the gas is so dilute as to be unnoticeable in air, or that it is, in effect, composed of two different elementary substances. To support the first suggestion, Mayow observed that many other substances, such as salts and vitriols, would become gradually acidic on exposure to air, after they had been calcined: "It is also to be noticed that all salts whatever, fixed and volatile, as also vitriols, if calcined

to the complete expulsion of the acid spirits, acquire when exposed for some time to air a certain acidity..." (23) In the particular case in question, we can take green vitriol, iron (II) sulphate, as an example. When heated strongly in air, it decomposes partially in accordance with the following equation:



On standing in air over a period of time, the equilibrium mixture of  $\text{Fe}_2\text{O}_3$  and anhydrous  $\text{FeSO}_4$  will absorb moisture, and acquire acidic properties. ( $\text{FeSO}_4$  is both oxidized and hydrolysed to give an acidic solid on standing in a moist atmosphere). In this particular case, the development of acidity is caused by moisture, or water, and not by oxygen which is also present in air. Mayow suspected that the explanation was not a simple one, hence he concluded: "So that *apparently* a certain acid and nitrous spirit reside in the air." (24) Time has shown that his suspicions were well founded.

Probably as a result of these doubts, he came to the conclusion that the nitrous spirit per se, no matter how dilute, could not exist in air. He continues: "Besides, the nitro-aerial salt, whatever it may be, becomes food for fires, and also passes into the blood of animals by respiration, as will be shown below. But the acid spirit of nitre, being humid and extremely corrosive, is fitted rather for extinguishing flame and the life of animals, than for sustaining them." (25) By clever reasoning Mayow then arrives at the conclusion that the nitrous spirit must be made up of two different substances: "...since some part

of the nitre is derived from the air, as has been shown above, while the fixed salt, of which nitre in part consists, proceeds from the earth, the remainder of the nitre, that is to say, its acid and fiery spirit, must be derived, in part at least, from the air." (26)

By suggesting that a part of the nitrous spirit is derived from air, he is effectively stating that it is composed of two different substances. In subsequent paragraphs, Mayow deduces that this indeed, is the case. He makes two points:

(i) a part of the air is necessary for combustion

(ii) this part is present in solid nitre.

Mayow first accepts the results of Boyle's experiments on combustion, which established that a part of air is necessary for combustion. "First, it is, I think, to be admitted that something aerial, whatever it may be, is necessary for the production of any flame - a fact which the experiments of Boyle have placed beyond doubt..." (27) He called this part of the air which was required for flame its 'aerial food'. Exactly the same expression was used by Sendivogius. Mayow then adopted a particulate model to clarify his explanations: "... so there can be no doubt whatever that certain aerial particles are quite indispensable to the production of fire,..." (28) He was quite clear in his own mind that these particles only constituted a certain proportion of the air, and not the whole of it: "But it is not to be supposed that the air itself, but only that its more active and subtle part is the igneo-aerial food,". (29) This assertion is backed by

experimental evidence: "...since a lamp enclosed in a glass goes out when there is still an ample enough supply of air in it,...". (30) He explains that these particles move around rapidly and have a shape, which they impart to the flame, and then concludes: "Further, it is impossible that these igneo-aerial particles are any perfect nitre, as is generally supposed - for it was already pointed out that not the very nitre as a whole, but only a certain part of it, resides in the air...". (31) Through experimental evidence which was assembled to test the hypothesis that a part of nitre is present in air and is necessary for combustion, Mayow thus arrived at a similar conclusion to one which Sendivogius had advanced some seventy years earlier. As we have mentioned already however, there was one significant difference: whereas Sendivogius had purposely concealed his findings in a complex text, Mayow had made both the aim and the explanation of his text perfectly clear. The contrast of approaches to the same problem by two men over a span of seventy years indicates the tremendous speed at which the attitude to and the investigation of chemical phenomena was changing at this time. Nevertheless, the fact remains that it is possible to detect a clear similarity between both Sendivogius' and Mayow's conclusions. These conclusions are in agreement with our present knowledge of chemistry, since oxygen which constitutes part of the air and is necessary for combustion, is present in a combined form in solid potassium nitrate.

Mayow follows these conclusions by proving

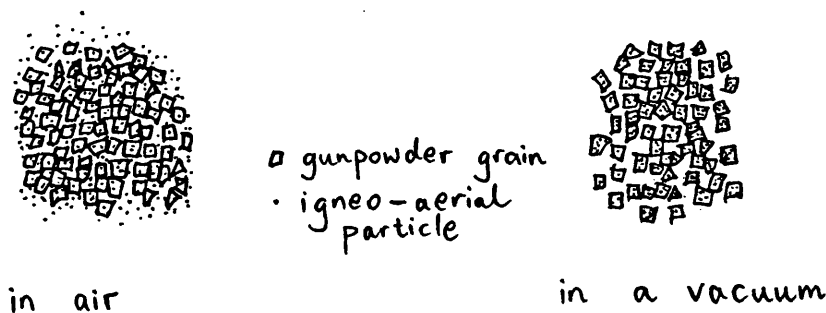
additionally that solid nitre on its own, and in the absence of air, can provide a sufficient concentration of these igneo-aerial particles in order to promote combustion. He does this by referring to a cleverly devised series of experiments involving the combustion of sulphur and nitre, and gunpowder, under water i.e. in the absence of air.

Two substantial paragraphs follow, in which Mayow seeks to disprove Thomas Willis' (32) idea that there is sulphur in nitre. He achieves this effectively in the following manner: "For neither in rectified spirit of nitre nor in pure *sal alkali* is any combustible sulphur to be found; and yet, from the combination of these two, nitre will be produced. But, because nitre produced in this manner will deflagrate, we cannot believe that this results from sulphureous particles, for it contains none..." (33) He carries on, labouring the point a little: "To kindle any sulphureous matter, igneo-aerial particles must be supplied, either from the air or from nitre previously added." (34) Throughout the argument Mayow uses the particulate model to explain and clarify his reasoning. Judging by the pains Mayow took to disprove the assertion, it was clearly a well established idea that nitre contained sulphur. The origin of this can be traced readily to the Paracelsian cosmology, which I have discussed earlier, and in which sulphur was considered to be the combustible principle. Since nitre was known to encourage combustion, it was therefore thought to contain sulphur.

In the paragraphs which follow Mayow makes use of the



particulate model to explain a result in one of Boyle's recently published experiments, which appeared to suggest that air must be present for the combustion of gunpowder. The inference from this would be that nitre on its own does not contain anything which supports combustion, thus conflicting with Mayow's earlier assertions. Boyle had shown that when gunpowder in a vacuum is ignited by means of a burning glass, the gunpowder only burns where the sun's rays reach it. Mayow suggests the following explanation, which is consistent with his theory: in each grain of gunpowder there is a sufficiently high concentration of igneo-aerial particles to enable the 'sulphureous' part of the gunpowder to burn in that grain. When air is present, its igneo-aerial particles enable the flame to spread from grain to grain, on account of the air's elasticity. In a vacuum however, there are no igneo-aerial particles and hence the flame cannot be transmitted from grain to grain. His arguments can be illustrated by means of a diagram:



As a result of this proof, Mayow was able to state again that: "...nitre contains in itself the igneo-aerial particles required for the production of flame..." (35),

and then most emphatically "*that the aerial part of nitre is nothing else than its igneo-aerial particles*". (36) He had earlier stated however that the aerial part of nitre is its acid spirit, so it follows logically that: "*the igneo-aerial particles of nitre, which are identical with its aerial part, are hidden in the spirit of nitre, and constitute its aerial part.*" (37) He then continues: "Indeed, it is probable that the spirit of nitre is a compound, and that some of its particles are flexile, humid, and of a grosser nature, being apparently derived from terrestrial matter..." (38) By using the word 'probable', Mayow is indicating that he is not quite sure about his explanation. This lack of certainty is borne out further in the paragraph which follows, which is difficult to interpret. Nevertheless, he then argues that, since the igneo-aerial particles which are necessary for flames, are also present in the nitrous spirit, he believes that they ought to be renamed nitro-aerial particles: "With regard then to the aerial part of nitrous spirit, we maintain that it is nothing else than the igneo-aerial particles which are quite necessary for the production of any flame. Wherefore, let me henceforth call the fiery particles, which also occur in air, nitro-aerial particles or nitro-aerial spirit." (39) From this point onwards, Mayow almost always refers to nitro-aerial particles, and on a few occasions only, which thus give rise to some confusion, to igneo-aerial particles.

In the remaining three paragraphs, he compares the colour and corrosive nature of the spirit of nitre to the

colour and destructive nature of fire: his arguments and explanations are once again consistent and logical. He then explains why the acid spirit of nitre i.e. nitric acid, does not burn and indeed, puts out a fire, although it is composed of 'fiery' and igneo-aerial particles. This, he says, is because "...the igneo-aerial particles existing in the spirit of nitre are in a humid condition... And, indeed, humidity is a very great hindrance to fire..." (40) He notes however, that when the igneo-aerial particles are present in nitre, they do support combustion. The answer to this is relatively simple - since no water is present in solid nitre, "its igneo-aerial particles exist now in a dry condition, there is no obstacle to their commencing a fiery motion." (41)

#### Conclusion

In the chapter being reviewed, John Mayow has put forward a clear case for the fact that nitre contains in itself a component which is present in air. Inasmuch as he concludes that there is an aerial component of nitre, his inference is very similar to that of Sendivogius.

In the latter part of the chapter however, and using certain aspects of the chemistry of (our) nitric acid, Mayow renames the igneo-aerial particles, and calls them nitro-aerial particles.

#### Chapter 3 On the Nature of Nitro-aerial and igneous spirit Synopsis

The chapter is divided roughly into two halves. In the first half, Mayow gives an explanation for the formation of flame. He suggests it is caused by nitro-aerial particles

which move rapidly. He then goes on to prove, by means of both the particulate model, and experiments, that sulphureous particles which had been generally considered as necessary for fire are, in fact, not necessary at all.

In the second half of the chapter Mayow uses certain aspects of the chemistry of antimony, to give further evidence that nitro-aerial, and not sulphureous particles, are necessary for combustion.

#### Analysis

After an opening paragraph in which Mayow summarizes the acidic characteristics of the nitro-aerial spirit, there follows a short discussion of which the object is to compare the relative effects of nitro-aerial spirit and fire, on salts, and to show that these effects are similar. This is because, according to Mayow, both fire and the nitro-aerial spirit owe their properties to the same types of particle - the nitro-aerial one. He notes that when the igneous salt (referring to his acid spirit of nitre in this case) is added to salts, it "...rather intensifies their power..." (42), and that when fixed salts are heated in a fire, they "...become more acrid and caustic in their nature" (43). This effect of fire is obviously not going to be the same as the effect with the acid, since fire contains the nitro-aerial particles themselves, whereas in the spirit of nitre they are combined with water.

fire = nitro-aerial particles moving rapidly

nitric acid = acid spirit of nitre = nitro-aerial particles  
combined with water

His concluding statement to this section is a promise that he will shortly show that acids and fixed salts have more

in common, than is immediately apparent.

In the paragraph which follows, Mayow considers the role of nitro-aerial particles in flames. He starts by reasserting that nitro-aerial spirit is the aerial part of nitre. He then states most emphatically that: "...my opinion is that the form of flame is chiefly due to the nitro-aerial spirit set in motion." (44) At this stage we can see that he is now using his new name for the igneo-aerial particles, for he had earlier, on page 13 of his book, stated that "the aerial part of nitre is nothing else than its igneo-aerial particles."

Returning to the text, Mayow next states: "For I do not think we ought to agree with recent philosophers, who believe that fire can be produced by the subtle particles of any kind of matter if they are thrown into violent agitation." (45) He was referring here to the influence of the Cartesian philosophy, in which all phenomena of the universe were explained in terms of the motion of particles. He decided that he would take an 'intermediate' path on this issue, and thus suggested that: "fire can only be produced by particles of a certain kind, and this is obvious from the fact that it cannot be kindled without nitro-aerial particles" (46). In this way he satisfied the ancient definition of an element i.e. fire, as a primary matter, and he also adopted the modern idea of a particle to denote what fire was composed of. He did this by assigning to it just one type of body - the nitro-aerial particle.

The next three sides are devoted to one aim only:

disproving the idea that any other kinds of particles i.e. sulphureous ones, are necessary for combustion. As we have seen earlier on pages 10 and 11 of his text, Mayow went to some trouble to show that elemental sulphur was not present at all in nitre. He now goes further, by showing that sulphureous particles are not at all present. In order to do this however, he commences by talking at some length about the nature and properties of both sulphureous and nitro-aerial particles.

As his initial proposition, Mayow notes the differences of properties of fires (or flames) which are produced:

- a) directly by the sun via a burning glass. He refers to these as 'celestial' fires,
- and b) by other means of ignition - these are the so-called 'kitchen fires'.

"Although sulphureous particles are absolutely necessary for kindling the kitchen fire, yet I do not think they exist in celestial fires..." (47) he says. Before demonstrating this, he first introduces a paragraph on the ubiquitousness of nitro-aerial particles in all flames as well as in the nitrous spirit. He compares both the colour and the destructive nature of flames with that of the nitrous spirit, notes that they are both very similar in appearance and in their action, and then concludes that nitro-aerial particles must be the 'common agent' responsible for these properties. This is more or less what he had written earlier on page 14. Bearing in mind the observations, his conclusions make good sense.

He next assigns physical properties to his particles, which can be summarized as follows:

nitro-aerial ones are small, pointed, and move fast  
sulphureous ones are large, rounded and move slowly

Thus he concludes that the sulphureous particles "appear less fitted for assuming the keen and eminently destructive nature of fire." (48) In addition, Mayow suggests that the nitro-aerial particles are too small to be seen whereas the sulphureous ones are "...always in view..." (49) He gives the following experimental evidence in support: if oil or molten sulphur are thrown onto molten nitre, they immediately catch fire. Molten nitre on its own however, does not do so. Thus the particles of flame, which Mayow naturally assumes must pass through the walls of the crucible, cannot possibly be sulphureous ones, since these would cause the nitre on its own to catch fire. Indeed, he notes that sulphureous particles "...are not thrown into a state of extremely rapid and fiery motion without the aid of nitro-aerial particles." (50)

He further illustrates the enormous difference between the large, slow moving sulphureous particles, and the tiny, nimble, fiery (i.e. nitro-aerial) ones by reference to further experimental evidence: if the flame from a burning candle is played onto a polished metal plate, the plate eventually blackens. This blackening, says Mayow, is due to sulphureous particles, which are too large to penetrate the body of the plate, so they are left behind. The tiny nitro-aerial particles, on the other hand, were able to enter into the body of the plate, but naturally were too small to be detected as such. He explains that these sulphureous particles were already present as part of the wick: during combustion they were transferred by the flame.

It is clear from his writings that Mayow lived in times when the idea of sulphur as a 'principle of combustibility' was very firmly established. Through his detailed reference to many experiments, which were not only his own, he was attempting to show that there is a matter which is necessary for combustion, but that this matter is not the element sulphur which we recognise today. He used the model of particles as small, rapidly moving bodies, to explain his ideas which were centred on nitro-aerial particles. Whilst he accepted that 'sulphureous' particles, which we would now refer to as soot, were present in certain flames, these were not necessary for the existence of the flame. Indeed, it is Mayow's discussion, rather than his conclusions on the role of nitro-aerial particles in combustion processes, which has been the focus of our attention.

The final section of this chapter, which is over two sides long, is devoted to some aspects of the chemistry of antimony. In Mayow's time antimony was important in both medicinal preparations and in metallurgy. Thus in contrast to today, the reactions and properties of antimony and its compounds were well known (51).

Mayow begins by noting that: "...the nitro-aerial particles in *the flame produced by solar rays* collected by a burning glass are particularly bright. This celestial flame appears to be due merely to the nitro-aerial particles of the atmosphere set in fiery motion by the action and intense impulse of light." (52) It is interesting that Mayow turns his attention to flames which



are produced exclusively by the condensation of solar rays: he is naturally using this example to support his theory that flames, however initiated, are always composed of nitro-aerial particles. He then notes that with antimony the same chemical reaction can be brought about by 'solar beams', which calcine it, and by the spirit of nitre. In each case the product is the same: Bezoardicum Minerale. (which was the popular name for antimony oxide  $Sb_2O_3$ , in Mayow's time). (53) The formation of this 'diaphoretic fixed antimony' was due in each case to nitro-aerial particles. He also notices that antimony increases in weight when it is calcined: "Indeed, we can scarcely imagine any other source for this increase of the antimony than the nitro-aerial and igneous particles fixed in it during calcination." (54) This, of course, is close to the modern interpretation of oxidation. As we shall see in due course however, Mayow did not go on to draw any general conclusions from this single experiment.

In the paragraph which follows, Mayow once again attacks the idea that sulphur is involved in combustion: "I am aware that it is the common opinion that the diaphoretic virtue of antimony is due to the loss of its extraneous and combustibile sulphur in its calcination. But I am not sure that this view is quite consistent with the truth." (55) He then describes the reactions of antimony with different quantities of molten nitre, and also with charcoal, and concludes: "Clearly, then, the fixation of antimony appears to be caused, not so much by the removal of its extraneous sulphur, as by the fixation in it of the nitro-aerial

particles in which the flame of nitre abounds." (56) So according to Mayow, the combustion of antimony is actually a combination rather than a decomposition. This idea is certainly consistent with his earlier view concerning the same reaction.

In spite of his persistent attacks on the 'combustible sulphur' principle, and his apparent success in disproving any ideas that sulphur - combustible or otherwise - is involved, Mayow nevertheless continues to refer to its presence in these processes. This is indeed surprising and it illustrates clearly how very perplexing the problems of calcination and combustion must then have appeared. In the penultimate paragraph of this chapter, he talks of "...tartar being imbued with such sulphur as is suitable for gradually and thoroughly burning the nitre." (57) He deduces this from the fact that the addition of tartar to a mixture of molten nitre and antimony greatly enhances the fixation (i.e. calcination) of the latter. In his explanation, he effectively assigns to tartar, in our terms, the role of a catalyst; it is not actually involved in the reaction, but its sulphur enhances the calcination of the antimony: "And hence it is that antimony kept in the flame of nitre, kindled by the sulphur of tartar and long burning, is fixed by the nitro-aerial particles of the nitre and becomes diaphoretic. Nor is it probable that the salt of tartar contributes anything to the fixation of antimony." (58) Thus we see that Mayow continues to use the nitro-aerial particles as his main tool in the explanation of what are now known to us as oxidation

processes.

The final short paragraph introduces a somewhat curious topic, That of 'pestilential miasma' as he calls it, or poisonous vapours. Mayow deems it fit to deduce that "...it is not difficult to explain why fires that burn with a bright flame purify the air from pestilential miasma, and are consequently so beneficial in contagious diseases."

(59) He believes that this is because in very bright fires the nitro-aerial particles, which are necessary for breathing, move so rapidly that they are "...purged... from their poisonous taint." (60) Thus we observe the gradual shift of Mayow's interest from purely chemical grounds, to aspects of science which are more related to physiology. These were the aspects which went on to form the principal part of his *Tractatus Quinque*.

#### Conclusion

From his treatment of the chemistry of nitre in just the first two chapters we were able to follow how Mayow developed a coherent theory which explained very well all phenomena associated with the chemistry of nitre. He successfully employed the model of particles to open new perspectives in chemical studies. In the third chapter, he attempted to apply his ideas to a slightly wider range of phenomena i.e. the nature of flames themselves and the chemistry of antimony. In addition to this, he continued to devote much attention to the role of sulphur and sulphureous particles in these processes.

It also becomes clear from this chapter that Mayow ran into several difficulties on account of unresolved

contradictions and his apparent lack of a consistent approach. This is highlighted by his increasing use of words such as 'seems' or 'appears', rather than more definitive ones.

Rather than demonstrating Mayow's deficiencies as a consistent thinker and natural philosopher, this chapter throws light on the ideas which were current at his time, and the great difficulty he experienced in advancing towards new and better ideas. Through his persistent and detailed attack on the phenomena of combustion and calcination (fixation), Mayow established himself as a natural philosopher of a high calibre.

Chapter 4 Of the Source of Acid Liquids: Also of the terrestrial part of the spirit of nitre.

A substantial proportion of this chapter is devoted to a discourse on the origin and nature of acids. This is done in order to explain the apparent paradox that an acid spirit i.e. the acid spirit of nitre, can be generated in soil, which is of a fixed i.e. alkaline, character.

Mayow refers to the chemistry of sulphur and its acid spirit (i.e. sulphur dioxide), vitriol and colcothar (i.e. iron (II) sulphate and iron (III) oxide), marcasite (the ore of iron - pyrites:  $\text{FeS}_2$ ), the dry distillation of wood, sugar and honey and also the reaction of French wine and strong ale with air (i.e. their aerial oxidation) over a period of time.

He continues to explain all phenomena relating to acidity in terms of the action of nitro-aerial particles, and also another particle - the saline one.

Through his general discussion of acids, Mayow was thus able to explain how all salts arise in the soil. Finally, he reaffirmed that nitre, as an example of a salt, is formed from three components: the most reactive part which comes from the air, the saline salt which is produced in earth (as he explains in this chapter), and the fixed salt. With this final statement on nitre, Mayow considers that its topic is concluded.

### Analysis

At the outset of this chapter, Mayow warned that he was about to tackle a very complex problem: "It is extremely difficult to understand how the spirit of nitre originates in the earth." (61) The difficulty is caused, as we have already mentioned, by the apparent paradox that "...earth appears to possess the nature of a fixed, rather than an acid, salt... But it has been shown above that the acid salt of which the nitre in part consists originates in the earth." (62) In order to explain how an acid can originate in an environment which is chemically its exact opposite, Mayow discusses in detail the nature of acids in general.

He begins by considering the acid spirit of sulphur, by which term we would nowadays understand sulphur dioxide or sulphur trioxide, or a mixture of both. "Hitherto the opinion has prevailed that an acid salt of a vitriolic nature lies concealed in the structure of sulphur, and that from this... the acid spirit of sulphur is composed." (63) If this were to be the case, Mayow argues, then sulphur should have an acidic taste, and it should also behave like

an acid in its reactions with other chemicals. He notes however that "...common sulphur... has a sweetish and by no means acid taste." (64) and also that it combines readily with fixed salts without effervescence, or the evolution of heat, or the formation of any new substance: these three features being typical of reactions between acids and fixed salts. Indeed, he quotes an example: "...fixed salt and sulphur if melted at a low temperature unite without any effervescence whatever; and neither of them is destroyed." (65) If a mixture of powdered sulphur and potassium carbonate (fixed salt) is heated gently, the sulphur melts at  $113^{\circ}\text{C}$ , which is a relatively low temperature, and the potassium carbonate will simply form a suspension in it. Mayow's observations that a gentle reaction occurs were therefore accurate. He is also correct in saying that acids react vigorously with fixed salt, since potassium carbonate i.e. fixed salt reacts readily and with considerable effervescence, with all acids to produce carbon dioxide, water and a salt as the products.

Having concluded that there is no acid present in sulphur itself, Mayow then suggests that the acidic quality is imparted to sulphur during its combustion: "why should we not suppose that the spirit is produced, by the burning of sulphur?" (66) In for this to occur, he postulates the existence of another type of particle - the saline one: "For I suppose that common sulphur contains in addition to its sulphureous particles pure and simple, a salt of a fixed or rather metallic nature in the closest union with its sulphureous particles, which saline part sometimes

crystallises when sulphur is dissolved by the spirit of turpentine." (67) Mayow's observation here about the crystallisation of sulphur from turpentine relates to the formation of needle shaped crystals of monoclinic sulphur when a saturated solution of sulphur in turpentine is allowed to cool, or evaporate over a period of time. His inference from this observation was that the crystallisation process constituted the separation of the saline particles of sulphur from its sulphureous ones, which remained in solution. We may thus summarize the "components" of sulphur according to Mayow, as follows:

closely united

common sulphur = sulphureous particles + saline (metallic) particles

↓  
crystallize in turpentine

In the paragraph which follows, Mayow explains the origin of the acid spirit of sulphur in terms of nitro-aerial and saline particles: during the combustion process the tiny saline particles which are present in sulphur become sharpened and pointed as a result of the rapid movement of nitro-aerial particles which rub against them. The last sentence of the paragraph reads: "The saline particles of the sulphur in fact which were previously of a fixed nature change, after they are thus sharpened and made fluid, into an acrid and acid liquid, and probably constitute the acid spirit of sulphur." (68) As further evidence to support these ideas, Mayow relates to the nature of the flame produced by burning sulphur: "That the facts of the case are as stated may be inferred from a careful study of the flame of sulphur since it is very different from other

flames." (69) As is well known, the colour of the flame of burning sulphur is blue. Since a blue flame is less active than a yellow flame: "And this is the reason that the flame of an expiring lamp is wont to be blue." (70), Mayow suggests that this is the result of a "diminished activity" of the nitro-aerial and sulphureous particles. His conclusion is that: "...it would appear that some third substance is interposed between the nitro-aerial and the sulphureous particles." (71) He labours the point of the relative weakness of the sulphur flame: "...the flame of sulphur... is less caustic and somewhat sluggish. For if a finger or anything combustible is thrust into the blue flame of sulphur... it will not be burned as by other fires, but will remain for some time uninjured." (72) Once again he reasons that there must be a third type of particle involved and hence reaches the final conclusion that these third particles must be the saline ones: "And that these particles, of a saline or metallic nature, mixed with the flame of the sulphur and sharpened by the rubbing of the nitro-aerial particles and brought at last to a fluid state, constitute the acid and corrosive spirit of sulphur, we take to be at least a probable conjecture;" (73) It is significant that Mayow sees the limitations: he was offering a theory on the basis of a detailed empirical study of a particular reaction, and he was aware of its limitations because it was based on a study of just that one reaction. In order to give further weight to his arguments, which are based on the mechanism by which nitro-aerial particles interact with saline particles to



cause them to become acidic, he quotes several other interesting chemical phenomena. The first of these relates to the dry distillation of vitriol, or iron (II) sulphate, which was a very well established means of obtaining oil of vitriol, or sulphuric acid.

Mayow begins by quoting the familiar reaction in which vitriol, or iron (II) sulphate, is strongly heated to give the acid spirit of sulphur, a mixture of sulphur dioxide and sulphur trioxide, and colcothar, iron (III) oxide. He uses this reaction to demonstrate that the acid spirit of sulphur is generated in the same way here, as it is during the combustion of sulphur. To start with, he notes that "...if the distillation of vitriol is continued with the strongest fire for ten or even more days, acid spirit will still all the while pass into the receiver." (74) He cannot accept that this is one reaction continuing for such a long period of time: "But it is scarcely to be believed that any acid spirit is so fixed and ponderous as to be able to remain so long in the hottest fire." (75), and so he suggests that the acid spirit is generated by the action of the nitro-aerial particles from the fire on the metallic sulphur particles of the colcothar. The result of this reaction is: "that the saline particles of the sulphur which are placed among the mutually rubbing fiery particles are pounded and comminuted so as to be sharpened and brought into a fluid state. And these... compose the oil of vitriol very much in the same way as we showed above that the spirit of sulphur is produced when sulphur is burned." (76) The point which Mayow is therefore making is that

regardless of the chemicals which react to produce the acid spirit in sulphur, the mechanism of its formation is the same, involving both nitro-aerial and saline sulphur particles.

Mayow's observations on the thermal decomposition of vitriol appear to be in accordance with known chemical facts today. Indeed, we have mentioned this reaction earlier on page 188, where an overall equation for its reaction is given. But his supposition that the acid spirit of sulphur must be produced by some reaction other than decomposition, is now known to be incorrect. Mayow was reasonable in his assumption that a single chemical reaction would not continue at red heat for several days: for at such elevated temperatures most reactions are completed in the space of a few minutes. In this particular case however, the thermal decomposition of iron (II) sulphate can continue for several days, even at red heat. Even the very small quantity of sulphur trioxide which is given off under these conditions will be clearly visible as white acidic fumes, on account of its very strong affinity to water vapour, with which it combines to form tiny droplets of sulphuric acid. It is of interest to note in this case how Mayow, being unaware of the exact mechanism of the reaction, invented one to fit his theory. Nevertheless, this type of speculation is necessary and fundamental for any progress in any discipline of natural philosophy. In this case, it served to strengthen Mayow's explanations which involved nitro-aerial particles.

In the next paragraph, Mayow turns his attention to

the destructive distillation, as we would call it, of several naturally occurring substances. He observes that if a hardwood such as Guaiacum is distilled, the products are acidic. Yet the wood itself, or its aqueous extract, are alkaline: "Indeed, Guaiacum wood before distillation does not seem to be endowed with an acid but rather with a fixed salt. For its powder or decoction effervesces when spirit of vitriol (but not when fixed salt) is poured on it."

(77) From this, Mayow deduces that the acidity must have been imparted to the wood by the action of heat, i.e. the nitro-aerial particles: "...whence it is that the nitro-aerial particles of fire, encountering the sulphureous particles of wood in the course of distillation, rub the saline particles and bring them into a fluid state in the manner aforesaid." (78) He then adds: "that acid spirits distilled from sugar and honey appear to be produced in a not very dissimilar way by the action of the nitro-aerial spirit of the fire." (79) Since neither sugar nor honey have an acidic taste, then the process of distillation imparts acidity. Mayow summarizes his theory for the formation of acids by the dry distillation of plants as follows: "For such plants as have no acid taste and yet yield an acid spirit on distillation are composed of sulphureous in intimate union with saline particles, and are therefore suited for yielding an acid liquid in the manner aforesaid." (80)

We may summarize this as follows:-

1. Plants which are not acidic contain two types of particles intimately combined: sulphureous and saline.

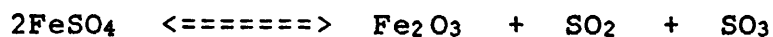
2. During their distillation, the saline particles of these plants are acted on by the nitro-aerial ones from the fire, and they become sharpened in shape, and hence become acidic.

Thus Mayow has postulated exactly the same mechanism for the formation of acids by combustion, and to the formation of acids by destructive distillation. From the point of view of modern chemistry, his observations are once again excellent since it is a well known fact that pyrolysis of carbohydrate chains present in starch, sugars and cellulose gives a wide mixture of substances which include carboxylic acids. It is therefore most interesting to see how two processes which would nowadays never be considered on a par i.e. oxidation and thermal degradation, were considered by Mayow to be identical in effect. And not without good reason, for the action of a flame i.e. nitro-aerial particles, was the common denominator to both types of reaction.

Having shown that his theory of acid formation applies to both mineral and plant substances, Mayow then turned his attention to the different rates at which acids can be formed from one substance. His logic is simple to follow: in a reaction involving strong heat the nitro-aerial particles move rapidly, whereas at room temperature they move more gently. Although Mayow makes no mention of room temperature, he implies this condition by not mentioning any degree of heat. It should also be noted that he had earlier shown that nitro-aerial particles are present in air. "As the nitro-aerial spirit of the fire... with very brisk effervescence, rubs down in a moment... the saline particles... so the same nitro-aerial spirit effervescing

with a slower motion... changes the saline particles after some time has elapsed." (81) This particular aspect of his theory of acid formation is prompted by his observation of the gradual appearance of acidity over a period of days, when calcined vitriol, or colcothar, is exposed to air. Referring to strongly calcined vitriol, he writes: "For if that vitriol has been exposed for some time to moist air, it will be impregnated anew with acid spirit." (82) He is not quite sure how the nitro-aerial particles cause this acidity however, and feels compelled therefore to admit that: "...nitro-aerial spirit ...effervesces with it in an obscure way..." (83) His uncertainty in this matter is further reinforced by his assertion that: "Certainly we can scarcely imagine any other mode for the formation of the vitriolic spirit..." (84) His proposed mechanism is therefore clearly a hypothesis which lacks firm evidence.

Viewed in the light of current knowledge, Mayow's observations relating to the gradual increase in acidity of colcothar which is exposed to moist air are entirely accurate. His attention to this type of phenomenon shows the diligent way in which Mayow worked, in that he attempted to explain every type of acid formation using his nitro-aerial particles. The reason why the solid acquires acidic properties is actually due to the fact that the equilibrium for the reaction:



never quite reaches the right hand side, and a small quantity of anhydrous  $\text{FeSO}_4$  will always remain. Being hygroscopic, this will attract moisture from the air, with

which salt hydrolysis will occur, to yield an acidic solution.

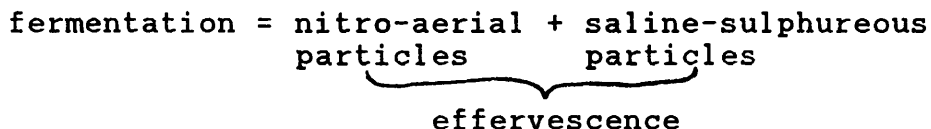
In the next paragraph, Mayow suggests that all vitriols are produced in the same way i.e. by reaction of nitro-aerial particles with minerals. As his example of a mineral, he chooses marcasite, which when "... exposed for some time to the air and wet weather... will be found to be richly impregnated with vitriol." (85) To Mayow, the explanation was straightforward: "No doubt the nitro-aerial spirit, effervescing with the metallic sulphur of these Marchasites, converts their more fixed part into an acid liquid which, directly it is produced, attacks the metallic particles of the said stone and draws them out and at last coalesces them to form vitriol." (86)

What Mayow was describing in this process was essentially the oxidation of the sulphide ion  $S^{2-}$  in the presence of moisture, to give the sulphate ion  $SO_4^{2-}$ . His observations are in accordance with known facts today (87).

Thus we are able to see, that even in what would now appear to be a somewhat curious manner, Mayow continues to focus his attention on processes which we now know as oxidation reactions. His nitro-aerial particles, which it may not be possible to exactly identify with oxygen, were certainly associated with many of its roles. And indeed, for his next example, Mayow cites the rusting of iron: "...iron rust also,... seems to be produced by the action of nitro-aerial particles meeting with the metallic sulphur of iron..." (88). This action produces an acidic liquid

which reacts in situ with iron to form rust: "...rust or a sort of imperfect vitriol is produced - very much as if the iron had been smeared with some acid liquid." (89)

For his next topic, Mayow discusses the formation of acids in liquids: "It should also be noted that acid salt or sourness is produced by the action of nitro-aerial spirit not only in solids but also in liquids." (90) The starting point of Mayow's arguments is that all substances which are dissolved in a liquid are made up of two particles: saline ones which are derived from the fixed salt part, and sulphureous ones. He commences by refuting the earlier held hypothesis that acidity is caused by the gradual "taking over" of properties by saline particles which had earlier been prevented from doing so by their close association with other particles. Instead he suggests, as might be expected, that acidity is caused by the action of nitro-aerial particles: "...souring of liquids is caused by the change of their fixed salt into an acid salt, a result which is probably due to the action of the nitro-aerial spirit." (91) To support this idea he gives an example: "...liquids abounding in fixed salt and sulphur, such as French wine and strong ale, acquire acidity from lengthy fermentation." (92) This overall reaction is called fermentation. In simplified form we may write:-



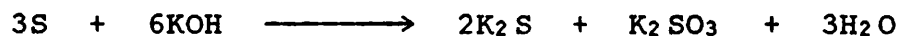
During the course of the fermentation, "...the saline particles of the liquid closely combined with the

sulphureous particles are beaten and rubbed by the nitro-aerial particles..." (93). Thus they acquire acidic properties. Mayow then makes the interesting digression that heat itself is the movement of nitro-aerial particles: "...every kind of heat is due to nitro-aerial particles put in motion." (94) and that therefore when wines or strong ale are kept in a warm place, or exposed to direct sunlight, they "...turn in the course of time into vinegar." (95) The exact mechanism of this process of acidification is summarized by Mayow as follows: "...the saline particles are sharpened by the action of the nitro-aerial particles and converted into acid salts." (96)

The phenomenon which Mayow has described in the preceding paragraph is now well known as the atmospheric oxidation of ethanol, which occurs in both wine and ale, to give a dilute solution of ethanoic acid. He has commented on, and with good reason, that a slightly warmer temperature increases the rate of this reaction, and he has also made the generalization that heat itself is caused by the movement of nitro-aerial particles. It is significant to note Mayow's persistence and his continued interest in concepts which we now recognise as redox reactions and energy changes. Although he continued to stress that his ideas were only tentative hypotheses, they show that in addition to his highly logical and systematic way of tackling problems, Mayow was also endowed with considerable imagination and intuition - characteristics of any truly original mind.



In the final sentence of this paragraph he adds, almost as an afterthought, that "if common sulphur is dissolved in water in which quicklime has been slaked, or in lye, this solution which was imbued at first with fixed salt will in course of time become acid, so that the sulphur will not any longer remain dissolved in it." (97) The reason why he quoted this additional reaction was to show that sulphur itself could also cause the neutralisation of an alkali i.e. it has acidic properties itself, and that over a period of time, the solution will become acidic and the sulphur will be displaced. Thus sulphur itself also possesses acidic properties, but these are weaker than those of nitro-aerial particles. From the point of view of modern chemistry these reactions are a little tricky to interpret. If we consider the reaction of sulphur with lye, or potassium hydroxide solution, we can write the equation (98):-



This effectively represents the disproportionation of sulphur into sulphide and sulphite ions. On standing, this solution will be subject to atmospheric oxidation, and thus the reaction may well be reversed, with the subsequent precipitation of sulphur, and the development of an acidic solution. To write equations for possible reactions would be a complex problem since it would involve several equilibria. Nevertheless it can be assumed that Mayow's observations were certainly feasible. Interpreted in terms of modern redox theory, Mayow is essentially observing that nitro-aerial particles (oxygen in this case) are more

reactive than sulphureous particles (sulphur in this case): a justifiable and correct conclusion on the basis of his quoted example.

Mayow's lengthy section on his theory for acid formation ends with a short note on the different strengths of different acids. He explains this by noting that "saline and sulphureous particles exist in a fluid state in liquids..." (99) Thus they "cannot be so rubbed and comminuted by the action of nitro-aerial particles as in the case of solids." (100) This explains the difference of strength between acids which we now recognise as ethanoic and sulphuric: "And this seems to be the reason why the acid salt of soured liquids is less sharp and corrosive than the spirit of sulphur and other eminently corrosive liquids of the same kind." (101) Two points are of interest here: the fact that he has observed the difference of strength between different acids, and the fact that he has attempted to explain this difference. Once again, his logic has been consistent. With this short paragraph, Mayow completes a seven page section on the origin and formation of acids.

In view of this aforementioned expose, he now considers himself ready to attempt an explanation of the key issue: "...how the acid spirit of nitre is generated in the earth." (102) He begins by commenting on the likeness of earth i.e. soil, to colcothar. He explains the similarity of appearance by assuming slightly different compositions: "...and indeed a dark purple clod of earth appears not very unlike colcothar, except that in the



particles: "And yet there is a great affinity and likeness among all acid salts, and in them all,... nitro-aerial and igneous particles reside, as will be shown below." (107)

In the next short paragraph he explains that once the spirit of nitre has been formed in the earth, it then approaches "the seeds of fixed salts which,... are hidden in the bosom of the earth,... and, lastly, from them, combined in the closest alliance, *sal nitrum* is produced." (108) This formation of nitre is similar, according to Mayow, to the formation of vitriol, "...as we have indicated above." (109)

The subsequent, equally short paragraph, is devoted to a general explanation of the reaction between fixed and acid salts. According to Mayow, their vigorous reaction is due, not to a "great repugnance between fixed and acid salts as is commonly supposed... but rather to a sort of conjugal affection." (110) This type of reaction gives a product which is very closely bonded as a result of the intimate contact which is developed by the reagents during the reaction. And it is this close bond between nitrous particles and those of the fixed salt, which enable the nitre thus formed, to become soluble in water. Thus, Mayow argues, "the reason is clear why nitrous but not purely saline salts are extracted by lixiviation from the earth." (111)

Using the terms and concepts of modern chemistry, we can see that Mayow was essentially describing the reaction between nitric acid and a carbonate. All reactions between nitric acid and carbonates are vigorous and result in the

formation of soluble nitrates, water and carbon dioxide. Carbonates are much less soluble in water than nitrates.

In the penultimate paragraph of this chapter, Mayow relates once again to the natural formation of nitre in farmyard soils. These soils are "imbued with saline-sulphureous particles..." (112). The role of the sulphureous particles however is merely to "excite" or catalyse the reaction between nitrous particles and those of the fixed salts. "The sulphureous particles..." says Mayow, "must not be supposed to constitute nitre in part." (113)

In the concluding short section, Mayow finally summarizes his thoughts on the composition of nitre: "For it seems to consist of salt of three kinds, of which one, the most active, is derived from the air, and it has an ethereal and a fiery nature. This salt, as an architect, forges for itself from terrestrial matter a saline vehicle in which, as in a fitting subject, it resides. The saline vehicle along with the fiery salt which occupies it forms the spirit of nitre, which from the moment of its production meets the fixed salts of the earth which have attained to proper maturity, and coalesces them to form common nitre." (114)

This summary can be abbreviated as follows:-

common nitre = an active ethereal, fiery salt from air

+ a saline vehicle, which contains the fiery salt

+ fixed salt

In terms of modern chemistry we could identify Mayow's constituents of nitre as follows:

fiery salt = oxygen

saline vehicle = nitrogen dioxide

fixed salt = potassium carbonate

His explanation of how these three are related to one another, and to nitre, is entirely correct. Mayow has now proved, in effect, his statement on the composition of nitre which he made in the third paragraph of chapter one.

It is significant that the final version is:

- a) clearer and easier to understand
- and b) more obviously chemically correct.

Mayow considers that this topic is now concluded to his satisfaction and finishes with the short statement: "So much then for *sal nitrum*." (115)

#### Conclusion

This chapter affords us the best insight yet into Mayow's knowledge of chemical reactions, and his attempts to explain them in terms of his particulate model. It is worth summarizing his chemical examples in the light of modern knowledge, in the form of a list:

1. combustion of sulphur to give sulphur dioxide
2. thermal decomposition of iron (II) sulphate
3. destructive distillation of wood, sugar and honey
4. rusting of iron
5. atmospheric oxidation of marcasite ( $\text{FeS}_2$ )
6. atmospheric oxidation of ethanol
7. disproportion of sulphur in alkali followed by atmospheric oxidation

From these reactions he deduced a general theory for the formation of acids in terms of nitro-aerial and saline particles, and he then used this theory to explain how the

acid spirit of nitre may be formed in soil.

Whereas his inferences and final conclusion were subject to the limitations of experimental evidence, as Mayow himself readily admitted, they nevertheless enable the following statements to be made about his chemistry:-

(a) a significant majority of reactions quoted by Mayow were related to oxidation processes involving atmospheric oxygen,

(b) he consistently made use of nitro-aerial particles in his explanations.

We may conclude from the foregoing analysis that Mayow made a significant contribution to studies relating to the composition of air, and especially the role of the substance which we now recognise as oxygen. Without having formally "discovered" this gas, he laid a firm foundation for an important advance, which was only to come well over a century after his death. In this respect, Mayow must be included among the great early contributors to the development of modern chemical knowledge. His attempts to solve problems which nowadays constitute facts that are familiar to all schoolchildren, enable us to appreciate the enormous complexity of phenomena which we all too often take for granted.

In the present study, only the first four chapters of Mayow's work have been considered. There are two good reasons for this: a study of the entire work in such detail must prove to be a major undertaking in its own right, and secondly, it is these chapters which provide an ideal link with the ideas of Sendivogius. Those ideas, as we have mentioned earlier, were centred on the chemistry of nitre - or our potassium nitrate. Bearing in mind the limitations

of the present study (as defined earlier), evidence has been presented to indicate certain important similarities in Mayow's and Sendivogius' interpretation of the composition of nitre and its properties. These are summarized below:

1. Nitre is composed of three salts. One of these is "aerial" and the other two are "fixed".
2. Attention was focused on the aerial component of nitre and its function in living organisms and in combustion processes.

As has already been explained, there were considerable differences between their approach to the subject. Nevertheless, the emphasis on these aspects of nitre is particularly characteristic of the two authors and provides a thread of continuity despite the larger discontinuity between alchemy and early-modern chemistry. It is analogous to the continuity and transposition of ideas that has been described by other modern historians dealing with the evolution of other important concepts in the history of chemistry. (116)

On the basis of the works studied, I have shown that Sendivogius' ideas on the chemical composition of nitre may well have provided the starting point for Mayow's attack on problems concerning air, combustion and respiration: this in turn provided men such as Priestly and Lavoisier with a vital link in their own contributions.

#### Notes

1. J. Mayow, *The Medico-Physical Works of John Mayow*, translated by A. Crum Brown and L. Dobbin (Edinburgh, 1907).
2. J. Mayow, *op.cit.*, 1, lines 3-4
3. R. Frank, *Harvey and the Oxford Physiologists*



(California, 1980). On page 230 we read about Mayow's *Tractatus Duo*, and the fact that it contained several interesting experiments, "but its central conception of an aerial nitre posited nothing that would have been unknown to someone who was acquainted with the Oxford group."

4. J. Mayow, *op.cit.*, 1, lines 8-9.
5. *ibid.*, 1, lines 16-19.
6. *ibid.*, 1, lines 20-22.
7. *ibid.*, 2, lines 1-3. The Latin original reads:  
"Sal-Nitrum e Sale acido, maxime Igneo; & in super  
Alcali, seu salis Alcali vicem subeunte, Sale Volatili  
pure salso, constare:"
8. *ibid.*, 2, lines 11-13.
9. J. Partington, *General and Inorganic Chemistry* (London, 1963), 578.
10. K. Leschewski und W. Degenhard, *Berichte der dtsh. chem. Ges.*, 72 (1939), 1763ff.
11. J. Mayow, *op.cit.*, 2, lines 23-26.
12. *ibid.*, 2, lines 30-31.
13. *ibid.*, 3, lines 1-5.
14. *ibid.*, 3, lines 6-10.
15. *ibid.*, 3, lines 20-22.
16. F.D. Adams, *The Birth and Development of the Geological Sciences* (Dover Publications, New York, 1954), 279-286.
17. K.Figala, "Die exakte Alchemie von Isaac Newton", *Verhandl. Naturf. Ges.* 94 (Basel, 1984), 157-228.
18. J.Mayow, *op.cit.*, 3, lines 33-34.
19. *ibid.*, 4, lines 22-23.
20. *ibid.*, 5, lines 4-10.
21. *ibid.*, 5, lines 34-35; 6, lines 1-5.
22. *ibid.*, 7, lines 6-7.
23. *ibid.*, 7, lines 20-22.
24. *ibid.*, 8, lines 4-5.
25. *ibid.*, 8, lines 9-15.

26. *ibid.*, 8, lines 18-23.
27. *ibid.*, 8, lines 26-29.
28. *ibid.*, 9, lines 8-10.
29. *ibid.*, 9, lines 15-17.
30. *ibid.*, 9, lines 17-19.
31. *ibid.*, 9, lines 23-27.
32. Thomas Willis (1621-1675) was, according to R.G. Frank (*op.cit* in note 3, pp.66-67), a major scientist whose professional interests included chemistry, anatomy, physiology and medicine.
33. J. Mayow, *op.cit.*, 10, lines 31-35; 11, lines 1-2.
34. *ibid.*, 11, lines 9-12.
35. *ibid.*, 13, lines 8-11.
36. *ibid.*, 13, lines 13-15.
37. *ibid.*, 13, lines 19-21.
38. *ibid.*, 13, lines 22-25. The Latin original reads: "Nempe verisimile est, Spiritum nitri quid compositum esse; illiusque particulas alias flexiles, humidas, indolisque crassioris esse; quae a materia terrestri procedere videntur;"
39. *ibid.*, 13, lines 32-35; 14, lines 1-2. The Latin original reads: "Circa partem ergo spiritus nitrosi Aeream statuimus, eam nihil aliud esse, quam particulas Igneo-aereas, quae ad flammam quamcumque constandam omnino necessariae sunt. Quo circa particulas istas igneas, nitro, aérique communes, *Particulas Nitro-aereas, sive Spiritum Nitro-aereum* in futurum nuncupare liceat."
40. *ibid.*, 14, lines 31-32, 35; 15, line 1.
41. *ibid.*, 15, lines 18-20.
42. *ibid.*, 16, lines 13-14.
43. *ibid.*, 16, lines 15-16.
44. *ibid.*, 16, lines 34-35.
45. *ibid.*, 17, lines 1-4.
46. *ibid.*, 17, lines 21-24.
47. *ibid.*, 17, lines 34-35; 18 line 1.

48. *ibid.*, 18, lines 26-27.
49. *ibid.*, 19. line 7. The full Latin text reads:  
"Quod vero particulas Sulphureas potius quam  
Nitro-aereas ignescere putamus; hoc propterea fit,  
quod pabulum ignis sulphureum, magis crassum,  
nunquam non in conspectum venit; cum tamen  
particulae nitro-aerae adeo tenues, subtilisque  
sint, ut oculorum aciem prorsus effugiant,..."
50. *ibid.*, 19, lines 25-27.
51. See, for example: M. Macquer, *Elements of the Theory and Practice of Chymistry* (London, 1758), 1, 83-92;  
2, 1-46. Also his: *Dictionary of Chemistry*,  
translated from French (London, 1771), 1, 87-94.
52. J. Mayow, *op.cit.*, 20, lines 17-22.
53. M. Macquer, *Elements of the Theory and Practice of Chymistry* (London, 1758), 2, 39-43.
54. J. Mayow, *op.cit.*, 21, lines 2-5.
55. *ibid.*, 21, lines 6-10.
56. *ibid.*, 21, lines 26-30.
57. *ibid.*, 21, lines 34-35.
58. *ibid.*, 22, lines 3-10.
59. *ibid.*, 22, lines 21-24.
60. *ibid.*, 22, lines 30-31.
61. *ibid.*, 23, lines 6-7.
62. *ibid.*, 23, lines 7-13.
63. *ibid.*, 23, lines 19-24.
64. *ibid.*, 23, lines 25-27.
65. *ibid.*, 24, lines 15-17. The Latin original reads:  
"At vero sal fixum & sulphur leni calore colliquata  
sine effervescentia quavis combinantur;"
66. *ibid.*, 24, lines 22-24.
67. *ibid.*, 24, lines 24-30.
68. *ibid.*, 25, lines 12-17.
69. *ibid.*, 25, lines 18-20.
70. *ibid.*, 25, lines 30-31.

71. *ibid.*, 24, lines 24-26.
72. *ibid.*, 24, lines 34-35; 25, lines 1-5.
73. *ibid.*, 26, lines 10-15.
74. *ibid.*, 26, lines 22-24.
75. *ibid.*, 26, lines 24-26.
76. *ibid.*, 26, lines 31-35; 27, lines 1-3.
77. *ibid.*, 27, lines 12-16.
78. *ibid.*, 27, lines 19-23.
79. *ibid.*, 27, lines 24-26.
80. *ibid.*, 27, lines 26-31.
81. *ibid.*, 27, lines 32-35; 28, lines 1-5.
82. *ibid.*, 28, lines 7-9.
83. *ibid.*, 28, lines 9-11.
84. *ibid.*, 28, lines 14-15.
85. *ibid.*, 28, lines 27-29.
86. *ibid.*, 28, lines 30-35.
87. Durrant & Durrant, *Introduction to Advanced Inorganic Chemistry* (London, 1975), 1064, line 45.
88. J. Mayow, *op.cit.*, 29, lines 1-4.
89. *ibid.*, 29, lines 7-9.
90. *ibid.*, 29, lines 10-12.
91. *ibid.*, 29, lines 25-27.
92. *ibid.*, 29, lines 28-30.
93. *ibid.*, 29, line 35; 30, lines 1-3.
94. *ibid.*, 30, lines 9-10.
95. *ibid.*, 30, line 6.
96. *ibid.*, 30, lines 12-14.
97. *ibid.*, 30, lines 18-23.
98. Durrant & Durrant, *op.cit.*, 829, line 43.
99. J. Mayow, *op.cit.*, 30, lines 24-25.

100. *ibid.*, 30, lines 26-27.
101. *ibid.*, 30, lines 28-32.
102. *ibid.*, 30, lines 34-35.
103. *ibid.*, 31, lines 3-6.
104. *ibid.*, 31, lines 13-19.
105. *ibid.*, 31, lines 22-24.
106. *ibid.*, 31, lines 25-29.
107. *ibid.*, 31, lines 34-35; 32, lines 1-2.
108. *ibid.*, 32, lines 5-10.
109. *ibid.*, 32, lines 14-15.
110. *ibid.*, 32, lines 17-21.
111. *ibid.*, 32, lines 25-27.
112. *ibid.*, 33, line 1-2.
113. *ibid.*, 33, lines 10-12.
114. *ibid.*, 33, lines 15-25.
115. *ibid.*, 33, line 25.
116. See the comparison between the ideas of Le Fèvre and Lemery regarding the 'universal spirit' in:  
N.E.Emerton, *The Scientific Reinterpretation of Form*  
(Cornell University Press, 1984), 186-189

## Chapter Eight

### A Summary of the Opinions expressed by Modern Authors, on Mayow's Chemical Ideas

#### Introduction

The object of the present chapter is to conduct a brief survey of some of the more important works which have been written during this century about John Mayow's chemical theories. The following authors' contributions will be discussed:

1. Patterson 1931
2. Guerlac 1953
3. Partington 1956
4. Böhm 1963
5. Debus 1964
6. Frank 1980

On the basis of the survey, and of my own discussion of Mayow's work, I hope to present a well substantiated conclusion concerning Mayow's contribution to chemistry. Furthermore, my survey will show that the connection between Mayow and Sendivogius had already been considered by scholars some decades ago. Thus the material presented in this thesis brings fresh evidence to the Mayow-Sendivogius debate.

#### 1. "John Mayow in Contemporary Setting", T. Patterson, 1931.

This classic paper is divided into two parts: the first (47 sides) in which Patterson summarizes the work of Mayow's contemporaries on combustion and respiration, and the second (40 sides) in which he discusses Mayow's chemical views on the strength of his arguments.

The inspiration for this paper came from the large number of what Patterson considered to be uncritical appraisals of Mayow's work. These had credited Mayow with being the forerunner, or precursor, of the discovery of oxygen and the theories of combustion and respiration, which we accept in modern chemistry. Authors to which he made particular reference in this respect are: Thomas Beddoes (1790), G.D.Yeats (1798), and Francis Gotch (1908). In commenting on their conclusions, Patterson was forthright: "...BEDDOES' estimate of MAYOW'S achievements... is quite inaccurate, not to say untrue, in almost every particular." (1) Of Yeats' book: *Observations on the Claims of the Moderns, to some discoveries in Chemistry and Physiology* (London, 1798), he wrote: "This book, an astonishing piece of special pleading, in which all sense of proportion, criticism, moderation and even comprehension seems to have been lost, is mainly responsible for most of the later exaggerations regarding MAYOW" (2). His comments on Gotch's contributions to the debate are even stronger: "...FRANCIS GOTCH... has given perhaps as erroneous a description of MAYOW'S views, as is humanly possible..." (3) It is clear that Patterson considered that he had good evidence to support these severe judgements.

He sets out the aims of his own contribution to the debate as follows: "It is the object of the present paper to show that MAYOW'S views, critically examined, have no resemblance to the new chemistry, and that MAYOW'S commentators merely thought that the new chemistry was to

be found there, which is quite a different thing." (4) A significant expression in this passage is the term "new chemistry". By this, we understand the chemistry of the post-Lavoisier and post-Dalton periods when concepts such as gases, elements and affinity were roughly the same as those we hold nowadays. During Mayow's lifetime in the seventeenth century, Aristotelian and Paracelsian ideas on the nature of matter played a major role in the interpretation of chemical phenomena. The new Cartesian and mechanistic philosophy, which interpreted matter in terms of particles, had only recently begun to be applied to chemical phenomena. As we have already seen, John Mayow used the particulate model in the explanation of natural phenomena. The ideas conveyed by the terms "new" and "old" as applied to chemistry can thus be summarized as follows:

new chemistry = particulate, mechanistic, inanimate

old chemistry = continuous, panvitalistic.

If we consider Patterson's statement in the light of these definitions, then it becomes clear that he was correct in suggesting that Mayow's views had no, or little, resemblance to the new chemistry. But this ought not to have been an issue, since it is obvious that someone who lived in the seventeenth century would operate with the concepts and terminology of that period, and not in those of the nineteenth century. It is also very possible that Mayow's work, which was written at a time when the transition to a more "modern" approach was just beginning, would bear superficial resemblances to writings of a later period.



What is an issue, and in this respect Patterson is entirely justified, is the fact that the authors mentioned tried to interpret Mayow's reasoning in the terms of today's chemistry. By showing the resemblances of Mayow's work to modern ideas, they had tried to establish that he was a "modern" chemist who had, in effect, discovered oxygen. Such an approach, in which a few resemblances of ideas to those of a later period are established, is not the basis for assessing the contribution to science, of a figure of the past. Patterson was therefore quite correct to point this out. He sets out his argument concerning the nature of discoveries on page 539:

"There can be no question of the discovery of oxygen until it was actually and consciously isolated by SCHEELE and by PRIESTLEY. That scientists from PARACELSUS - and perhaps even before PARACELSUS - down to these discoverers dealt with and discussed phenomena that had indeed to do with oxygen, is true, but it is greatly to force the meaning of the word "discovery" to use it with regard to their investigations. Even when oxygen had been definitely and deliberately prepared by PRIESTLEY it took not only him, but also LAVOISIER, the better part of a year, really to understand that something of an entirely unsuspected character had been obtained, and to impress upon scientists, actually for the first time, the presence of a second aeriform constituent of the atmosphere."

Having said that he will compare Mayow's ideas with those of his contemporaries, and also that he will analyse them on their own merit, Patterson reached the conclusion that Mayow's contribution to the development of chemistry was nominal. He summed up his views succinctly: "I hope it is now clear that MAYOW'S book is in reality a mass of speculations almost entirely unsupported by any kind of evidence; and, where there is evidence, very little indeed of it was supplied by MAYOW." (5) and "The fact that MAYOW'S *Tractatus quinque*, where it is original, is mostly

a string of baseless and absurd assertions, must infallibly rule him out of the company of even third rate scientists." (6)

In view of Patterson's earlier claims that he would show that Mayow's work bears little, or no resemblance to modern chemistry, it is surprising that he has also reached the conclusion that Mayow's contribution was virtually insignificant. For, as we have mentioned earlier, the fact that someone's work, which was written a long time ago, bears no resemblance to modern accepted ideas, is what we should expect. It in no way discredits his achievements as a scientist or philosopher. Whilst there is no doubt that the authors mentioned by Patterson had assessed Mayow uncritically, it does not follow that his work was necessarily worthless.

The debate on Patterson's paper was taken up in detail by Professor Partington in the late 1950's, and it is not intended to enter into it in great detail in the present work. Nevertheless, the following points can be drawn from it:-

a) Authors such as Gotch, Yeats and Beddoes had undoubtedly used superficial similarities between Mayow's conclusions and those of modern chemists to erroneously deduce that he was a "precursor" to the discoverers of oxygen and theories of respiration and combustion. They had also failed to note the inconsistencies of Mayow's own arguments and his conclusions. In short, they had failed to analyse his work in depth, and objectively.

b) The fact that inconsistencies and inaccuracies

exist in Mayow's arguments and conclusions does not, as Patterson suggests, reduce his worth to less than that of "even third rate scientists".

In carrying out his analysis, Patterson himself had not analysed Mayow's arguments consistently and in depth: he has merely used fragments to support his own forgone views.

#### Summary

Patterson's paper provides us with an important example of the treatment of a key issue in the history of chemistry: that of air and its composition and role in combustion and respiration. He has shown how very careful historians must be, in assessing the contributions of others in a scientific discipline.

Above all, Patterson's paper makes us appreciate even more, the remarkable efforts of scientists and philosophers in the past, in a field which we often take for granted: the composition of air and its functions in nature.

2. "John Mayow and the Aerial Nitre: Studies on the Chemistry of John Mayow - I", H. Guerlac, 1953.

Guerlac opens this paper by drawing reference, indirectly, to Patterson's study. Referring to the *Tractatus Quinque*, he writes:

"It is doubtful if any scientific work of the seventeenth century has been the subject of more thoroughly conflicting interpretations. It has been praised as one of the great classics of chemistry and physiology, and more recently damned without mercy as absolute nonsense." (7)

Guerlac does not attempt to enter the debate on whether Mayow was a great chemist or not - his main objective is to show that Mayow had not, as Patterson suggested, copied

ideas concerning nitre and its role in respiration and combustion, from his contemporaries, but was inspired by an earlier source which was well known to all natural philosophers of his period: "I shall bring forward evidence of an unsuspected common source from which both Hooke and Mayow may have derived their theory." (8)

Guerlac had been prompted to write this paper by the fact that none of his own contemporaries had made any new contributions to the debate, they had merely "...contented themselves with taking an unsubstantiated middle position." (9)

The "unsuspected source" to which Guerlac refers is Sendivogius' work: *A New Light of Alchemy*, in which the key role of a nitrous salt, or "central nitre", had been put forward. Guerlac draws attention to several passages, which have already been discussed earlier in the present work, which point to the role of air in combustion and respiration, and also to the relationship between nitre and the "active" part of air. Referring to such a passage from the *Treatise on Sulphur*, where Sendivogius refers to the importance of fresh air for both animal and vegetable life, he observes that: "In the light of the later speculations of Boyle, Hooke, and Mayow, this is indeed a surprising passage to have escaped the notice of historians of science." (10) Guerlac also mentions the fact that Sendivogius' work went through several editions in several languages, and thus concludes that these works must have had a very wide readership over a long period of time throughout Europe. He then notes that: "...barely an echo

of Sendivogius' great reputation in his own century is to be found in the works of modern historians of chemistry."

(11) The reasons for this lack of recognition of Sendivogius' contribution have been already extensively discussed in earlier chapters: it was caused by Sendivogius' obsession with anonymity and his deeply erroneous biographical accounts. Indeed, it can be seen from his paper that Guerlac was not acquainted with a more accurate account of Sendivogius' life, but this did not prevent him from a careful study of the Sendivogian works.

In the final section, Guerlac discusses the influence of Paracelsus in the development of ideas concerning the role of air in combustion and respiration. He concluded that Paracelsus had written extensively about the role of air, and that, like Sendivogius and many others, he had also used the words "balsam" and "dew" with reference to a "mysterious life preserving substance". As far as Guerlac could tell however, Sendivogius had been the first person to introduce nitre and its chemistry into the debate on air and its functions in nature.

The paper concludes with the following passage:

"Until more evidence is forthcoming - and I do not claim to have combed the works of Paracelsus and all his disciples thoroughly enough to say that there is no such evidence - I shall be tempted to believe that the theory of a life-preserving balsamic nitre, or nitrous spirit, in the air, was the work of the *Cosmopolite* and Sendivogius, developing their Paracelsian legacy. Whether or not this will turn out to be the final explanation, it was almost certainly through the *Novum Lumen Chymicum* and the *Tractatus de Sulphure* that this physiological theory of an aerial nitre became known in the seventeenth century, passed to Ent and Digby, and from them to Hooke, Thruston, Lower, and John Mayow, who found it a useful conceptual scheme by which to interpret the steadily growing mass of experimental evidence concerning combustion and respiration." (12)

Through this statement, Guerlac had made evident his challenge to Patterson's conclusion: "I have, I trust, produced enough evidence up to this point to suggest that we need not, with Dr. Patterson, assume that Mayow in the *De Respiratione* of 1668 derived his ideas from either Hooke or Thruston." (13)

#### Summary

Henry Guerlac has put forward a strong case for Mayow having drawn many of his ideas concerning the role of nitre in nature, from the Sendivogian works *Treatise on the Philosophers' Stone* and *Treatise on Sulphur*. I believe that my own conclusions, which are based on more detailed evidence and on more recent information, are in line with Guerlac's pioneering suggestions.

3. "The Life and Work of John Mayow (1641 - 1679)", J.R.Partington, 1956.

Partington's interest in Mayow had evidently been stimulated by Patterson's article, for he published three fairly extensive articles on Mayow, and also wrote about him at some length in his major work - *A History of Chemistry*. (14)

For the purposes of the present work I shall limit my comments to just one paper, since I believe that it contains the most original material which is relevant to the present thesis.

This paper was written as a direct reply to Patterson's one, which we have discussed already. Partington disagreed strongly with Patterson and made this point clearly in the opening section:

"Patterson's article shows that he was ignorant of matters of importance, his reading was too superficial, his understanding of the meaning and novelty of some of Mayow's statements were defective, he was too obsessed with the idea that Boyle was a more rational thinker than Mayow; he confused Hooke's and Mayow's theories of combustion, he gives too much credit to Lower (who was not a chemist); and he gives only a superficial treatment of the origin of the name 'nitrous air'." (15)

As we have seen earlier, Guerlac had already treated the issue of the origin of the term 'nitrous air'. Partington was familiar with Guerlac's paper (16), and his own brief suggestions as to the origin of the term are in good agreement with those of Guerlac, as we shall shortly see.

Partington additionally displayed concern that other historians of chemistry may follow Patterson's ideas uncritically, with the result that Mayow may indeed, as Patterson suggests, be relegated to the status of a "third rate scientist" - a view which Partington most strongly contested. The principal object his paper was to show that Mayow's views were not, as Patterson suggested, plagiarisations of his contemporaries' ideas and that many of his contributions were important for the history of chemistry. Partington cites 24 examples of these, with brief comments.

Additionally, Partington makes the most significant comment that no study of Mayow can give an objective appraisal of his achievements, unless it is backed by a thorough and systematic analysis of his works. This point was clearly stated at the end of the first section: "This article is in no way an adequate study of Mayow,..." (17), and notes in his concluding paragraph:

"In my opinion, there is room for a full and critical study of Mayow, based on an accurate knowledge of his writings, of those of his contemporaries (not confined to Boyle and Hooke), and of the philosophical ideas which underlie his theories. I have little doubt that such a study would reinstate Mayow as one of the outstanding experimenters and thinkers of his time, and would complete the brief sketch which I am now able to offer. I invite some younger man to undertake this work, with the conviction that it will be both interesting and valuable." (18)

Two further issues are relevant to the present study:-

- a) the origin of the expression 'nitrous air'
- b) a comment on Partington's own interpretation of some of Mayow's ideas.

In the first place, Partington points out a common misconception:

"It is widely believed that the theory of combustion of Mayow differs from that of Hooke only in the name of the active constituent of air, and that what Hooke afterwards called 'nitrous air' has the same meaning as the 'nitro-aerial spirit' of Mayow. There are two reasons for rejecting this idea." (19)

The two reasons suggested were that "Hooke and Mayow were on friendly terms after 1674" and that "Hooke's first use of the name 'nitrous air' is in 1682, after Mayow's publication". (20) According to Partington, the name 'nitrous air' had been used in a rather different but allied sense in 1651 by John French, who speaks of the:

"nitrous aire (for indeed as many judicious philosophers are of opinion, the air is wholly nitrous, as it appears by the condensation of it in cold places into Nitre)... this nitrous aire or vapour, before it be condensed, even when it is neer unto condensation, is acid." (21)

He used this idea to explain the formation of nitre in the earth. What Partington was apparently not aware of, was the fact that John French, as we have already shown, had been the translator of the first English edition of Sendivogius' *A New Light of Alchymie*. It is clear from French's Preface to this first edition, that he was very impressed with it:



"Now for the better understanding of them [i.e. divinity and philosophy, AZS], make use of most profound *Sandivogius* the author of the first of the ensuing Treatises, as the best Expositor of them: in that treatise of his thou shalt see the mystery of the Deity, and Nature unfolded, even to admiration as to see what that light and fire is which is the throne of God's Majesty.... Also the reason why Gold, which had a Seed put into it, as well as other creatures, whereby it should be multiplied, doth not multiply. What the obstruction is, and it may be removed that so it may be digested to the highest purity, and become the true Elixir, or Philosophers' Stone; the possibility whereof is so plainly illustrated in this book of *Sandivogius*, that let any judicious man read it over without all partiality and prejudice, but three or four times, and he shall *nolens volens* be convinced of the truth of it, and not only of this, but of many other mysteries as incredible as this. So that if anyone should ask me, What one book did most conduce to the knowledge of God and the Creature, and the mysteries thereof; I should speake contrary to my judgment, if I should not, next to the sacred Writ, say *Sandivogius*." (22)

It is thus very likely that French could have obtained his idea of a 'nitrous air' from *Sendivogius' A New Light of Alchymie*.

Partington admits that his own interpretation of Mayow's work is superficial, but he nevertheless concluded that it has considerable merit. He correctly points out that the difficulty in interpretation is caused by Mayow's contradictions, and by his inconsistent terminology. To illustrate his arguments, Partington cites 24 quotes from Mayow in section "X" of his paper. He comments on some of these passages, and uses them to illustrate some of Mayow's important conclusions and experiments. For reasons already stated, Partington does not subject the work to an in-depth analysis, but considers that the examples quoted, with annotations where relevant, are sufficient to prove his point:

"The foregoing discussion is intended to justify the opinion stated at the beginning that the publication of Patterson on Mayow is misleading and in part inaccurate..."

Although there is no doubt that Mayow's views were not always clear and that some were erroneous, they were a great advance on others of their time...

The achievements of Mayow, and his shortcomings as well had been clearly and concisely stated, long before Patterson's article.. and an objective and readable account of him and his work could well have replaced the violent and sometimes inaccurate article by Patterson." (23)

#### Summary

Without going into a detailed analysis of Mayow's work, Patterson has given strong arguments in support of Mayow's achievements. He has also indicated that only a detailed analysis of Mayow's work could give grounds for a qualified comment on its merit.

Additionally, he has suggested that the term 'nitrous air' was familiar to natural philosophers at least 20 years before Mayow had used it, and he refers to John French's work: *The Art of Distillation* (London, 1651) in which its mention occurs.

#### 4. "John Mayow and his Contemporaries", Walter Böhm, 1963.

Böhm opens his paper by stating clearly his views on Mayow's role in the history of chemistry. He considers that Mayow's nitro-aerial theory is: "...justifiably considered the forerunner of the oxygen theory of combustion as formulated by Lavoisier a hundred years later." (24) The first paragraph ends: "In particular, it still remains to emphasize the great superiority of Mayow's theories to those of his contemporaries and successors." (25)

The object of his paper then, was not to discuss the significance of Mayow's ideas, or to assess his contribution to the development of chemistry - the value of these was a foregone conclusion as far as Böhm was concerned - but, with the aid of an original 1668 edition

of the "Tractatus... De Respiratione..." which he had recently obtained,

"..to carefully analyse Mayow's views in their original form and to compare them with the more developed and detailed theory 'Tractatus quinque medico-physici...' of 1674 and with the views of his predecessors and contemporaries." (26)

Böhm stresses the extent to which Mayow was influenced by the Cartesian philosophy, and how it enabled him to make deductions concerning certain chemical processes such as combustion and respiration. Like Patterson, whose article he mentions on several occasions, Böhm notes that Mayow's theories were "first and mainly conceived speculatively" (27), and additionally had limited experimental support. "However", as Böhm immediately goes on to say, "the conclusions which we draw differ fundamentally." (28) He then points out that Patterson had disqualified Mayow from being a scientist because he had "...recognized a spirit predominantly on a speculative and metaphysical level." (29) In this respect Böhm disagreed strongly with Patterson's conclusion, as indeed did Partington. Böhm restates his views that "Compared with those of his contemporaries and immediate successors Mayow's theories represent a great scientific advance." (30)

In the paragraphs which follow, Böhm analyses in detail Mayow's use of particles in explanations, and also those of Lower, Willis, Hooke, Thruston and Boyle. He concludes that Mayow was the only one of the men of science mentioned, who believed that there were different types of particles with characteristic shapes, properties, and origins. Two of these were to be found in the air. He also

points out specific weaknesses in Boyle's arguments, in order to answer Patterson's repeated assertions that Boyle was a vastly superior logical thinker than Mayow.

Additionally, Böhm points out that Mayow, unlike any of his contemporaries, introduces the idea of particles combining to make compounds: "...he repeatedly uses the image of conjugal union." (31)

On the subject of nitre and its composition, Bohm writes that: "It must also be emphasized that Mayow correctly recognised the composition of saltpetre." (32) (This view coincides with that which I have expressed earlier.)

In the final two paragraphs, Böhm emphasizes the conclusions which he has reached:

"Mayow's theory is not only correct in its essentials, it is also on careful study, generally completely clear what is meant in each case and any indistinctness which may be present can be accounted for as due to the general lack of certain knowledge on this subject at that period." (33)

and "Mayow was undoubtedly the chemical genius of his era: his theory was the best possible one for the mentality of the times and Dr. Beddoes is absolutely right in ranging him at Newton's side." (34)

#### Summary

Both Partington and Böhm are in agreement with Patterson, that the earlier interpretations of Mayow's work by historians of chemistry such as Yeats, Gotch and Beddoes, had been uncritical and inaccurate. However, whereas Patterson went on to find reason to dismiss Mayow as a poor scientist on the basis of his apparent inconsistencies of logic and lack of originality, both Partington and Böhm are at pains to show that, within the conceptual framework of his times, Mayow's theories were

very original, and well in advance over those of any of his contemporaries. Thus, according to them, Mayow should be ranked among the great chemical philosophers of his time.

Unlike the works of Partington and Böhm, the present thesis does not include a comparative study of Mayow's work with those of his contemporaries. But also unlike Partington and Böhm's papers, the present thesis does subject four of Mayow's chapters to detailed study. The conclusions drawn from it have already shown that Mayow's work, when treated on its own merit, is indeed, of very high calibre.

##### 5. "The Paracelsian Aerial Nitre", A.G. Debus, 1964.

Debus mentions the controversy surrounding the assessment of Mayow's works, and correctly states that: "it has only been recently that attention has been focussed on Mayow's sources for his belief that there is a 'nitrous' part of the air that is requisite for both combustion and respiration." (35) Referring to Partington's and Guerlac's papers which we have already discussed, he notes that Partington had pointed out the similar views of Mayow's contemporaries and his immediate predecessors, whereas Guerlac had suggested that: "...the concept of a vital 'nitrous' part of the air is found in the writings of Michael Sendivogius..." (36) In Debus' opinion however, the concept of a nitrous spirit had already been developed to a certain extent by Paracelsus, and was subsequently further developed by his followers in the sixteenth and early seventeenth centuries. He therefore suggests that Paracelsus and his followers should be considered key

figures in the story, rather than Sendivogius or the English chemists.

The main point of Debus' argument is that the Paracelsian interpretation of nitre and its role in the cosmos was really much the same as that of Sendivogius and the Oxford chemists.

He discusses briefly the various concepts of air, pneuma, starry emanations, the role of nitre in thunder, and the principles of salt, sulphur, and mercury. He then concludes that: "Like many substances utilized by the alchemists, niter - a term which then included other salts besides potassium nitrate - had mystical as well as purely chemical meanings." (37) In the present thesis, I have provided evidence which suggests that Sendivogius' references to nitre were directed to one particular chemical substance. This remains true even though the term carried a different 'metaphysical' overtone for Sendivogius than the one it carried for Mayow, or that it may carry for the chemist today, since the overall frameworks within which each pursues his 'chemical' inquiries is different, as I have already discussed in the conclusion to Chapter Five. Furthermore, current historiography is likely to question whether the introduction of terms like 'occult', 'mystical', or even 'metaphysical' used in a perjorative sense, is helpful in understanding the science of the past.

Debus then continues:

"Both the chemical and the occult connotations are reflected in the work of Paracelsus. It is, of course, our common saltpeter, produced, as he said, from the union of urine and the universal natural balsam. But, he continued, no salt in the world is like this one through which many of the Arcana of alchemy may be brought about." (38)

Furthermore, Paracelsus' suggestion as to the origin and composition of nitre is also seen to be different from that of both Sendivogius and Mayow.

Debus then summarizes what he considers to be Paracelsus' four basic theories involving an aerial niter or nitrous salt or saltpeter, and subsequently argues that Du Chesne deserves to be considered alongside Sendivogius:

"...Professor Guerlac has already pointed to the *New Light of Alchemy* and the treatise on Sulphur ascribed to Sendivogius, but I would like to suggest that an earlier and perhaps equally influential source of this theory may be found in the work of the French iatrochemist Joseph du Chesne - or Quercetanus - in whose works a most interesting discussion of saltpeter may be found." (39)

Since I have already discussed Paracelsus', Du Chesne's and Sendivogius' contributions to this subject earlier, I feel that I have given sufficient evidence to show that their conclusions were very different. Indeed Debus himself suggests that:

"With Du Chesne in 1603 we are still far from the stage of modern experiment and observation, but we are also perhaps some distance on our journey from the mystical interpretation of life processes we met in the *Liber Azoth* and Paracelsus' Iliastic and Cagastric souls." (40)

This is absolutely correct.

Debus' statement further on that: "Sendivogius did not discuss the composition of saltpeter... as had the French Paracelsian." (41) is, however, open to correction. A careful reading of the *New Light of Alchymie* and Sendivogius' *Process on the Central Salt*, (the latter not considered by Debus), shows that Sendivogius did discuss the composition of nitre extensively, as we have seen in Chapter Five. His conclusions, unlike those of Du Chesne and other Paracelsians, were drawn from 'the fountaine of

manual experience'. They, like those of John Mayow which were in many ways similar, were based on the observations of chemical and natural phenomena, which were extensively described by both authors. It is for this reason that Du Chesne's findings cannot be considered side by side with those of either Sendivogius or Mayow as far as the chemical properties of nitre are concerned.

#### Summary

Debus has given an account of the origin and meaning of the term 'nitrous air', and of the role of nitre in the Paracelsian cosmology. He has pointed out that both of these terms were in use well before the times of John Mayow and Michael Sendivogius, and that philosophers who used them undoubtedly contributed to the development of our understanding of air and nitre and their chemistry.

Debus does not appear to have made an extensive study of Sendivogius' works however, and thus he has not recognised the extent of Sendivogius' involvement in the chemistry of nitre.

The conclusion reached by H. Guerlac ten years earlier that "...the theory of a life-preserving balsamic nitre, or nitrous spirit, in the air, was the work of the *Cosmopolite* and Sendivogius, developing their Paracelsian legacy." (42) is, in my opinion, a more accurate one than that reached by Debus.

#### 6. *Harvey and the Oxford Physiologists: A Study of Scientific Ideas*, R. Frank Jr., 1980.

This book is some 300 pages long, and contains additionally 50 pages of references. It contains 11



chapters, of which one is devoted to John Mayow's *Tractatus Quinque* and "a General Physiology of Active Particles", and another, entitled "Niter, Niter everywhere", contains a major section on Mayow's "Early Life and Tractatus Duo". Additionally, in the chapter on Robert Boyle, there is a section on "Early concepts of the Aerial Niter".

In Chapter 3 which is entitled "The Scientific Community in the Commonwealth and Restoration Oxford", Frank lists the 'major scientists', 'minor scientists' and 'virtuosi'. Every name in the list contains brief biographical details, and main fields of interest. There are 104 people listed altogether, of which 17 are major scientists, 46 are minor scientists and 41 are virtuosi. John Mayow appears as one of the 17 major scientists, and it is quite clear from the rest of his work, that Frank thought very highly of Mayow's achievements.

In the fifth chapter, Frank introduces the topic of air and its study by noting that until about 1640, no serious consideration had ever been given to air. It had simply been treated as one of the four Aristotelian elements, and therefore,

"...as late as 1640, air was considered an object so little worthy of inquiry that the writers of textbooks in natural philosophy, especially those reprinted for use in English universities, gave it only a few pages." (43)

Between 1640 and 1670 however, earlier ideas about air had become almost entirely abandoned, he claims, and air and 'airs' became the "focus of scientific concern".

In the section entitled "Early Concepts of the Aerial Niter", Frank notes that:

"Recent scholarship, especially the excellent work of

Guerlac, Partington, and Debus, has shown that, in contrast to the barrenness of early modern scholastic concepts of air, the chemical tradition arising out of Paracelsus contained diverse and complex speculations about the properties of the air." (44)

He summarizes the opinions of the three mentioned authors very effectively but, understandably, makes no additional contribution of his own. Furthermore, he mentions the achievements of Sendivogius, but only in a minor way, and in the light of recent studies, which are not yet available in English, rather inaccurately:

"Two other Hermetics, Alexander Seton (obit 1604) and Michael Sendivogius (1556-1636 or 1646) seem to have had rather clearer ideas of the aerial "niter". In Seton's *Novum Lumen Chymicum* (1604), he referred to a secret food of life in the air called dew. In the accompanying tract, *De Sulphure*, Sendivogius went on to point out the necessity of air to all animals, plants, and to the continued combustion of fire. In another widely separated passage, Sendivogius spoke of the waters of the dew as the source of the "Salt Peter of Philosophers". This dew, brought to earth, joined with the salt niter of the earth to give fecundity to plants. Although the explanation was cast in less mystical terms than most Paracelsian exegeses, the linkage of concepts was still quite weak." (45)

In the final three paragraphs of the chapter entitled "Niter, Niter everywhere", Frank writes about aerial niter. He suggests that this "...has claimed the attention of historians of science very largely because it has been seen by some as simply another name for oxygen." (46) This judgement is open to question, however, and the idea of an aerial nitre has undoubtedly played an important role in our understanding of the nature and functions of air. Of Mayow's contribution in this respect, Frank is very complimentary:

"The particular brilliance of Mayow... lay in perceiving not only that the properties of an aerial nitrous substance could solve important problems in physiology, but that in doing so one could draw more general conclusions about the active component of the air." (47)

Frank summarizes the development of Mayow's ideas in the tenth chapter which is primarily concerned with the *Tractatus Quingue*. He correctly states that this work was split into two main sections:

"In the first, Mayow developed in great chemical and physical detail the idea of active nitro-aerial particles and their ubiquitous function in the properties and transformations of matter. In the second theme, Mayow used the characteristics of his nitro-aerial particles to fill in, more forcefully and with greater clarity, the physiological system he had sketched out in the 'De Respiratione' of 1668." (48)

On pages 259 to 261 Frank explains how Mayow developed the idea of nitro-aerial particles as his "...*primum mobile* of the physical world." (49) He first explains how Mayow cleverly devised igneo-aerial particles, as a tool which enabled him to "...account for the properties of flame, of air, of niter, and of nitric acid..." (50), and then suggests that because these particles were present in both nitre and in nitric acid, "...he felt justified in giving them their proper name..." (51), which was - 'nitro-aerial' particles.

Frank's overall assessment of Mayow's contribution to the natural sciences was very positive:

"Mayow's brilliant exposition of the relationship between combustion, respiration, air pressure, and nitro-aerial particles, as well as the experiments with which he demonstrated his ideas, is an unsurpassed example of rigorous logic applied to an almost non-truth." (52).

Of his overall contributions to his system of thinking, Frank wrote:

"He integrated them into a system of relations whose similarities to modern ideas of oxygen, combustion and respiration have made Mayow an object of fascination to generations of historians of chemistry." (53)

The time has come for Mayow to cease being just 'an

object of fascination' - he should be honoured as unquestionably one of the great natural philosophers.

#### Notes

1. T.S.Patterson, "John Mayow in Contemporary Setting. A Contribution to the History of Respiration and Combustion", *Isis* 15 (1931), 50, lines 6-8.
2. *ibid.*, 50, lines 19-22.
3. *ibid.*, 53, lines 34-37.
4. *ibid.*, 53, lines 53-54.
5. *ibid.*, 532, lines 8-11.
6. *ibid.*, 533, lines 1-6.
7. H. Guerlac, "John Mayow and the Aerial Nitre: Studies in the Chemistry of John Mayow - 1", *Actes du Septième Congrès d'Histoire des Sciences* (Jerusalem, 1953), 332, lines 6-9.
8. *ibid.*, 333, lines 33-35.
9. *ibid.*, 333, lines 23-25.
10. *ibid.*, 339, lines 22-23.
11. *ibid.*, 338, lines 41-43.
12. *ibid.*, 341, lines 32-41; 342, lines 1-2.
13. *ibid.*, 342, lines 14-17.
14. J. Partington, *A History of Chemistry* (London, 1969) vol.2. Chapter XVI, pp.577-614, is about Mayow and his works.
15. J. Partington, "The Life and Work of John Mayow (1641-1679)" *Isis* 47 (1956), 217, lines 25-31.
16. *ibid.*, 227 note 60. "Since this paper was first written (in April 1954) I have seen the paper by H.Guerlac, *Actes du 7 Congrès Internat. d'Histoire des Sciences* (Jerusalem, 1953), pp.332-49; see also *Isis*, 1954, 45: 243, in which he draws attention to publications by Digby and Sendivogius which I think very pertinent;"
17. *ibid.*, 218, lines 23-24.
18. *ibid.*, 417, lines 1-8.
19. *ibid.*, 228, lines 36-37; 229, lines 1-2.
20. *ibid.*, 229, lines 19-20.

21. *ibid.*, 229, lines 21-25.
22. M. Sendivogius, *A New Light of Alchymie* (London, 1650), Preface entitled: "To the Reader".
23. J. Partington, *op.cit.*, 416, lines 11-41.
24. W. Böhm, "John Mayow and His Contemporaries", *Ambix* 11, (1963), 105, lines 2-4.
25. *ibid.*, 105, lines 9-11.
26. *ibid.*, 105, lines 12-26.
27. *ibid.*, 106, lines 28-30.
28. *ibid.*, 106, line 30.
29. *ibid.*, 107, lines 2-3.
30. *ibid.*, 107, lines 7-8.
31. *ibid.*, 115, line 39.
32. *ibid.*, 117, lines 28-29.
33. *ibid.*, 119, lines 27-30.
34. *ibid.*, 120, lines 19-21.
35. A. Debus, "The Paracelsian Aerial Niter", *Isis* 55, (1964), 43, lines 8-10.
36. *ibid.*, 43, lines 14-15.
37. *ibid.*, 46, lines 8-11.
38. *ibid.*, 46, lines 11-15.
39. *ibid.*, 51, lines 23-28.
40. *ibid.*, 54, lines 20-24.
41. *ibid.*, 56, lines 13-15.
42. H. Guerlac, "John Mayow and the Aerial Nitre: Studies in the Chemistry of John Mayow - 1", *Actes du Septième Congrès d'Histoire des Sciences* (Jerusalem, 1953), 341, lines 35-37.
43. R. Frank Jr., *Harvey and the Oxford Physiologists* (University of California Press, 1980), 50, lines 7-10.
44. *ibid.*, 117, lines 37-40.
45. *ibid.*, 119, lines 19-28.

46. *ibid.*, 243, lines 40-41.
47. *ibid.*, 244, lines 36-39.
48. *ibid.*, 259, lines 18-23.
49. *ibid.*, 261, lines 42-43.
50. *ibid.*, 261, lines 4-5.
51. *ibid.*, 261, lines 7-8.
52. *ibid.*, 267, lines 3-7.
53. *ibid.*, 274, lines 23-26.

## Conclusion

The work presented in the thesis has attempted to show that our understanding of air and its chemical composition and properties emerged from a historical development which spans many centuries. Its history includes the work of two natural philosophers: Michael Sendivogius and John Mayow. Their important contributions in the field described can be summarized respectively as follows:

Sendivogius, through the wide influence of his works, played a major role in focusing the field of alchemical pursuits towards a study of air and its role in combustion and respiration.

Through the use of his particulate theory involving nitro-aerial and igneo-aerial particles, which he related to a wide variety of chemical phenomena and experiments, John Mayow made great advances in our understanding of the role of air in combustion and in physiological processes.

Additionally, it has been shown that Sendivogius' grand theory, centred on nitre and its chemical properties, may have contributed to the development of Mayow's synthesis.

The example which we have selected for the present study, is just one from a vast selection of topics in the history of science. It has shown that a commonly known and accepted fact i.e. air is a mixture of two principal gases, oxygen and nitrogen, and that oxygen is necessary for combustion and respiration, had a long and complex prehistory.

## APPENDIX

The Appendix is divided into several sections, which contain bibliographical information and my summaries and translations of some of Sendivogius' works.

### Section page Contents

- A 256 The French Editions.
- B 268 *Treatise on the Philosophers' Stone* - a summary.
- C 282 Editions of *Harmony*.
- D 286 Editions of the *Treatise on Salt*.
- E 289 *Treatise on Salt* - a translation of some parts and a summary of others.
- 289 Preface and Contents - translation.
- 290 Chapter 1 - translation.
- 293 Chapter 2 - translation.
- 299 Chapters 3 to 8 - a translation of the summaries which are entitled "Discourse translated from verse".
- 301 Recapitulation - a summary.
- 303 Dialogue of the Vision and the Alchemist - translation.
- F 316 *Process on the Central Salt* - a summary.
- G 322 *Statutes for a Society of Unknown Philosophers* - translation.
- H 345 *Operations on the Philosophical Elixir* - a summary.

Note: All summaries, except the "Recapitulation" from the *Treatise on Salt*, have been made on the basis of Bugaj's 1971 Polish edition, *Traktat o Kamieniu Filozoficznym*. All translations, and the summary of the "Recapitulation", are from the 1691 French edition of *Les Oeuvres du Cosmopolite*.



## Appendix A - The French Editions

These are listed in order of first known publication date.

The following information is given for each edition:

- (a) Date, publisher, place of publication,
- (b) References. These are indicated by means of a number which denotes the bibliographical source, and volume and/or page references which follow in brackets. Editions which are known to me from first hand experience are additionally denoted by an asterisk. The following bibliographic sources are used:
  1. Bibliotheca Esoterica, Paris, 1940. (Fascimile reprint in 1988).
  2. Bibliothèque Nationale Catalogue.
  3. Bolton, H.C. *A select bibliography of chemistry 1492-1892*, Washington, 1893.
  4. British Library Catalogue.
  5. Bugaj, R. *Michał Sędziwój (1566-1636) Życie i Pisma*, Warszawa, 1968.
  6. Caillet, A. *Manuel bibliographique des Sciences Psychiques ou Occultes*, Paris, 1912.
  7. Ferguson Collection Catalogue, Glasgow, 1943.
  8. Dufresnoy, L. *Histoire de la Philosophie Hermetique*, Paris, 1742.
  9. Duveen, D. *Bibliotheca Chemica et Alchemica*, London, 1949.
  10. Estreicher, K. *Bibliografia Polska*, Kraków, 1929.
  11. Ferguson, J. *Bibliotheca Chemica*, Glasgow, 1906.
  12. National Union Catalog Pre-1965 Imprints.
  13. Wellcome Institute Catalogue.
- (c) General Title. The full text of the title page is given.
- (d) List of titles of the works included in the volume. These are given in the order in which they appear. Details of title pages are given where appropriate.
- (e) Additional information or notes, if applicable.

The French editions of works by Michael Sendivogius

- 1.(a) 1609, Ieremie Perier, Paris.  
(b) 1 (472), 2 (170, 519), 4\*, 5 (285), 6 (3, 517), 8 (3, 141), 10 (27, 336), 11 (2, 368), 13\*.  
(c) *COSMOPOLITE OV NOUVELLE LVMIERE de la Phisique naturelle. Traittant de la constitution generale des Elemens simples & des composez. Traduit nouvellement de LATIN EN FRANÇOIS. A PARIS, Chez Iérémie Périer, tenant sa boutique sur les petits degrez de la grand salle du Palais. M.DC.IX.*  
(d) *DE LA NATVRE EN GENERAL.* (30 pages)
- 2.(a) 1612, Paris.  
(b) 5 (285).  
(c) *Cosmopolite, ou Nouvelle Lumiere de la Phisique*

*naturelle traittant de la constitution generale, des elemens simples et des composees.*

(d) Details are not available, but the title will almost certainly have been the same as the one above.

3.(a) 1618, Sebastian Chapelet, Paris.

(b) 5 (288), 10 (27, 336).

(c) *Cosmopolite ou nouvelle lumiere de la Physique naturelle, traduit par Bosnay et imprimé à la Haye, avec le Traité du sel de Nuysement. Imprimé à Paris chez Seb. Chapelet 1618.*

(d) Estreicher only informs us that the first work is 103 sides long.

4.(a) 1618, Abraham Pacard, Paris.

(b) 1 (472), 2 (170, 520), 5 (287), 6 (3, 517), 12 (538, 227)\*.

(c) *COSMOPOLITE OV NOUVELLE LVMIERE de la Physique naturelle. Traictant de la constitution generale des Elements simples & des composez. Traduit nouvellement de LATIN EN FRANÇOIS. Par le Sieur DE BOSNAY. A PARIS. Chez ABRAHAM PACARD, rue saint Iacques, au sacrifice d'Abraham. M.DC.XVIII.*

(d) *De La Nature en General.* (105 sides)

5.(a) 1618, Abraham Pacard, Paris.

(b) 2 (170, 522), 5 (288), 7 (646), 9 (542), 10 (27, 340), 12 (538, 229).

(c) *Traicte du Soulphre, Second Principe de Nature. Faict par le mesme Autheur, qui par cy devant a mis en lumiere le premier Principe, intitulé le Cosmopolite. Traduit de Latin en François par F. Guiraud, Docteur en Medecine. Avec plusieurs autres Opuscles du mesme sujet. A Paris. Chez Abraham Pacard, ruë S. Iacques, au sacrifice d'Abraham. M.DC.XVIII.*

(d) *Traicte du Soulphre.* (89 sides)

*Oeuvre Royal de Charles VI Roy de France.* (18 sides)

*Thresor de Philosophie ou Original de Desir Desire de Nicolas Flamel.* (43 sides)

6.(a) 1618, Abraham Pacard, Paris.

(b) 4\*.

(c) *COSMOPOLITE OV NOUVELLE LVMIERE de la Physique naturelle. Traictant de la constitution generale des Elements simples & des composez. Traduit nouvellement de LATIN EN FRANÇOIS. Par le Sieur DE BOSNAY. A PARIS. Chez ABRAHAM PACARD, ruë saint Iacques, au sacrifice d'Abraham. M.DC.XVIII.*

(d) *De la Nature en General.* (pp.1-103)

*TRAICTE DV SOVLPHRE SECOND PRINCIPE DE NATVRE. FAICT PAR LE MESME Autheur, qui par cydeuant a mis en lumiere le premier Principe, intitulé le Cosmopolite. Traduit de Latin en François par F. GVIRAUD, Docteur en Medecine. Avec plusieurs autres Opuscles du mesme Sujet. A PARIS.*

Chez ABRAHAM PACARD, ruë S. Iacques, au sacrifice  
d'Abraham. M.DC.XVIII. (pp.1-89)

OEUVRE ROYALLE, DE CHARLES VI. ROY DE FRANCE.  
(pp.90-109)

THRESOR DE PHILOSOPHIE, OV ORIGINAL DV DESIR DESIRÉ  
de Nicolas Flamel. LIVRE TRES-EXCELLENT, contenant  
l'ordre & la voye qu'a obserué ledit Flamel en la  
composition de l'oeuvre Physique, comprise sous ses  
figures hieroglyphiques. Extract d'un ancien  
Manuscrit. (pp. 113-152)

TRAITTEZ DE L'HARMONIE ET CONSTITUTION GENERALE DV VRAY  
SEL, secret des Philosophes, & de L'ESPRIT vniuerselle du  
Monde, suiuant le troisieme Principe du Cosmopolite.  
OEUVRE NON MOINS CVRIEVX que profitable, traittant de la  
cognoissance de la vraye medecine Chimique. Recueilly par  
le sieur de NUISEMENT, Receueur general du Comte de  
Ligny en Barrois. A PARIS. Chez IEREMIE PERIER ET ABDIAS  
BVISARD, tenant leur boutique à la Cour du Palais vers  
les Horlogers. M.DC.XXI. Avec PRIVILEGE DV ROY.  
(pp. 1-334)

POEME PHILOSOPHIC DE LA VERITÉ DE LA PHISIQUE MINERALLE.  
OV Sont refutees les obiections que peuent faire les  
incredules & ennemis de cet Art. Auquel est naifusement &  
veritablement depeinte la vraye matiere des Philosophes.  
Par le Sieur de NUISEMENT, Receueur general du Comte de  
Ligny en Barrois. DEDIE A TRES-HAUT, TRES-UISSANT & Tres  
Vertueux Prince, Monseigneur le Duc de Lorraine & de Bar,  
&c. A PARIS, Chez IEREMIE PERIER & ABDIAS BUISARD, à la  
place Dauphine, pres de Palais, au Bellerophon. M.DC.XX.  
Avec Priuilege du Roy. (pp. 1-80)

RAISONNEMENS PHILOSOPHIQUES. Touchant la Salûre, Flux &  
reflux de la Mer, & l'origine des Sources, tant des  
Fleues que des Fontaines. Par NICOLAS PAPIN, Medecin de  
la Ville de Blois. Ausquels est adiouste un Traicté de la  
Lumiere de la Mer, composé par le mesme Autheur. A BLOIS  
Par FRANCOIS DE LA SAVGERE, Imprimeur du Roy, de son  
Altesse Royale & de la Ville, 1647. (pp. 1-107)

LA MER LUMINEUSE OU TRAICTE DE LA LUMIERE DE LA MER. Par  
NICOLAS PAPIN, D.M. (pp. 111-156)

- 7.(a) 1620, Perier, Paris.  
(b) 8 (3, 249).  
(c) La Table d'Hermes expliquée par Sonnets, avec  
son Traite du Sel, imprimé en Fland. Paris, chez Perier.  
1620.
- 8.(a) 1621, Ieremie Perier et Abdias Buisard, Paris.  
(b) 9 (437).  
(c) Poème Philosophic de la Verité de la Phisique  
Mineralle, Ou sont refutees les obiections que peuent  
faire les incredules & ennemis de cet Art. Auquel est  
naifusement & veritablement depeinte la vraye matiere des

Philosophes... A Paris, Chez Ieremie Perier & Abdias Buisard, à la place Dauphine, près de Palais, au Bellerophon. 1620. Avec priuilege du Roy.

(d) Poeme Philosophic... (80 sides)

Traitez De L'Harmonie, Et Constitution Generale du Vray Sel, Secret des Philosophes, & de l'Esprit universel du Monde, suivant le troisieme Principe du Cosmopolite. Oeuvre non moins curieux que profitable, traittant de la cognoissance de la vraye medecine Chimique. Recueilly par le sieur de Nuisement, Receueur general du Comté de Ligny en Barrois. A Paris. Chez Ieremie Perier et Abdias Buisard, tenant leur boutique a la Cour du Palais vers les Horlogers. 1621. Avec Privilege Du Roy. (332 sides)

9.(a) 1621, Ieremie Perier et Abdias Buisard, Paris.

(b) 2 (71, 799), 6 (3, 194), 7 (499), 11 (2, 148).

(c) Traitez du Vray sel, Secret des Philosophes et de l'Esprit General du Monde Contenant en son interieur les trois Principes naturels, selon la doctrine d'Hermes. Par le sieur de NUISEMENT, receueur General au Comté de Ligny en Barrois.

(d) Premier Traicte de l'Esprit general du monde.

(pp.1-62) Deuxieme livre. Que l'Esprit du monde prend corps, et comment il se corporise. (pp.63-304) Troisieme livre. (pp.305-323)

10.(a) 1621, Ieremie Perier et Abdias Buizard, Paris.

(b) 3 (1020-1021), 13\*.

(c) TRAITTEZ DV VRAY SEL, SECRET DES PHILOSOPHES ET DE L'ESPRIT GENERAL DV MONDE. Contenant en son interieur les trois Principes naturels, selon la doctrine de Hermes. Oeuvre très-utile & necessaire à quiconque desire arriuer à la parfaite prattique de ce pretieux Elixir ou Medecine vniuerselle, tant celebrée des anciens, recogneuë & experimentée. Par le sieur de NUISEMENT, receueur General au Comté de Ligny en Barrois. A PARIS, Chez IEREMIE PERIER & ABDIAS BVIZARD, en la Cour du Palais, vers les Horlogers. M.DC.XXI. Avec Priuilege du Roy.

(d) Premier Traicte de l'Esprit general du monde.

(pp.1-62) Deuxieme livre. Que l'Esprit du monde prend corps, et comment il se corporise. (pp.63-304) Troisieme livre. (pp.305-323)

POÈME PHILOSOPHIC DE LA VERITE DE LA PHISIQVE MINERALLE. OV Sont refutees les obiections que peuuent faire les incredules & ennemis de cet Art. Auquel est naifusement & veritablement depeinte la vraye matiere des Philosophes. Par le Sieur de NUISEMENT, Receueur general du Comte de Ligny en Barrois. DEDIE A TRES-HAUT, TRES-UISSANT & Tres Vertueux Prince, Monseigneur le Duc de Lorraine & de Bar, &c. A PARIS, Chez IEREMIE PERIER & ABDIAS BUISARD, à la place Dauphine, près de Palais, au Bellerophon. M.DC.XX. Avec Priuilege du Roy. (pp.1-80)

11.(a) 1621, Ieremie Perier et Abdias Buisard, Paris.

(b) 13\*.

(c) *TRAITTEZ DE L'HARMONIE ET CONSTITVTION GENERALE DU VRAY SEL, secret des Philosophes, & de L'ESPRIT Vniuersell du Monde, suiuant le troisiemes Principe du Cosmopolite. OEVVRE NON MOINS CVRIEUX que profitable, traittant de la cognoissance de la vraye medecine Chimique. Recueilly par le sieur de NUISEMENT, receueur general du Comté de Ligny en Barrois. A PARIS. Chez IEREMIE PERIER ET ABDIAS BUISARD, tenant leur boutique à la Cour du Palais vers les Horlogers. M.DC.XXI. AVEC PRIVILEGE DU ROY.*

(d) *Premier Traicte de l'Esprit general du monde.*

(pp.1-62) *Deuxieme livre. Que l'Esprit du monde prend corps, et comment il se corporise.* (pp.63-304) *Troisieme livre.* (pp.305-323)

12.(a) 1628, Pierre Billaine, Paris.

(b) 5 (290), 10 (27, 340).

(c) *Traicté du Souldphre, Second Principe de Nature. Faict par le mesme auther, qui par cy deuant a mis en lumiere le premier principe, intitulé: "le Cosmopolite". Traduit de Latin en François par F. Guiraud, Docteur en Medecine. Auec plusieurs autres opuscles de mesme sujet. A Paris, chez Pierre Billaine, rue S. Jacques, a la bonne Foy, deuant S. Vue M.DC.XXVIII.*

(d) *Traicté du Souldphre and four other works.*

(e) According to Estreicher's bibliography this treatise appeared with four further alchemical works, one of which was by Roger Bacon. These would undoubtedly have been the same four which appeared with the 1629 edition described below. In quoting this edition, Bugaj himself was not sure whether or not Estreicher had made an error in the date. In his note on this edition he writes: "Pomyłka Estreichera? Por. nr.37" (Estreicher's error? See ref. 37) From the other evidence available i.e. both a 1628 and a 1629 edition for the main work, I do not see any reason why there should not have also been a 1628 and a 1629 edition of the *Traicté du Souldphre*.

13.(a) 1628, Pierre Billaine, Paris.

(b) 4\*.

(c) *COSMOPOLITE OV NOUVELLE LVMIERE de la Phisique naturelle. Traitant de la constitution generale des Elements simples & des composez. Traduit nouuellement de LATIN EN FRANÇOIS. Par le sieur DE BOSNAY. A PARIS, Chez PIERRE BILLAINE, ruë S. Iacques à la Bonne Foy, deuant S. Yues. M.DC.XXVIII.*

(d) *DE LA NATVRE EN general.* (pp.1-103)

*TRAICTE DV SOVLPHRE, SECOND PRINCIPE DE NATVRE. FAICT PAR LE MESME Auther, qui par cy deuant a mis en lumiere le premier Principe, intitule le Cosmopolite. Traduit de Latin en François par F. GVIRAUD, Docteur en Medecine. Auec plusieurs autres Opuscles du mesme sujet. A PARIS, Chez PIERRE BILLAINE, rue S. Iacques, à la bonne Foy, dauant S. Yue. M.DC.XXVIII. (pp.1-89)*

THRESOR DE PHILOSOPHIE OV ORIGINAL DV DESIR DESIRÉ de  
Nicolas Flamel. LIVRE TRES EXCELLENT. contenant l'ordre &  
la voye qu'a obserue ledit Flamel en la composition de  
l'oeuvre Physique, comprise sous ses figures  
hieroglyphiques. Extraict d'vn ancien Manuscrit.  
(pp.113-152)

ROGER BACHON DE L'ADMIRABLE POUVOIR ET PVISSANCE de l'Art  
& de Nature, où est traicté de la pierre Philosophale.  
Traduit en Francois par IACQVES GIRARD de TOVRNVS. A  
PARIS chez PIERRE BILLAINE, rue S. Iacques, à la Bonne  
Foy, deuant S. Yves. M.DC.XXVIII. Auec priuilege du  
Roy. (pp.1-63)

L'ART TRANSMVTATOIRE DV PAPE IEAN XXII DE CE NOM.  
(pp.1-39)

- 14.(a) 1629, Pierre Billaine, Paris.  
(b) 5 (290), 6 (3, 517), 10 (27, 340), 11 (2, 367),  
12 (538, 227, 229), 13\*.

(c) COSMOPOLITE OV NOUVELLE LVMIERE de la Phisique  
naturelle. Traittant de la constitution generale des  
Elements simples & des composez. Traduit nouvellement  
de LATIN EN FRANÇOIS. Par le sieur DE BOSNAY. A PARIS,  
Chez PIERRE BILLAINE, rue S. Iacques, a la Bonne Foy,  
deuant S. Yves. M.DC.XXVIII.

(d) DE LA NATVRE EN GENERAL. (pp.1-103)

TRAICTÉ DV SOVLPHRE, SECOND PRINCIPE DE NATVRE. FAICT  
PAR LE MESME Autheur, qui par cy deuant a mis en lumiere  
le premier Principe, intitule le Cosmopolite. Traduit de  
Latin en François par F. GVIRAUD, Docteur en Medecine.  
Auec plusieurs autres Opuscules du mesme sujet. A PARIS,  
Chez PIERRE BILLAINE, ruë S. Iacques, à la bonne Foy,  
deuant S. Yue. M.DC.XXVIII. (pp.1-89)

THRESOR DE PHILOSOPHIE OV ORIGINAL DV DESIR DESIRÉ de  
Nicolas Flamel. LIVRE TRES EXCELLENT. contenant l'ordre &  
la voye qu'a obserué ledit Flamel en la composition de  
l'oeuvre Physique, comprise sous ses figures  
hieroglyphiques. Extraict d'vn ancien Manuscrit.  
(pp.113-152)

(e) Ferguson's copy of this edition had two further works:  
"Appended, with separate signatures and pagination, are:  
Roger Bachon, De l'Admirable Pouvoir et Puissance de  
l'Art & de Nature, où est traicté de la pierre  
Philosophale. Traduit en François par Iacques Girard de  
Tournus, pp. 63; and Jean XXII., L'Art Transmutatoire,  
pp. 39(1 blank)."

Bugaj has listed this volume as having gone through  
two separate editions, numbers 37 and 38, in his list.  
There is insufficient evidence available from the  
reference works consulted to suggest that the two works

were bound separately. Additionally, Caillet has confused this edition with the 1629 Hulpeau one. He incorrectly gives the cross-reference "R.32432" for the Bibliothèque Nationale Catalogue.

- 15.(a) 1629, Charles Hulpeau, Paris.  
(b) 1 (472), 2 (170, 520, 522), 8 (3, 141), 9 (543),  
12 (538, 227, 229)\*.  
(c) COSMOPOLITE OV NOUVELLE LUMIERE de la Phisique naturelle. Traittant de la constitution generale des Elements simples & des composez. Traduit nouvellement de LATIN EN FRANÇOIS. Par le sieur DE BOSNAY. A PARIS, Chez CHARLES HVLPEAV, sur le Pont S. Michel, à l'Ancre Double: Et en sa Boutique dans la grand Sale du Palais contre le Parquet. 1629.  
(d) De la Nature en General. (103 sides)

TRAICTÉ DV SOVLPHRE, SECOND PRINCIPE DE NATURE. FAICT PAR LE MESME Autheur, qui par cy deuant a mis en lumiere le premier Principe, intitulé le Cosmopolite. Traduit de Latin en François par F. GVIRAVD, Docteur en Medecine. Auec plusieurs autres Opuscules du mesme sujet. A PARIS, Chez CHARLES HVLPEAV, sur le Pont S. Michel à l'Ancre Double: En sa Boutique dans la grand' Salle du Palais contre le Parquet. M.DC.XXVIII. (89 sides)

OEUVRE ROYALLE, DE CHARLES VI. ROY DE FRANCE. (pp.91-109)

THRESOR DE PHILOSOPHIE OV ORIGINAL DV DESIR DESIRÉ de Nicolas Flamel. LIVRE TRES-EXCELLENT. contenant l'ordre & la voye qu'a obserué ledit Flamel en la composition de l'oeuvre Physique, comprise sous ses figures hieroglyphiques. Extrait d'vn ancien Manuscrit. (pp. 111-152)

- 16.(a) 1639, Theodore Maire, The Hague.  
(b) 2 (170, 520), 5 (290-291)\*, 6 (3, 193-194, 516),  
7 (499, 646), 9 (437-438), 11 (2, 148, 368),  
12 (538, 227, 229).  
(c) OEUVRE DE LA PHYSIQUE NATURELLE. CONTENANT LES TROIS PRINCIPES DES PHILOSOPHES. A LA HAYE, De l'Imprimerie de THEODORE MAIRE. M.DC.XL.  
The reverse of the title page reads:  
CONTENANT du Traitez de l'Oeuvre.  
I. Le Cosmopolite ou Nouvelle lumiere de la Physique Naturelle, traictant du vray Mercure des Philosophes.  
II. Traicté du Souldphre des Philosophes, second Principe de Nature.  
III. Traictez de l'Esprit Vniuersel du Monde, ou l'harmonie & constitution generale du vray Sel des Philosophes, suivant le troisiéme Principe du Cosmopolite.  
De plus, le Poëme Philosophic de la Verité de la Phisique Minerale.  
There then follows a TABLE DES CHAPITRES du premier Traicté de l'Esprit general du monde. on the next page followed by a TABLE Du Second Traicté. on its reverse. The third title page then follows:

COSMOPOLITE OU NOUVELLE LUMIERE DE LA PHISIQUE NATURELLE. Traittant de la constitution generale des Elements simples & des composez. Traduit nouvellement de Latin en François par le sieur DE BOSNAY. A LA HAYE, De l'Imprimerie de THEODORE MAIRE. M.DC.XXXIX.

(d) DE LA NATURE en general. (pp.1-58)

TRAICTÉ DU SOVLPHRE, SECOND PRINCIPE DE NATURE. Faict par le mesme Autheur, qui par cy devant a mis en lumiere le premier Principe, intitulé le Cosmopolite. Traduit de Latin en Francois, par F.GVIRAVD, Docteur en Midecine. Avec plusieurs autres Opuscules du mesme sujet. A LA HAYE, De l'Imprimerie de THEODORE MAIRE. M.DC.XXXIX.

TRAITTEZ DE L'HARMONIE, ET CONSTITUTION GENERALE DV VRAY SEL, Secret des Philosophes, & de l'Esprit universelle du monde, suivant le troisieme Principe du Cosmopolite. OEuvre non moins curieux que profitable, traittant de la cognoissance de la vraye medecine Chimique. Recueilly par le sieur de NUISEMENT. Receveur General du Comte de Ligny en Barrois. A LA HAYE, De l'Imprimerie de THEODORE MAIRE. M.DC.XXXIX.

POÈME PHILOSOPHIC DE LA VERITÉ DE LA PHYSIQUE MINERALLE. Où sont refutées les objections que peuvent faire les incredules & ennemis de cet Art. Auquel est naïfvement & veritablement depeinte la vraye matiere des Philosophes. Par le Sieur de NUISEMENT, Receveur general du Comté de Ligny en Barrois. DEDIÉ A TRES-HAUT, TRES-UISSANT, & Tres-Vertueux Prince, Monseigneur le Duc de Lorraine & de Bar, &c. A LA HAYE, De l'Imprimerie de THEODORE MAIRE. M.DC.XXXIX.

17.(a) 1659, A.Vlacq, The Hague.

(b) 2 (170, 518; 171, 373), 12 (538, 227).

(c) Lettre Philosophique; translátée d'aleman en françois, par Antoine du Val. La Haye, A.Vlacq, 1659.

18.(a) 1669, Jean d'Houry, Paris.

(b) 1 (473).

(e) The work is listed under catalogue no. 4546, and the information given about it is: "Le même ouvrage, [as no. 4545, which corresponds with the next edition in the present list] mais ne contenant que les deux premiers traités, en un vol. in-12, vélin ancien." [The same work, but containing only the first two treatises, in one vol. 12mo, old vellum.]

19.(a) 1669, Jean d'Houry, Paris.

(b) 2 (170, 520-521), 5 (294), 6 (3, 517), 7 (646), 9 (544), 11 (2, 368), 12 (538, 226), 13\*.

(c) LES OEUVRES DV COSMOPOLITE. Diuisez en trois Parties.

The second title page reads:

TROIS TRAITTEZ, Dans lesquels sont expliquez les trois Principes de la Physique Naturelle.

I. Traite du Mercure des Philosophes

II. Traite du Soulphre des Philosophes



III. Traite du vray Sel des Philosophes, nouvellement mis au jour. Ausquels a este adjoute, Vne lettre missive tres-curieuse, tiree de la Bibliotheque du sieur de Loberye, personnage très-verse en cette science.

The third title page reads:

COSMOPOLITE OU NOUVELLE LVMIERE CHIMYQVE, Divisez en douse Traitez. Avec un Dialogue du Mercure, de l'Alchymiste, & de la Nature. Reveuz & fidelement corrigez sur les plus anciens Exemplaires. A PARIS, Chez IEAN D'HOVRY, à l'Image S.IEAN, au bout du Pont-neuf, sur le Quay des Augustins. M.DC.LXIX. AVEC PRIVILEGE DV ROY.  
(d) DE LA NATVRE EN GENERAL. (pp.1-118)

TRAITE DV SOVLPHRE SECOND PRINCIPE de la Nature. Exactement reUeu & corrige. A PARIS, Chez IEAN D'HOVRY, à l'Image S.IEAN, au bout du Pont-neuf, sur le Quay des Augustins. M.DC.LXIX. (pp.1-105)

TRAITE DV SEL. TROISIEME PRINCIPE des choses minerales. De nouveau mis en lumiere. A PARIS, Chez IEAN D'HOVRY, à l'Image S.IEAN, au bout du Pont-neuf, sur le Quay des Augustins. M.DC.LXIX. (pp.1-87)

LETTRE MISSIVE, Contenant LA VIE DE SENDIVOGIVS.

(e) The letter has no page numbers but is 18 sides long. It is signed at the end: "POLIARCO MICIGNO Le 20 mars 1661."

20. (a) 1669, Jean d'Houry, Paris.

(b) 2 (170, 521), 5 (294), 12 (538, 227), 13\*.

(c) LES OEUVRES DV COSMOPOLITE, Divisez en trois Parties.

The second title page reads:

TROIS TRAITTEZ, Dans lesquels sont expliquez les trois Principes de la Philosophie Naturelle.

I. Traite du Mercure des Philosophes.

II. Traite du Souldphre des Philosophes.

III. Traite du vray Sel des Philosophes, nouvellement mis au jour.

Ausquels a este adjoute. Une Lettre Philosophique Traduite d'Alleman en Francois, par ANTOINE DV VAL.

The third title page reads:

COSMOPOLITE OV NOUVELLE LVMIERE CHIMYQVE, Divisée en douse Traitez. Avec un Dialogue de Mercure, de l'Alchymiste, & de la Nature. Reveuz & fidelement corrigez sur les plus anciens Exemplaires. A PARIS, Chez IEAN D'HOVRY, à l'Image S.Iean, au bout du Pont-neuf, sur le Quay des Augustins. M.DC.LXIX. AVEC PRIVILEGE DV ROY  
(d) DE LA NATVRE EN GENERAL. (pp.1-118)

TRAITE DV SOVLPHRE, SECOND PRINCIPE de la Nature. Exactement reueu & corrige. A PARIS, Chez IEAN D'HOVRY, a l'Image S.Iean, au bout du Pont-neuf, sur le Quay des Augustins. M.DC.LXIX. AVEC PRIVILEGE DV ROY. (pp.1-105)

TRAITE DV SEL. TROISIEME PRINCIPE des choses minerales. De nouveau mis en lumiere. A PARIS, Chez IEAN D'HOVRY, a l'Image S.Iean, au bout du Pont-neuf, sur le Quay des Augustins. M.DC.LXIX. AVEC PRIVILEGE DV ROY. (pp.1-87)

LETTRE PHILOSOPHIQUE, Traduite d'Alleman en Francois. Par ANTOINE DU VAL, A PARIS, Chez IEAN D'HOURY, a l'Image S.Iean, au bout du Pont-neuf, sur le Quay des Augustins. M.DC.LXXI. (pp.1-84)

21.(a) 1691, Laurent d'Houry, Paris.

(b) 1 (473), 2 (170, 521), 3 (1046), 4\*, 5 (298), 6 (3, 516), 8 (3, 141), 9 (545), 11 (2, 368), 12 (538, 226, 228, 229), 13\*.

(c) LES OEUVRES DU COSMOPOLITE, Divisez en trois Traitez. Dans lesquels sont clairement expliqués les trois Principes des Philosophes Chymiques, sel, Soufre & Mercure.

The second title page reads:

COSMOPOLITE OU NOUVELLE LUMIERE CHYMIQUE, Pour servir d'éclaircissement aux trois Principes de la Nature, exactement décrits dans les trois Traitez suivans.

Le I. traite du Mercure.

Le II. Du Soufre.

& Le III. Du vray Sel des Philosophes.

DERNIERE EDITION,

Revûë & Augmentée DES LETTRES PHILOSOPHIQUES DU MESME AUTEUR. A PARIS, Chez LAURENT D'HOURI, ruë S. Jacques, devant la Fontaine S. Severin, au S. Esprit. M.DC.XCI. Avec Privilege du Roy.

(d) TRAITE DE LA NATURE EN GENERAL. (pp.1-122)

TRAITE DU SOUFRE, SECOND PRINCIPE de la Nature. Reveu & corrige de nouveau. (pp.125-242)

TRAITÉ DU SEL. TROISIEME PRINCIPE DES CHOSES MINERALES. De nouveau mis en lumiere. (pp.243-333)

There then follows another title page:

TRAITEZ DU COSMOPOLITE - Nouvellement découverts. Où après avoir donné une idée d'une Societé des Philosophes, on explique dans plusieurs Lettres de cét Autheur la Theorie & la Pratique des Veritez Hermetiques. A PARIS, Chez LAURENT D'HOURY, ruë Saint Jacques, devant la Fontaine Saint Severin, au Saint Esprit. M.DC.XCI. Avec Privilege du Roy.

IDÉE D'une nouvelle Societé des Philosophes. PREFACE. (pp.3-9)

STATUTS Des Philosophes inconnus. (pp.10-40)

LETTRES DE MICHEL SENDIVOGIUS OU DE J.J.D.I. \* C'est-a-dire, Jean Joachim Destinguel d'Ingrofont. Communément appellé COSMOPOLITE, Sur la Théorie & la Pratique de la Pierre Philosophale. PREMIER TRAITE De l'Art general de changer les Metaux les uns dans les autres. (pp.41-224)

SOMMAIRE ABRÉGÉ, De tout ce qui est contenu dans ces Lettres, renferme dans un Sceau ou Hierogliphe de la Societé des Philosophes inconnus. (pp.225-232)

(e) It may be noted that the *Sommaire abrégé* of the Wellcome Institute copy has been carefully cut out. Additionally, in the British Library copy, pages 49-208 of the first two works have been erroneously bound in place of pages 49-208 of the *Lettres*.

22.(a) 1723, Laurent d'Houry, Paris.

(b) 1 (473), 2 (170, 521), 5 (229), 6 (3, 516), 12 (538, 227), 13\*.

(c) *LES OEUVRES DU COSMOPOLITE, Divisez en Trois Traitez, Dans lesquels sont clairement expliquez les trois Principes de la Philosophie naturelle, Sel, Soufre & Mercure.*

The second title page reads:

*COSMOPOLITE OU NOUVELLE LUMIERE CHYMIQUE, Pour servir d'éclaircissement aux trois Principes de la Nature, exactements décrits dans les trois Traitez suivans. Le Ier. De la Nature en général, où il est parlé du Mercure.*

*Le II. Du Soufre*

*Le III. Du vray Sel des Philosophes.*

*Dernière EDITION, Revue & Augmentée DE LA LETTRE PHILOSOPHIQUE D'ANTOINE DUVAL, Et de l'Extrait d'une autre Lettre assez curieuse. A PARIS, Chez LAURENT D'HOURY, Imprimeur-Libraire, rue de la Harpe, vis-à-vis la rue S. Severin, au Saint Esprit. M.DCC.XXIII. Avec Privilege du Roy.*

(d) *DE LA NATURE EN GENERAL.* (pp.1-122)

*TRAITE DU SOUFRE, SECOND PRINCIPE de la Nature. Revu & corrige de nouveau.* (pp.123-241)

*TRAITE DU SEL, TROISIEME PRINCIPE DES CHOSES MINERALES. De nouveau mis en lumiere.* (pp.243-333)

*LETTRE PHILOSOPHIQUE, Très estimée de ceux qui se plaisent aux Verites Hermetiques. TRADUITE d'Allemand en François par ANTOINE DUVAL. Avec l'Extrait d'une LETTRE assez curieuse sur le même sujet. A PARIS, Chez LAURENT D'HOURY, Imprimeur-Libraire, rue de la Harpe, vis-à-vis la rue S. Severin, au Saint Esprit.*

23.(a) 1723, Laurent d'Houry, Paris.

(b) 9 (545).

(c) This was identical to the previous edition, no.20, but it was bound with the following additional work:  
*POLEMAN, J. Nouvelle Lumière de Médecine, 1721.*

Further general points

1. The *De la Nature en General*, termed *Traité du Mercure* in later editions, always consisted of the following works:
  - Treatise on the Philosophers' Stone* (12 chapters)
  - Epilogue*
  - Philosophical Enigma*
  - Dialogue of Mercury, the Alchemist and Nature.*
2. In the editions which I have seen, I have given the actual page numbers for the various works.
3. I have received photocopies of title pages kindly sent by various American libraries in response to my inquiries. An asterisk has been supplied next to the NUC references where photocopies of title pages and details of contents were thus made available to me.

Edition reference number	Bibliographic source reference number												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	*	*		*	*	*		*		*	*		*
2					*								
3					*					*			
4	*	*			*	*							*
5		*			*		*		*	*			*
6				*									
7								*					
8									*				
9		*				*	*				*		
10			*										*
11													*
12					*					*			
13				*									
14					*	*				*	*		
15	*	*						*	*				*
16		*			*	*	*		*		*	*	*
17		*											*
18	*												
19		*			*	*	*		*		*	*	*
20		*			*							*	*
21	*	*	*	*	*	*		*	*		*	*	*
22	*	*			*	*						*	*
23									*				

The bibliographic source numbers refer to the ones listed at the beginning of this Appendix - page 256. The edition reference numbers refer to the ones used throughout this Appendix, which are the same as those used in Table 2 on page 39.

Table 6 Bibliographic sources of the French editions

## Appendix B

### *Treatise on the Philosophers' Stone - a summary*

#### Preface

Sendivogius explains why he has written the work and why he has chosen to remain anonymous.

The object of the book is to help enthusiasts of the hermetic art to make the transmuting agent which will turn base metals into gold. There exist an enormous number of books which have no value whatsoever and which have been written with the intention of fooling the gullible. The authors of these books are dishonest and their sole objective is material gain.

Sendivogius' book is written on the basis of enormous practical experience. It will enable people to gain knowledge through earnest study and experiment, under the guidance of God. Sendivogius has been fortunate enough to acquire real knowledge and enlightenment, like many philosophers of the past. He chooses to remain anonymous since he has no interest in material gain, and he feels that in executing his duty to others, his own identity is irrelevant.

#### First treatise: On Nature - what it is and what its investigators ought to be like

It is interesting that humans continuously try to find out more about Nature. Although ancient philosophers had discovered a great deal about Nature, modern investigators have gone much further. The modern alchemical art, for example, is now so full of subtleties that it is hard to imagine it getting any more sophisticated. Indeed, the knowledge possessed by ancient philosophers is so small

that they would be merely students by today's standards. And yet they knew how to make the Philosopher's Stone - something which still eludes us. In searching for this Stone though, they have made many discoveries. This demonstrates to us the remarkable possibilities of Nature.

Nature, which is one, real, and indivisible, was created by God who gave it the spirit. It is composed of male and female parts which give rise to all things. This occurs by the will of God.

Investigators of Nature must be like Nature herself: honest, simple, patient, persistent, and most importantly - faithful. They must carefully consider whether their actions are in accordance with Nature. They must realise that in order to improve a metal, for example, they should use metallic elements as starting materials. It would be impossible for instance, to obtain a tree from a dog.

#### **Second Treatise: How Nature behaves during the course of our undertaking, and about the seed**

God gave Nature free will, so Nature has formed the seed i.e. its own free will in living things. This seed must always be present for the act of generation. As God permits Man to use his free will for good or bad purposes, so Nature allows the seed to generate good or bad results.

In the present work, those aspects of the seed are discussed, which relate to the chemical arts.

The four elements have seeds. These seeds are cast into the centre of the Earth by the continuous movement of the elements. In the centre of the Earth new substances are generated and unwanted matter is thrown out. This is exactly comparable to reproduction in human beings - the

man casts his seed into the woman where a new human is generated, and the rest of the matter is rejected. The centre of the Earth is thus like a womb, which attracts seeds magnetically, and which serves for reproduction.

All things on Earth are born in this manner. As the products of generation move through the Earth's crust, they become stones, trees, metals etc., depending on the purity of the region through which they passed.

Sendivogius then discusses the origin of seeds. Each of the four elements is capable of reproducing according to the will of God. The four elements are continuously in motion and thus each one of them throws its delicate matter to the centre of the Earth, where they meet. The Archeus of Nature acts on them there and throws the products outwards.

#### Third Treatise: On the basic matter of metals

All metals are composed of two primary elements: mercury and sulphur. The exact nature of sulphur, which is the more concealed element, is discussed here.

Many workers use the correct ingredients, but fail to get any result. This is because their ingredients do not contain the correct seeds. You cannot make a human, for example, out of a man's leg and a woman's hand. Every body contains a tiny part (  $1/8200$  ) which is the seed, and which contains the spark of life. [This fraction has formed the subject for recent investigations. See: K.Figala, "Die Alchemistenzahl 8200", *Travaux du Premier Congrès International de la Metrologie Historique*, (Zagreb, (28.-30.10.1975), 415-430.)]

It is important to find the seed in the right kind of

metal, for not every metal contains one. Workers should not waste time looking for the seed in impure metals. The metals to be used in the Sendivogian works are alive, and have a spirit. Fire is both the life and death of metals.

The first principle of all metals then is a certain moisture mixed with air which takes the form of a fatty water.

#### **Fourth Treatise: How metals are formed in the Earth**

The primary matter of metals is moist vapour, and not a solid, as is commonly believed. It is the secondary matter of metals which is solid, and which does not change. Adepts should therefore not waste their time trying to find a solid primary matter of metals. They should concentrate their efforts on the secondary matter which, unlike a primary element, is not subject to change.

Sendivogius states that he would like the reader to understand his work clearly - especially the point that adepts can only take over and complete a process which Nature has left unfinished.

He then reiterates that metals are formed from moist vapours which are generated in the centre of the Earth, and which are acted upon by the Archeus of Nature. These vapours sublime through pores in the Earth, and give rise to different metals depending on the kind of region they pass through. All metals are born from the same seed. The final product depends on the time during which Nature acts upon the seed. Silver, being less perfect than gold, for example, is acted on for a shorter period of time than gold. This is because silver was worse positioned than



gold in the Earth. The more pure the location, the more beautiful the metal which is formed.

Nature acts continuously and thus the composition of rocks changes accordingly. The metallic principle is acted upon by sulphur and mercury of the philosophers, whereupon it produces a fattiness in the Earth. During winter, this fatty substance freezes with the soil. In spring, it combines with soil and water to form magnesia which attracts the mercury of the air, which gives life to all things through the sun's and moon's rays, and also the stars. For Nature never ceases to work.

Metals are formed when this fattiness approaches those parts of the Earth which have been purified by extensive distillation.

#### **Fifth Treatise: How all types of stones are formed**

Stones and minerals are composed of the same matter as other substances. They are formed in a similar manner to metals. The vapour of the four elements is acted upon by the Archeus of Nature in the centre of the Earth, and subsequently diffuses outwards. When this vapour meets with air, it congeals to form rocks and stones. The purity of the regions which are traversed, and the size of the pores determines the types of minerals which are formed. Metals are formed in the purer regions. Gold, for example, is always found in mountainous regions and not in valleys, because there the water and air are purest. The sun acts on these minerals and can give rise to either sand, where there is fattiness, or grass and plants, where there is no fattiness.

Semi-precious stones are formed by varying degrees of reaction of the vapour with sulphur and fattiness itself. If, on the other hand, the vapours only come into contact with water containing salt, then diamonds are formed. If large amounts of sulphur and fattiness are encountered, mud and silt are formed. The mechanism by which semi-precious stones acquire colour by reaction with sulphur is explained. The explanation involves water and steam, and indicates that Sendivogius was aware of properties of substances which we would call in today's terminology - specific and latent heat capacities.

#### **Sixth Treatise: On Secondary matter and on putrefaction**

In this fairly lengthy treatise, Sendivogius explains the differences between primary and secondary matter, and between embryos and seeds. The generation of metals is once again discussed.

Reproduction cannot occur without embryos, which are composed of congealed air or moist steam. These embryos are present in either MINERALS, PLANTS or ANIMALS, which have been formed from the four elements. The embryos of minerals have been discovered only by philosophers, plant seeds are common, and animal seeds, although they have not been seen, are known to exist.

Sendivogius then describes the formation of plant seeds by the action of Nature, using the tree as an example. The behaviour of its vital spirits during different seasons and weather conditions results in the formation of bark, leaves, flowers and seeds. Humans should not interfere with these processes of Nature.

The mineral kingdom is treated next. Sendivogius states that metal embryos, which are formed from the four elements, and acted on by the Archeus of Nature, are invisible, and contain the Philosophers' mercury, which is different from metallic mercury. He then poses the question: why should metals not have seeds, if plants have them? Many alchemists, says Sendivogius, do not realise that a male and a female principle are necessary for the generation of metals, and thus these alchemists make mistakes which are illustrated by the following example: it is a known fact that humans contain embryos by means of which reproduction occurs; however, one human being cannot be generated from one other - two are always necessary. In the same way, metals may only be generated from their embryos and not just from other metals. If a human being is cut up into pieces, you cannot make another one out of them. In the same way, if a metal is dissolved in acid, and treated chemically in various ways, it cannot give rise to another metal.

Whereas secondary matter can be acted on and multiplied, primary matter, which is concealed by Nature, was created by God.

#### **Seventh Treatise: On the power of secondary matter**

Sendivogius summarizes various aspects of the mineral, plant and animal kingdoms, which can be represented as:

Kingdom	Mineral	Plant (multiplies power)	Animal (the most perfect)
Existence on its own	yes	yes	no
Primary matter, formed by Nature	nitre	grass, trees	animals and humans
Secondary matter	water	seeds	unknown
"Mother of embryo"	air	soil	female womb
"Digestive kidney"	fire	warm air	male kidney

By referring to the relationships illustrated in this table, all changes such as purification, dissolving, putrefaction etc. can be explained.

Only the embryo has the power to reproduce. It can only do so within its own kingdom. The embryo, which contains a soul, can only be found in living things. To search for it in dead matter, e.g. in dead trees, is therefore a waste of time.

**Eighth Treatise:  
On the Art and how Nature acts on the embryo**

Embryos can only grow in the wombs for which they were designed. This is true for the mineral and animal kingdoms. The process of growth, once started, may last many months, years, or even epochs.

It is a wise art indeed which can shorten this process of growth in the mineral or vegetable kingdoms. In the mineral kingdom, for instance, the growth process is lengthened by the action of air, which penetrates into all pores. Sendivogius then adds that the elements eject their embryos towards the centre of the Earth with different speeds. Through their movement the embryos are then thrown

into wombs. Some wombs are cleaner than others, and this affects the nature of the product.

Whereas in the animal kingdom there exist wombs in humans, cows, horses and dogs, in the mineral kingdom there exist wombs in metals, stones and salts. Salts ought to be considered in more detail.

**Ninth Treatise: On the mixing of metals or on the extraction of the metallic seed.**

In this treatise, Sendivogius essentially describes what we would call today, the electrochemical series of metals. He uses the names of planets to denote metals, and describes their movements relative to one another, in a chemical, and not astronomical, sense, to explain the displacement of metals from salt solutions by more reactive metals. The object of this explanation is to help the reader to understand how metals combine in order that they may accept or reject the embryo.

Although chemists have already learnt how to perform certain transmutations such as tin into mercury, they have not yet learnt to transmute metals into gold.

Sendivogius then describes the enigmatic "chalybs" which, according to him, is the mother of all metals. It is this "chalybs", he says, which can extract from the sun's rays, that which so many people seek. This "chalybs" is the beginning of Sendivogius' work.

**Tenth Treatise:**

**On the supernatural birth of the son of the Sun**

Having discussed Nature and its possibilities, Sendivogius turns to a theoretical explanation of the preparation of the Philosopher's Stone.

Ordinary gold is similar to grass without a seed. This is because ordinary gold has not reached maturity: it has not been allowed to reach the stage where it can furnish seeds, because of the inhibiting action of raw air. The analogy is drawn between orange trees bearing fruit in a warm climate, but not in a cold climate. Metals behave in a similar fashion.

In the same way that man can gently aid orange trees by assisting Nature, he can assist Nature in the production of the seed of gold - the Philosopher's Stone. This can be accomplished through the use of fire and heat.

If fire or heat does not succeed however, the pores of the gold can be opened by dissolving it in aqua regia, and heating it for about seven months. The product is then "fed" with the fattiness of the earth, whereupon the next generation of gold is born.

#### **Eleventh Treatise: Using the Art for the practical preparation of the Philosopher's Stone**

The contents of this, the longest treatise - 5 sides - do not seem to bear much relevance to the title. The first side contains a practical description for a technique for preparing the Philosopher's Stone. The rest of the treatise is devoted to a discussion of the four elements and their relationship to the Sun, which, Sendivogius notes, occupies a central position among the spheres of the planets, and also the Sun which is at the centre of the Earth.

The preparation of the Philosopher's Stone is very difficult to understand. It involves the mixing according to quantity of live gold, live silver, and "our earth". These are then dissolved in what we would recognise as

nitric acid, and heated until a series of colour changes occurs. The resulting solution imparts a colour to iron. At the end of this section Sendivogius writes: "This is as far as my experience has taken me - I have not found anything else."

He then writes about fire. There are two kinds of fire: primary fire which always burns and which is always associated with matter, and secondary fire, which digests and solidifies matter. Sendivogius emphasizes that he has discovered the guiding force of fire, and he repeats that fire, like Nature, has a dual role.

There are two levels at which phenomena may be interpreted, and this is illustrated by the following example: most people believe that the Sun is hot; philosophers know that it is cold however, and only its motion generates heat. The heat from the celestial Sun is modified by the Earth's atmosphere, whereas the heat from the sun at the centre of the Earth is modified by water. The relationship between air and water is then explained by suggesting that heat from the Earth's sun vapourizes water to give the air, which surrounds us. In cooler zones, the air condenses back to water. An equilibrium thus exists between these elements. Sendivogius illustrates his ideas by referring to the way in which a distillation apparatus works.

He then returns to the theme of fire which is the cause of movement and life in all things. The Earth feeds all things and water plays a vital role - otherwise the Earth would dry up. The alchemist should ensure that the

delicate balance of Nature is maintained. He should use his ears and his intelligence to achieve this.

#### **Twelfth Treatise: On the Stone and its power**

Sendivogius summarizes the ideas expressed in previous treatises concerning elements, primary and secondary matter, bodies and seeds, their use and power.

He reasserts once again that the Art has been handed down through generations of philosophers, who have great faith in it. If all things have seeds, why should metals not have seeds? All sceptics should be disregarded, for the deaf and dumb have nothing to say.

In practice, alchemy is always correct and Nature is always correct. Water is the mother of all things and the spirit fire acts on it to produce them. Thus winds are formed, and also vapours which combine with earth. Motion causes heat, heat moves water, which gives rise to air - the essence of all living things.

In forming all things Nature sometimes cannot separate the pure from the impure. The alchemist can achieve this separation.

The central salt does not accept more water than it needs. But the fattiness of water, which is not always pure, can be purified by the art.

#### **Epilogue**

The epilogue is roughly divided into four sections. Sendivogius explains that he has written the work to help adepts:-

- a) understand the way in which Nature works
- b) become familiar with his own experimental findings



- c) put on the "right track" those who had been led astray by false claims and recipes
- d) introduce himself to those who had not heard of him and to show that he had achieved results which were at least as good as those of any of his contemporaries.

The epilogue also summarizes several theoretical points which are connected with explaining changes. The Philosopher's nitre plays an important role in these explanations.

Some of the main points are mentioned below: the processes of Nature are not easily understood, but once the "light has been seen", it will be possible to perceive the "focus of our magnet", which attracts the rays from both the Sun and the Earth.

Sendivogius illustrates the way in which Nature conceals herself by analogy to the apparent similarity between a boy and a girl, both of whom are identically clad. When they are undressed, it can be seen that Nature has made them different. In a similar manner, close inspection of natural phenomena can reveal their more subtle aspects.

Sendivogius suggests at this point that he could easily digress on the dignity of humans and their creation and reproduction. He decides however to simply mention that the food of life is a colourless spirit, which is concealed in the air.

He gives practical instructions for making the Philosopher's Stone. They are rather difficult to follow, but it is clear that Philosopher's nitre is important for all living things since it contains the "hidden food of

life". The instructions are not complete. But by careful study, further knowledge may be revealed, if God wills it. There is further reference to the "magnet" saltpetre, which contains the nutrient for plants, which has been extracted from the air. Whoever wishes to achieve the desired result must understand the nature of changes. The driving force of these is always fire.

Any success achieved should be used for the good of others and the glory of God.

Editions of *Harmony*.

These are listed in order of publication date.

The following information is given for each edition:

- (a) Date, place of publication, author to whom the work is ascribed.
- (b) References. These are indicated by means of a number which denotes the bibliographic source, and volume and/or page references which follow in brackets. Editions which are known to me from first hand experience are additionally denoted by an asterisk. The following bibliographic sources are used:
1. Bibliothèque Nationale Catalogue
  2. British Library Catalogue
  3. Caillet, A. *Manuel bibliographique des Sciences Psychiques ou Occultes*, Paris, 1912.
  4. Catalogue of the Ferguson Collection, Glasgow, 1943.
  5. Dufresnoy, L. *Histoire de la Philosophie Hermetique*, Paris, 1742.
  6. Duveen, D. *Bibliotheca Chemica et Alchemica*, London, 1949.
  7. Estreicher, K. *Bibliografia Polska*, Kraków, 1929.
  8. Ferguson, J. *Bibliotheca Chemica*, Glasgow, 1906.
  9. National Union Catalog Pre-1965 Imprints.
  10. Wellcome Institute Catalogue.
- (c) General title. The full text of the title page is given.
- (d) Additional information or notes, where necessary.
1. (a) 1618, Paris, Nuysement.  
 (b) 7 (27, 336).  
 (c) *Cosmopolite ou nouvelle lumiere de la Physique naturelle, traduit par Bosnay et imprimé à la Haye, avec le Traité du sel de Nuysement. Imprimé à Paris chez Seb. Chapelet 1618.*
  2. (a) 1620, Paris, Nuisement.  
 (b) 5 (3, 249).  
 (c) *La Table d'Hermes expliquée par Sonnets, avec son Traite du Sel, imprime en Fland. Paris, chez Perier. 1620.*
  3. (a) 1621, Paris, Nuisement.  
 (b) 1 (71, 799), 3 (3, 194), 4 (499), 8 (2, 148), 10\*.  
 (c) *TRAITTEZ DV VRAY SEL, SECRET DES PHILOSOPHES ET DE L'ESPRIT GENERAL DV MONDE. Contenant en son interieur les trois Principes naturels, selon la doctrine de Hermes. Oeuvre très-utile & necessaire à quiconque desire arriuer à la parfaite prattique de ce pretieux Elixir ou Medecine vniuerselle, tant celebrée des anciens, recogneuë & experimentée. Par le sieur de NUISEMENT, receueur General au Comté de Ligny en Barrois.*

A PARIS, Chez IEREMIE PERIER & ABDIAS BVIZARD, en la Cour du Palais, vers les Horlogers. M. DC. XXI. Avec Priuilege du Roy. (pp.1-332)

4. (a) 1621, Paris, Nuisement.  
(b) 6 (437), 9 (425, 102), 10\*.  
(c) TRAITTEZ DE L'HARMONIE ET CONSTITVTION GENERALE DU VRAY SEL, secret des Philosophes, & de L'ESPRIT Vniuersell du Monde, suiuant le troisiemes Principe du Cosmopolite. OEUVRE NON MOINS CVRIEVX que profitable, traittant de la cognoissance de la vraye medecine Chimique. Recueilly par le sieur de NUISEMENT, receueur general du Comté de Ligny en Barrois. A PARIS. Chez IEREMIE PERIER ET ABDIAS BVISARD, tenant leur boutique à la Cour du Palais vers les Horlogers. M.DC.XXI. AVEC PRIVILEGE DU ROY. (pp.1-332)  
(d) The above two items correspond to nos.10 and 11 in the list of French editions. The texts are identical, only the title pages are different.
5. (a) 1639, Paris, Nuisement.  
(b) 1 (71, 799), 3 (3, 193), 4 (499), 6 (437), 8 (2, 148), 9 (425, 102), \*.  
(c) TRAITTEZ DE L'HARMONIE, ET CONSTITUTION GENERALE DV VRAY SEL, Secret des Philosophes, & de l'Esprit universelle du monde, suivant le troisiemes Principe du Cosmopolite. OEuvre non moins curieux que profitable, traittant de la cognoissance de la vraye medecine Chimique. Recueilly par le sieur de NUISEMENT, Receueur General du Comté de Ligny en Barrois. A LA HAYE, De l'Imprimerie de THEODORE MAIRE. M. DC. XXXIX.  
(d) I have consulted this work in Bugaj's private collection.
6. (a) 1651, Kassel, Combach or Nuysement.  
(b) 2\*, 4 (500), 5 (3, 138, 249), 6 (438), 8 (2, 148) 9 (425, 102).  
(c) TRACTATUS De VERO SALE SECRETO PHILOSOPHorum, & de universali Mundi Spiritu. Gallice primo scriptus in supplementum diu desiderati tertij principij Cosmopolitae, sive, ut vulgo creditur, Michaelis Sendivogij Poloni, quod de Sale promisit, & Serenissimo Lotharingiae Duci dedicatus a Domino de Nuysement, Quaestore generali Comitatus de Ligny in Ducatu Barrensi, Parisij vero impressus apud Jeremiam Perier, & Abdiam Buizard. Liber non minus curiosus, quam proficuus, utpote tractans de cognitione verae Medicinae Chemicæ. Nunc simplicissimo stylo Latine versus a LUDOVICO COMBACHIO D. & Illustrissimo, Hassiae PP. Medico ordinario. CASSELIS, Typis, JACOBI GENTSCHII, Impensis Sebaldi Kohlers. ANNO 1651.
7. (a) 1652, Kassel, Sendivogius.  
(b) Roman Bugaj has found the reference to this particular edition in the Polish National Archives in Kraków, in the collection of A. Pinocci: "Inw. Tym. A. Pinocciana 404, Rkps Woj. Arch. Państw. w Krakowie nr. 67, 114". He has listed it as no.45 on pages 292-293 of his *Michał Sędziwój*.

(c) *Tractatus de vero Sale secreto Philosophorum et de Universali Mundi spiritu gallice primo scriptus, in supplementum diu desiderati Tertii Principii Cosmopolitae, sive ut vulgo creditur Michaelis Sendivogii Poloni, quod de sale promisit. Impressus Parisiis apud Jeremiam Perier et Abdianus Buizard. Liber non minus curiosus quam profimus, utpote tractans de Coginoe vera Medicina Chymica. Casselis Typis Jacobi Genoschij impensis Sebaldi Kohlen. A. 1652.*

8. (a) 1657, London, Nuisement.

(b) 2\*, 4 (499), 6 (438), 8 (2, 148), 9 (425, 102).

(c) *Sal, Lumen, & Spiritus Mundi Philosophici: OR, The dawning of the Day, Discovered By the Beams of Light: Shewing, the true SALT and SECRET of the Philosophers, The first and universal Spirit of the World. Written Originally in French, afterwards turned into Latin, by the Illustrious Doctor, Ludovicus Combachius, Ordinary Physitian to the King, and publick Professor of Physick in the University of Mompelier. And now transplanted into Albyons Garden, by R. T. Printed at London, by J.C. for Martha Harrison, at the Lamb at the East-end of S. Pauls. 1657. (pp.1-220)*

9. (a) 1658, London, Combach.

(b) 4 (500), 8 (2, 438).

(c) *Fundamenta Chymica: or A Sure Guide into the high and rare Mysteries of Alchymie by L(udwig) C(ombach) Philomedico Chymicus. (Translated by Robert Turner). London, Printed by William Godbit for William Barlow, without Aldersgate, 1658.*

10.(a) 1667, Nuremburg, Monte Cubiti.

(b) 1 (71, 800), 2\*, 6 (410), 8 (2, 102), 9 (425, 102), 10\*.

(c) The general title of the book is: *Dreyfaches Hermetisches Kleeblatt, in welchem begriffen dreyer vornehmen Philosophorum herrliche Tractätlein. Das erste von dem geheimem waaren Saltz der Philosophorum, und allgemeinen Geist der Welt. H. Nuysement aus Lothringen. etc. ... Durch Vigilantium de Monte Cubiti. Nurnberg. In Verlegung Michael und Johann Friderich Endtern. 1667.* The title of Harmony reads: *Herrn de Nuysement TRACTAT von dem waaren geheimen Saltz der Philosophorum, und von dem allgemeinen Geist der Welt. Zu ergäntzung langbegehrten dritten Principii, Michaelis Sendivogii, welches er vom Saltze verheissen hat.*

11.(a) 1671, Leyden, Nuysement.

(b) 8 (2, 147), 9 (425, 102).

(c) *Tractatus de Vero Sale Secreto Philosophorum, et de Universali Mundi Spiritu. Gallice primo scriptus a Domino de Nuysement, nunc simplicissimo stylo Latine versus a Ludovico Combachio. D. et Illustrissimorum Hassiea PP. Medico Ordinario. Liber non minus curiosus quam proficiuus, utpote tractans de cognitione verae Medicinae Chemicæ. Lugduni Batavorum, Apud Arnoldum Doude, Anno 1671.*

- 12.(a) 1672, Leyden, Combach or Nuysement.  
 (b) 1 (71, 800), 2\*, 5 (3, 138, 249), 6 (438), 8 (2, 148),  
 9 (425, 102).  
 (c) *TRACTATUS de VERO SALE Secreto Philosophorum, & de  
 Universali Mundi Spiritu, Gallice primo scriptus A DOMINO  
 DE NUYSEMENT, Nunc simplicissimo stylo Latine versus A  
 LUDOVICO COMBACHIO, D. & Illustrissimorum Hassiea P.P.  
 Medico Ordinario. Liber non minus curiosus quam proficiuus,  
 utpote tractans de cognitione verae Medicinae Chemicæ.  
 LVGDVNI BATAVORVM. Apud ARNOLDUM DOUDE. Anno 1672.  
 (pp.1-244)*
- 13.(a) 1716, Frankfurt, Nuysement.  
 (b) No details are available of this edition. It is  
 referred to in Karl Schmieder's *Geschichte der Alchemie*,  
 (Ulm Donau, 1959), on page 358.
- 14.(a) 1757, Dresden, Nuysement.  
 (b) 8 (2, 148), 9 (425, 102).  
 (c) The main title of the book is: *Eines wahren Adepti  
 besondere Geheimnisse von der Alchymie zum Gebrauch und  
 Nutzen denen Liebhabern herausgegeben und mit Figuren  
 erläutert von C. G. H. Dresden, bey Johann Nicolaus  
 Gerlach. 1757.* The title of Nuysement's contribution is  
 given as: *Tractat von dem wahren geheimen Salz der  
 Philosophen, und allgemeinen Weltgeiste.* (233 sides)
- 15.(a) 1778, Berlin, Nuysement.  
 (b) 8 (2, 148).  
 (c) The main title of the book is: *A.B.C. vom Stein der  
 Weisen. Erster Theil. Mit Churfurstl. Sachsisch gnadigerer  
 Freiheit. Berlin 1770 bey Christian Ulrich Ringmacher.* On  
 pages 230-260 a summary of *Harmony* is printed under the  
 following heading: *Aus des Herrn de Nuysement Tractat vom  
 wahren geheimen Salz der Weisen und dem allgemeinen Geiste  
 der Welte.*
- 16.(a) 1787, Leipzig, Nuysement.  
 (b) 3 (3, 193), 8 (2, 148), 9 (425, 102).  
 (c) *Die ganze höhere Chemie und Naturwissenschaft in  
 allgemeinen Grundsätzen, nach den drei Uranfangen und  
 Grundkräften der ganzen Natur (titre interieur:) des Hr.  
 de Nuysement Abhandlung vom wahren geheimen Salze der  
 Weisen und vom allgemeinen Weltgeiste (e Gallico latine  
 versus a Ludovico Combachio) von AdaMah Booz (Adam  
 Melchior Birkholz). Leipzig. Joh. Friedr. Junius. 1787.*

Note

Bugaj informs us that there have been three further  
 printings. These were in Berlin (1915), Berlin (1920) and  
 Schwarzenburg (1979). They were all fascimile editions of  
 the 1778 Berlin edition.

## APPENDIX D

### Editions of *Treatise on Salt*.

Details of each edition are given under the following headings:

- (a) Date, place, author, language.
- (b) Title page.
- (c) References. The following sources are used for the German and Latin editions. For French editions, see Table 2 on page 39, and Appendix A (pp.256-267).
  1. British Library Catalogue.
  2. Duveen, D. *Bibliotheca Chemica et Alchemica*, London, 1949.
  3. Ferguson, J. *Bibliotheca Chemica*, Glasgow, 1906.
  4. Wellcome Institute Catalogue.Editions which are known to me from first hand experience are additionally denoted by an asterisk.
- (d) Additional notes.

1. (a) 1656, Amsterdam, Harprecht or Hauthorthon, German.  
(b) Der Verlangete Dritte Anfang Der Mineralischen Dinge, oder vom Philosophischen Saltz; Nebenst der waren Praeparation Lapidis & Tincturae Philosophorum. Darin die Sucher dieser grossen Geheimnuss vom Philosophischen Werck einen solchen Nachricht finden, dass dessgleichen mit keinem Gelde zu Bezahlen; So aber ihnen auss inniglichem Mitleiden wegen des langen suchens rund und frey heraus ohn allen umschweiff mitgetheilet wird vom Sohn SENDIVOGII, genant I. F. H. S. Gedruckt zu Amsterdam, Vor Christoffel Luycken, Buchverkauffer auff der Haarlemmer Creutzstrassen, da sie verkaufft werden. 1656.  
(c) 1\*; 2, 546.

2. (a) 1657, Amsterdam, Harprecht or Hautnorthon, German.  
(b) Der Verlangete Dritte Anfang Der Mineralischen Dinge, oder vom Philosophischen Saltz; Nebenst der wahren Praeparation; Lapidis & Tincturae Philosophorum. Darin die Sucher dieser grossen Geheimnuss vom Philosophischen Werck einen solchen Nachricht finden, dass dessgleichen mit keinem Gelde zu bezahlen; So aber ihnen auss inniglichem Mitleiden wegen dess langen suchens rund und frey heraus ohn allen umschweiff mitgetheilet wird vom Sohn SENDIVOGII, genant I. F. H. S. Gedruckt zu Amsterdam, Vor Christoffel Luycken, Buchverkauffer auff der Haarlemmen Creutzstrassen, da sie verkaufft werden. 1657.  
(c) 1\*; 3, 1, 368.  
(d) Both the 1656 and 1657 editions appear to have identical texts. The typeface used is different in each printing.

3. (a) 1658, Amsterdam, Harprecht or Hautnorthon, Latin.  
(b) Lucerna Salis Philosophorum. Hoc est: Delineatio nuda desiderati illius Principii tertii mineralium Sendivogiani, sive Salis pontici, quod est subjectum omnis mirabilitatis & Academia unica veterum Sapientum, nec non clavis artis Gebricae, claudens sigillans & aperiens, nemine alias pandente vel occludente, continens simul veram

praeparationem hujus mirabilis saponis & aquae siccae, quae nihil madefacit, nec ulli alii rei in Mundo commiscetur, quam metallis: Secundum methodum qua cuncti Philosophi panaceaem illam universalem confecerunt, in salutem afflicti hominis ceu effigiei & imaginis gloriosi DEI, qui laudetur in secula seculorum. Ad contestandum animum officiosum erga prolem doctrinae fideliter eidem communicata a filio SENDIVOGII, anagramatice vocato: Tuis Ophir dono fert theca Saturni. Annum publicationis continet famosum illud Paracelsi vaticinium: ELIAS artIVM artes DoCebIt. Et illud nostri Cosmopolitae: MonarChIa BoreaLIa aDVenIet. Et Bohmii Teutonici: LILIVM eDet fLOres a septentrIone: AMSTELODAMI, apud Henricum Betkium, Cum Privilegio. An. MDCLVIII.

(c) 1; 2, 282 (12mo. 212pp.); 3, 368-369 (8vo. 167pp.); 4\* (8vo. 167 pp.).

(d) There are three works in this Latin edition. The first one corresponds roughly with the *Treatise on Salt*, whereas the other two are entitled: *Auctoritates Philosophorum. Harmonicae, in corroborationem hujus tractatuli allegatae.* (pp. 64-141) and *Dialogus praeparationem Lapidis Philosophici amplius detegeus.* (pp. 142-157). Additionally, there is an appendix on pages 158-167. It is also of interest to note that the anagram: "TUIS OPHIR DONO FERT THECA SATURNI" is an exact anagram of "IOSAPHAT FRIDERICUS HEUTNORTON". I have not had the opportunity to study any of these works, but I feel that they could provide the basis for future investigations into Sendivogius and his influence on secret societies. Joachim Telle's article, cited in note 36 on page 171 forms an important starting point for further discussions.

4. (a) 1669, Paris, Cosmopolite, French.  
(b) & (c) See pp. 263-264.

5. (a) 1691, Paris, Cosmopolite, French.  
(b) & (c) See pp. 264-265.

6. (a) 1722, London, Cosmopolite, English.  
(b) A Philosophical Account OF Nature in General, And of the Generation of the *Three Principles of Nature, VIZ. MERCURY, SULPHUR, and SALT, OUT OF The Four Elements.* Translated from the French. By JOHN DIGBY, Esq; LONDON, Printed for JOHN HOOKE, at the *Flower-de-luce*, against St. Dunstan's Church in *Fleetstreet*; and THOMAS EDLIN, at the *Prince's Arms*, against *Exeter-Exchange* in the *Strand*. MDCCXXII.

(c) 2, 545; 3, 2, 367; \* Edinburgh University Library.

7. (a) 1723, Paris, Cosmopolite, French.  
(b) and (c) See page 266.

8. (a) 1727, Nuremburg, Hautnorthon, German.  
(b) Josaphat Friederich Hautnorthons Svecus, dritter Anfang der Mineralischen Dinge, oder vom Philosophischen Saltz; nebenst der wahren PRAEPARATION LAPIDIS ET TINCTURAE PHILOSOPHORUM. Darinnen die Sucher dieser grossen Geheimnuss vom Philosophischen Werck eine solche Nachricht



finden, dass desgleichen mit keinem Gelde zu bezahlen; So aber ihnen aus inniglichen Mitleiden, wegen des langen Suchens, rund und frey heraus ohne allen Umschweiff mitgetheilet wird. Und nun zum Druck befördert worden durch Friederich Roth-Scholtzen Herrenst. Siles. Nurnberg, bey Adam Jonathan Felssecker. 1727.

(c) 1\*, 3, 1, 368.

(d) This treatise occupies pp.339-390 in this collection of works.

## Appendix E

### *Treatise on Salt* (translation)

The Third Mineral Principle, published for the first time

#### To the Reader

Dear reader, please do not waste any effort in trying to find out who the author of this short work is. Nor should you bother finding out why he wrote it. It would not even make any difference if you knew who I am. You can rest assured however, that the author of this short work possesses the Philosopher's Stone, and that he has already made it. And because we had a sincere and mutual goodwill towards one another, I asked him to explain to me the three primary principles: Mercury, Sulphur, and Salt. I also asked him to tell me whether it is necessary to look for the Philosopher's Stone among those elements that we see and use every day, or whether there are others that we should be aware of. He explained all of this to me in a simple and clear style. After having secretly written those parts of these short treatises which he had given to me which I could remember, I convinced myself that by printing them, although against the author's (who has no great aspirations) wishes, the true amateurs of the philosophy will feel obliged towards me. For I have no doubt whatsoever, that once they have read these works, they will be far better equipped to deal with imposters, and they will lose far less time, money, and their own honour and reputation. Accept therefore dear reader in good faith, our intention to help you. Place all your hope in the Lord, adore Him with all your heart and revere him with awe, be

careful to maintain secrecy, love your neighbour, and God will bestow everything upon you.

The beginning of knowledge is the fear of God.

## Table of Chapters

### Contained in this Treatise on Salt

- 1 On the quality and properties of the Salt of Nature
  - 2 Where one must Search for our Salt
  - 3 On Dissolution
  - 4 How our Salt is distributed among the four elements according to the intentions of the Philosophers
  - 5 On the Preparation of the Diana which is whiter than snow
  - 6 On the marriage of the red servant to the white woman
  - 7 The degrees of fire
  - 8 On the admirable virtue of our salty and aqueous stone
- Recapitulation
- Dialogue of the Vision and the Alchemist

## Treatise on Salt, the third mineral principle

### Chapter 1

#### On the quality and properties of the Salt of Nature

The Salt is the third principle of all things which the ancient Philosophers never mentioned. However, it has now been explained to us and exactly pointed out by Isaac Hollandus, Basil Valentine and Theophrastus Paracelsus. This is not to say that there is a "first" principle and a "last" principle, since they all have the same origin and an equal beginning among themselves; but we are following the order given to them by Our Father, who gave the first place to Mercury, the second to Sulphur and the third to Salt. It is this salt principally which is the third being

and which gives the beginning to Minerals. It contains in itself the other two principles: Mercury and Sulphur, and in its birth it has only the impression of Saturn as its Mother, which restrains it and compacts it, and from which the body of all metals is formed.

There are three sorts of salt. The first one is a central Salt, which the spirit of the world gives rise to by the influence of stars, without disturbing the centre of the elements at all, and which is governed by the rays of the Sun and the Moon in our Philosophical Sea. The second one is a Spermatic salt which is the home of the invisible sperm, and which by the method of putrefaction in a natural gentle warmth, gives rise to the vegetable form and quality. It is important that this invisible and very volatile sperm is not dissipated and destroyed entirely by excessive external heat, or alternatively by some violent accident. For if this happens, the sperm will not be able to produce anything. The third salt is the ultimate matter of all things. It is found in the other two elements and continues to remain even after their destruction.

This triple salt was born at the starting point of Creation when God said: "LET IT BE MADE". It came into existence from nothing, in the same way that the initial chaos of the Earth was nothing other than a certain filthy and dirty obscurity, or a cloud over an abyss. This cloud was concentrated, and it created invisible things by the word of God. It came out of the force of God's voice, as a being which must serve the primary matter and which must give life to everything and which actually exists. It is

neither dry, nor moist, nor thick, nor thin, nor light, nor dark, nor hot, nor cold, nor hard, nor soft; but it is just a grand mixture from which all things were produced and separated. But in this particular work we shall pass over these matters in silence, for we shall only consider our Salt which is the third principle of all minerals, and which still remains the beginning of our philosophical work.

If the reader wishes to understand fully and gain something from this work of mine, he should first of all read diligently the works of other great philosophers, especially those of the aforementioned Sendivogius. This is so that he will understand the generation and primary principles of metals, which are all derived from the same roots. For he who understands the generation of metals exactly, will not ignore their improvement and their transmutation. After having thus understood our Fountain of Salt, he will be given here the rest of the instructions which are necessary for him, in order that having prayed devoutly to God, by His holy grace and benediction he will be able to acquire the salt which is as white as snow. He will be able to draw the living Water of Paradise, and he will be able to prepare the Philosophical Tincture with it, which is the greatest and most noble treasure that God has ever given to the wise Philosophers.

#### Discourse translated from verse

Pray to the Lord that he should give you wisdom, his mercy,  
and his grace.  
By the means of which one can acquire this Art.  
Do not devote your attention to anything else,  
other than the Hylech of Philosophers  
In the fountain of the Salt of our Sun and Moon,

You will find there the treasure of the son of the Sun.

## Chapter 2

### Where one must look for our Salt

Since our Azoth is the semen of all metals, and since it was established and composed by Nature in the same moderation and proportion as the Elements, and in accordance with the seven Planets; it is also in this semen that we must search and hope to find a powerful quality of astonishing force, which could not be found in anything else in the world. For in the entire universality of Nature there is only one thing through which we can discover the truth of our Art, that of which our Art consists entirely, and that without which our Art could not exist. It is both the Stone and not the Stone; firstly a Stone because it initially resembles one when it is mined from caverns in the Earth. It is a hard and earthy substance which can be crumbled, and ground like a stone. Secondly, because after the destruction of its form (which is only like a stinking sulphur which first has to be removed) and after the division of the parts which had been put together and made into one by Nature, it is necessary to reduce it to a unique essence, and to gently convert it in accordance with Nature to an incombustible Stone, which is resistant to fire, and which flows like wax.

Thus if you know what you are looking for, you also know what our Stone is. In order to produce, or to give rise to an object, you must possess semen which is of the same nature as that object. The evidence of all philosophers, and even reason, have shown us clearly that

this Tincture is nothing other than extremely well digested gold - reduced and drawn to its entire perfection. For if the auriferous Tincture was made from anything other than the substance of Gold, it would necessarily follow that it would have to tinge all other things, just as it was accustomed to tinge metals - and this is something it will not do. There is only metallic mercury which through its property of being able to tinge and to bring to perfection, actually becomes Gold or Silver, because it had earlier potentially been Gold or Silver. This happens when one takes the only and unique Mercury of metals in the form of a crude and not yet mature sperm (that which is called a hermaphrodite because it contains in its belly its male and female parts - its "doer" and its "done-to"; when this is made into a pure and permanent whiteness it becomes silver and when pushed just to its redness it becomes gold) which is only that part of it which is of a homogeneous nature, and which matures and coagulates by boiling. This is shown unmistakably since it becomes of an intensely red colour and its entire mass is completely unaffected by the hottest part of the flame, without which it produces a tiny amount of smoke or vapour and also becomes lighter in mass. After that, it must be once more dissolved in a new menstrual fluid of the World, in such a way that this very stable part which flows through everything is received back in its abdomen, in which this stable Sulphur is reduced to a much greater fluidity and solubility. Similarly, the volatile Sulphur, by means of a great magnetic warmth of the fixed Sulphur, becomes promptly matured etc. For one Mercurial

Nature does not wish to be separated from another - but then one sees how this red or white gold as we have just described, or sooner mature antimony, solid and perfect, begins to solidify while cold, whereas it liquefies very easily at the same temperature as wax, and it becomes very easy to dissolve it in a liquid which is and which spreads itself to all aspects of this subject [mercury], and gives it colour everywhere in the same fashion as a tiny amount of Saffron colours an enormous quantity of water. Thus when this solid liquefiable substance is thrown onto molten metals, it is reduced to the state of water by the great heat, and will penetrate into the heart of these metals. This solid water will then cause all the volatile parts to be held back, and will prevent them from combusting. But a double intensity of fire and of Sulphur will act so strongly that the imperfect Mercury will have no other option and within the space of an hour, one will be able to hear a certain noise or crackling, which will be a sure sign that the Mercury has been overcome, and that it had thrown outside that which it had had in its interior, and that everything is converted to a pure perfect metal.

Thus whoever has possessed a certain Philosophical or special tincture, would only have been able to make it in accordance with this principle. As the great Alsatian Philosopher, our compatriot Basil Valentine, who lived in my country about 50 years ago, said in his book entitled: *The Triumphal Chariot of Antimony* in which he wrote about the various tinctures which one can produce from this same Principle:



"Yet the Stone of Fire tingeth not universally, as the Stone of Philosophers, which is made of the Essence of Gold itself. To this no such power is given, as that it should perform such things, but it tingeth particularly; viz, Silver into Gold, Tin also and Lead; but Mars and Venus it toucheth not, nor do they yield more, then from them by Separation may be effected.

Moreover, one part of it can tinge no more, than five parts of Metall, so as to persist in the Tryal of *Saturn* and *Antimony*; whereas, on the contrary, the Great Stone of Philosophers can transmute to infinity. Also in augmentation it cannot be so far exalted; yet the Gold is pure and solid.

The Minera, [sic] out of which this Stone or Tincture is made, is no other then (as I above mentioned) the very Earth of *Antimony*; from which, I say, it is made: but how or with what virtue, force, and power it is endued, you shall hear anon.

Let the Reader consider, that there are many kinds of Stones found, which tinge particularly; but all fixed Pouders, which tinge, I here signify by the name of Stones; yet one tingeth more highly then another, as especially the Stone of the Philosophers, which obtains the principal place; the next is the Tincture of *Sol*, and of *Luna* &c. For the White: after these, the Tincture of *Vitriol* or *Venus*; likewise the Tincture of *Mars*; either of which hath in it self the Tincture of *Sol*, when reduced to Fixation. Next to these follow the Tinctures of *Jupiter* and *Saturn* for Coagulation of *Mercury*; and lastly, the Tincture of *Mercury* it self. This is the difference and multiplicity of Stones and Tinctures, all which notwithstanding are generated from Seed, and from one original *Matrix*, from which the true Universal Stone proceeds, but out of these no other Metallick Tincture is to be found. But all other Things, by what name soever called, all Stones (whether pretious or common) I touch not now, nor have I any Intention to write or speak any thing of them at this time; because they contain in themselves not other Virtues, then what appertain to Medicine. Nor shall I here make mention of *Animal* or *Vegetable* Stones; because they are only conducent to Medicine; but for Metallick Works unprofitable and voyd of all Virtue. Yet all the Virtues of all Things, *Mineral*, *Animal*, and *Vegetable*, collected into one, are found in the Stone of Philosophers.

Salts are endued with no tinging Virtue, but are onely Keys for the Preparation of Stones; otherwise of themselves they effect nothing.

Yet, as for Metallick Salts (I now speak to the purpose if you rightly understand, what distinction I put between *Mineral* Salts) they are not to be slightly esteemed, nor to be rejected in Tinctures, since we can in no wise be without them, in their Composition, For in them Lyes that most pretious Treasure, from which every Fixation derives its Original." [This translation has been taken verbatim from pages 146-148 of the 1678 London edition of the *Triumphal Chariot of Antimony*.]

The entire philosophical truth is thus contained in

the roots which we have discussed; and anyone who understands this Principle well will know that everything which is above is as that which is below. Thus by way of contrast that same person also knows how to use and operate the Philosophical Key, which through its acrid bitterness calcines and decomposes all substances. By this decomposition of perfect bodies however, one only finds the same sperm, which one has already prepared through the interaction of Nature. This could have been done without the need of reducing the compact body, but rather the sperm. This sperm is the one which Nature gives us; it is soft and not mature. However, it can be guided to maturity.

You should therefore put all of your effort into this primitive metallic subject to which Nature has given the true properties of a metal, but which nevertheless, she has left in a crude and unfinished, immature form. This subject is found in a soft mound in which you can easily dig a pit, and take it from our pure bitter water which is found in the vicinity of the Fountain. This is the only water (with the exclusion of all others) which by its Nature can be made into a paste with its correct flour and solar ferment, and can then be cooked in ambrosia. Our Stone is thus found in the same form in all seven metals. This is exactly in accordance with the opinion of the Philosophers who reassure us that the poor metals i.e. the five imperfect ones, possess it just as well as the noble ones i.e. the two perfect metals. The best of all the stones is found in the new abode of Saturn, which has never been touched. This is to say, of the one whose son (offspring) presents

himself, not without great mystery, to the eyes of all the world through night and day, and which all people use when they see it, and which the eyes can never attract by any species, in order that one may see, or at least believe, that this great Secret is enclosed in the son of Saturn, as all Philosophers confirm it and even swear to it. And this is the enclosure for their secrets, which contains the spirit of the Sun closed in its intestines and in its clean bowels.

At present we do not know how to describe our vitriolated egg more clearly. It is sufficient to know one of the:

"children of Saturn, i.e. the triumphant antimony; Bismuth or tin which melt like ice when heated by a candle: Cobalt which blackens more than either Lead or Iron: the Lead which does the tests: the Plumbites (or substances thus called) which are used in paints: the Zinc which colours and which is remarkable in that it can show itself in two different forms, almost like Mercury: a metallic matter, which can be calcined and vitriolated by air etc."

Thus this serene Vulcan which is the distiller of the human species, and which was born of black parents, i.e. from a black stone and from black steel, inevitably can and also has the property of preparing the most excellent remedies, from each of the aforementioned substances. But our volatile Mercury is completely different from all these things.

#### Discourse translated from verse

It is a Stone and not a Stone  
In which the entire Art is contained  
Nature has made it thus  
But she has not yet brought it to perfection  
You will not find it on the ground, because it does not  
grow there at all:  
It only grows in mountain caves  
All of this Art depends on it  
For the person who has the vapour of this object

Has the golden splendour of the red lion,  
The pure and clear Mercury:  
And the one who knows the red Sulphur which is in it  
He has in his power the entire foundation.

**Note: For Chapters 3 to 8 only the "Discourse from Verse"  
has been translated.**

### **Chapter 3 On Dissolution**

Discourse translated from Verse

Dissolve your stone then in a way which is convenient and simple,  
And not by a complex process.  
And remember to follow carefully the thoughts of the Wise Men.  
Hence do not add anything corrosive.  
For you will never find another water which can dissolve our Stone.  
Except for a tiny and very pure fountain  
From which the water itself flows  
And which is of exactly the right nature for dissolution.  
But it is hidden almost throughout the World  
And it gets hot by itself  
Which is the reason why our Stone sweats tears by itself  
It only needs a very gentle heat from the outside  
This is the main thing that you must remember  
But I must also reveal one more thing to you:  
If you do not see any black smoke above it all,  
and a white one below,  
Your work will not have been done correctly  
And you will have been misled in your dissolution of the Stone.  
That is what you will know straight away from this sign.  
But if you proceed in the correct way,  
You will detect a dark cloud,  
Which will go to the bottom without stopping,  
When the spirit turns white.

### **Chapter 4 How Our Salt is divided in the Four Elements according to the intentions of the Philosophers**

Discourse translated from Verse

The gold of the Wise men is never the same as vulgar gold,  
But it is a certain pure and clear water,  
Which carries the spirit of our Saviour;  
And it is there, from this water, that all living beings  
take and receive their life.  
This is why our gold can be completely made into a spirit,  
And by means of this Spirit it can pass through the alembic;  
Its earth remains black,  
Which it had never appeared to be before  
And now it dissolves in itself  
And thus becomes a water with a thicker consistency,  
Which is more suited to a higher life

In order that it can rejoin itself.  
For on account of its thirst, it dissolves itself and  
breaks itself off,  
And this is good for it  
Because if it does not become water and oil,  
Its spirit and its soul will not be able to join  
themselves,  
Nor could they mix with it, as it comes  
In such a way that these things are not done in a single  
operation,  
Which raises itself into pure perfection  
Of which the parts are joined so strongly together  
That they cannot be separated at all.

#### Chapter 5 On the Preparation of the Diana which is whiter than Snow

Discourse translated from verse

The Salt is the only and ancient key  
without which our Art could not otherwise exist.  
And that this Salt, which I bring to your notice,  
Does not look like salt at all at first  
It is however a true salt, which without doubt  
Is black and smelly at its beginning,  
but during its operation and through its work  
It acquires the consistency of blood,  
After that it becomes completely white and clear  
When it is dissolved in itself and when it ferments in  
itself.

#### Chapter 6 On the marriage of the red servant to the white woman

Discourse translated from verse

When the earth has been well prepared  
To drink its moisture  
Then take together the Spirit, the soul and the life,  
and put them into the ground.  
For what is earth without a seed?  
And what is a body without a soul?  
When mercury is taken to its mother  
From which it obtained its origin  
Throw it thus onto this earth, and it will be useful to you  
The Semen dissolves the earth  
And the earth coagulates the semen.

#### Chapter 7 The Degrees of fire

Discourse translated from verse

Take careful note of the advice which I have given you,  
concerning the strength of your gentle fire,  
And thus you will be able to hope for all kinds of  
excellent things,  
And one day you will take part in this excellent treasure;  
But first of all you must understand,

The vapourous fire following the thoughts of the Wise Men  
Because this is not an Elementary fire,  
Or a material or other similar one  
But it is rather a dry water taken from Mercury:  
This fire is supernatural,  
Essential, celestial and pure.  
It is a fire in which the Sun and the Moon are joined  
together.  
You should control this fire with an external one,  
And bring your work to an end.

## Chapter 8 On the admirable virtue of our Salty and Watery Stone

Discourse translated from verse

The Moon (white tincture)  
The divine Empress of August is born here  
The Masters have agreed by common consent to call her their  
daughter.  
She multiplies herself, and produces a large number of  
children  
They are pure, immortal and without blemish  
This Queen has a hatred for death and for poverty;  
She surpasses in her excellence gold, silver, and precious  
stones.  
She has more power than the remedies afforded by them all  
together.  
There is nothing else in the world which can be compared to  
her,  
And for this reason we give thanks to our heavenly Lord  
God.

The Sun (red tincture)  
We have an Emperor here who was born full of honours,  
No one greater than him could ever be born,  
Nor by the Art, nor by Nature,  
Among all the things that have ever been created.  
The Philosophers call it their Son,  
Who has the power to produce all kinds of effects.  
He gives to Man anything that Man may want of him.  
He grants to man an enduring health,  
Gold, silver and precious stones,  
A Strength and a beautiful and sincere youth,  
He destroys anger, sadness, poverty and all weaknesses.  
Oh three times happy is he who has received such a grace  
from our Lord.

### Recapitulation (a summary)

The recapitulation is nine sides long. In the first  
four sides the author discusses the religious aspects which  
include: praying to God, having good intentions, a  
reference to the words of Salomon, knowing the difference

between the evil forces of the devil which lead to eternal damnation, and faithful allegiance to the Lord our God, who grants eternal salvation. Altogether a fairly black and white picture is presented: good or bad, and the reader is invited to choose between them.

On the next two sides, the reader is advised to study the works of the great authors and to try to understand the theory underlying "The Philosophy". The reader ought to know, for example, that the right kind of sperm is required for a given process.

On the next two sides, practical aspects of the "Art" are discussed i.e. a knowledge of how the physical properties of the "real" Stone differ from those of the "false" ones. This is evident principally by their reaction to heat: "false" stones apparently decompose and sublime easily, whereas the "real" stone is pure and fumes or sublimes or dissolves "elegantly" in itself at a certain temperature.

In the final two pages the author once again describes the properties of "Our Medicine", which is composed of "the Sun and even its rays". There then follows a brief passage on how the Sun is so important to life and indeed to anything that happens. The rays of the Sun, Moon and Stars have accumulated on the Earth through the ages, because it has attracted them through its magnetic properties. These rays are what cause Nature to operate on Earth. Our Stone is that which is involved here.

This is the essence of our Art, which has been fundamentally explained by the Ancient Philosophers.

A Dialogue, which illustrates more clearly the preparation  
of the Philosopher's Stone (translation)

You have already seen in the previous treatises that the Assembly of Alchemists and Distillers which was vociferously discussing the Philosopher's Stone, was interrupted by a sudden storm. The people at the assembly were randomly scattered throughout many places and countries, and their fate was unknown. This event has caused an enormous number of deceptive and erroneous complex processes to develop because when this terrible storm had prevented them from reaching a final decision which would settle all their differences, every one of them had imagined to himself that he was the one who knew the true recipe. A certain number of the doctor chemists, who had helped at this Assembly, had read the works of the great philosophers which we recommend. Thus works on Mercury, Sulphur and Salt were relevant to their Stone. Both of these classes of men had regrettably misunderstood the thoughts of the Ancients on these matters, and thus they believed that common quicksilver, sulphur and salt were the required ingredients for the Stone. Thus when they were scattered into many different parts of the world they tried to make the Stone in a multitude of different ways. One of them had taken note of this important statement made by Geber which is worthy of consideration:

"when the ancients spoke of salt, they concluded that this was the soap of Wise Men, the key which closed and opened, and closed again for good; they considered that without this key, no person in the world will know how to arrive at the perfection of this work. That is to say that if they cannot calcine the salt once it has been prepared, it is then called the fusible salt."



Just as he read in another author's work: "*The person who understands the Salt and its dissolution, knows the hidden secret of the Ancients*". This alchemist was persuaded by these words that it is necessary to work with common salt, from which he could learn to prepare a subtle spirit, with which he would dissolve common gold. He would thus cause its colour and hue to become lemon yellow and he would learn how to combine this substance with imperfect metals in order to make gold. But for all his work, he did not achieve the desired result. A further effort which he must have made was that he remembered another remark from the same Geber:

"All imperfect bodies can only be perfected by being mixed with bodies which have been simply perfected by Nature. For in the first stage of their perfection, they had only acquired a simple form, through which they had been perfected by Nature, and as dead bodies they did not have any superfluous perfection which they would be able to pass on to others. There are two reasons for this: a) because of this mixture of imperfection they become imperfect because they have no more perfection than they need for themselves, and b) because by this means their qualities are unable to become intimately mixed to the highest degree, just as the bodies do not penetrate one another at all etc."

After that, this next sentence of Hermes comes to the attention of our Artist: "*The Salt of metals is the Stone of the Philosophers*." From this, he concluded that common salt is not the salt which the Philosophers used to talk about, but that he had to extract it from metals. It is for this reason that he began to heat metals strongly, to dissolve them in strong waters, to corrode them, destroy them, and to prepare Salts. For this purpose he has devised many ways of dissolving metals, of making them melt easily, and many other such unnecessary and superfluous processes. But he has never been able to achieve his goal by using

these techniques. This has made him doubt those matters concerning salts and the substances which we have discussed so that he always kept reading the works of very many Philosophers. He always used to thumb through the pages of these books in the hope that he would find a passage which formally discusses the matter and he did this until he discovered the following axiom: "*Our Stone is the Salt, and our Salt is an earth, and this earth is virgin.*" He considered the meaning of these words very seriously and suddenly realised why these earlier works had not succeeded in the manner in which he had expected them to. Because until now, he had missed this virginal salt. He did not know how to obtain this virginal salt on the ground, nor indeed, anywhere above it at all. For the entire surface of the earth is covered with plants, flowers and gardens, whose roots attract and draw up the virginal salt which causes them to grow. Thus all of this Salt loses its virginity as it gives rise to life. And it is all the more surprising to find how people can be so extremely stupid as to still not understand these topics which have been so clearly explained in the Books of the Philosophers. Philosophers such as: Morienus who said: "Our water grows in the mountains and in the valleys", or Aristotle: "Our water is dry", or Danthyn: "Our water is found in old stables, toilets and stinking drains", or Alphydius: "Our stone can be found in all things everywhere in the world and also thrown on the path (of life). God has ensured that it will not be expensive, in order that it may be attained by both the poor as well as the rich." And so what! (He

thought about it to himself) Is this Salt not clearly marked in all of these places? It is true that this stone and this dry water can be found in all things: and even in sewers. In the same way that all bodies are composed of it, are nourished by it, and are caused to grow by it. Through their decay they are therefore continuously involved with it, and also because a large quantity of this fat Salt causes fertility. There is one thing which the ignorant can do better than us learned people; and this concerns the treatment of barren ground. When the ground has become barren on account of its dryness, they use rotten dung and a bloated and fat Salt, when we know well that a barren soil cannot be fertile. Nature has also revealed to certain people, that it is possible to improve the fertility of a barren soil by using a certain Salt derived from ashes. It is for this reason that in certain places farm labourers take leather which they cut into small pieces. They then burn this leather and throw the ashes onto poor soils which subsequently become fertile. This is done for example in the county of Denbighshire in England. We have another example of this method being used in ancient times, in Virgil. At a time when the opinions of the Philosophers were most highly esteemed, they revealed to us in their writings the following properties of the Salt: For where can one ever find a force and virtue which is more awe-inspiring than that found in Salt of the Earth i.e. nitre, which is a thunderbolt of lightning that nothing can resist?

Through reasoning and arguments such as this, our

Alchemist was already convinced that he had reached the ultimate truth. He rejoiced at the thought that he alone, amongst a thousand million others, had achieved such a profound level of knowledge. He already took no notice of learned men, indeed of almost any men, whom he considered to be in a stagnant quagmire of ignorance because they had not yet achieved the quintessence of the Philosophy. They had thus not become rich because there was an infinite variety of treasures concealed in the virgin Salt of the Philosophers. He next convinced himself that in order to acquire this virgin Salt, he would have to dig the foundations of the roots in a certain clayey soil in order to extract a certain virgin soil which had never yet had anything growing on it. He then reached the wrong conclusion that: *To obtain the living water of the Salt of nitre, it is necessary to dig a hole which is knee-deep.* Instead of trying out this dream-idea in practice, he decided that this would not be necessary and instead he resolved to make his ideas known to everyone by putting them into print. In this printed work, he maintained that he had exposed the true thoughts of all the Philosophers. He persisted so strongly in this vain and imaginary opinion that he exploited himself to the maximum. Thus he reduced himself to a pauper who was overwhelmed with grief and boredom and who felt thoroughly sorry for himself for wasting so much time, effort and money. This misfortune was accompanied by a great disillusionment, anxiety, much worry and much sleeplessness. All of these afflictions grew on him day by day. Finally he decided to return to this place

to which he had been before, and to dig into this soil which he believed was the Philosophical soil. He continued to pour forth his grievances and curses until suddenly he fell into a deep sleep - something which he had been deprived of for several days as a result of his worry and sadness. While he was in this deep sleep he had a dream: he saw a large group of men who were all radiating light. One of them came up to him and addressed him: "My friend, why do you say such bad things, and curse and swear against the Philosophers who are guided by God?" This alchemist, who was completely taken aback, replied in a trembling voice: "Sir, I have read parts of their works in which I saw how greatly they praised their Stone and how very much they were impressed by it. This gave me enormous inspiration to attempt its preparation myself, and so I followed their recipes and their instructions in order to achieve their Stone. But now I have seen that their words misled me and thus I have lost everything."

*Vision:* You are doing them an injustice in accusing them of being imposters, for all that you see here are genuine people. They never wrote a single lie and they left us only with the purest truth. For in their words there lies a hidden and occult meaning. Otherwise unworthy people would put these ideas to bad practice and thus cause a great deal of harm and disorder in the world. You must not interpret their writings literally, but according to the functions and possibilities of Nature. It is not necessary that you should have had practical experience beforehand. For after having built solid foundations by your fervent prayers to

our Lord, and by assiduous study and careful reading, you will then be able to understand what the Philosophers were really talking about. This was just the one thing that was Salt, Sulphur, and Philosophical Mercury.

*Alchemist:* How is it that Salt, Sulphur and Mercury can be just one substance, since they are three distinct substances?

*Vision:* Now you can see how little you really know, and that you really have not understood anything at all. The Philosophers have only ever spoken of one thing which has body, soul and spirit, and they call it Salt, Sulphur and Mercury. These three are found in one and the same substance and this substance is their Salt.

*Alchemist:* Where can one get this salt from?

*Vision:* It is obtained from the obscure prison of metals. You can do remarkable things with it, and also see a wide variety of colours and transmute base metals into gold. But this substance must first be made in its fixed state.

*Alchemist:* It is a long time since I was in the mood to carry out these experiments with metals, and I never found anything which resembled this substance.

*Vision:* This is because you always searched in dead metals, which never had in them the virtue of the Philosophical Salt. In the same way that you cannot expect a loaf of bread which has been baked to give seeds, you cannot expect a chicken to hatch from a cooked egg. If, therefore, you wish to generate something, you must start with pure seeds which are living and which have not been damaged. For vulgar metals are dead. Why then, do you search for living

matter among that which is dead?

*Alchemist:* Cannot gold and silver be revitalised once more by the process of dissolution?

*Vision:* The gold and silver of the Philosophers are life themselves and they do not need to be vivified; you can even get them for nothing. But vulgar gold and silver are both very expensive to buy, and are dead, and always will be dead.

*Alchemist:* How can you get this living gold?

*Vision:* By dissolution.

*Alchemist:* How does one achieve this dissolution?

*Vision:* Dissolution is done by itself and with itself, without adding anything else. For the dissolution of the body is done in its own blood.

*Alchemist:* Does the entire body go into the liquid state?

*Vision:* To be sure it does. But the wind also carries in its belly the unchangeable son of the Sun. This son is like a fish without bones, which swims in our Philosophical sea.

*Alchemist:* Don't all other waters have this characteristic?

*Vision:* This Philosophical water is not like water from clouds, or some large spring. But this is a strong water, a white gum and a permanent water, one when joined to its body will never leave it, and when it has been digested for the necessary period of time, can never be separated from it. This water then is the real substance of life in Nature; water which has been attained through the magnet of the gold, and which, through the industry of the Artist, can be decomposed into a clear water. This is something which no other water in the world can do.

*Alchemist:* Does this water bear any fruits?

*Vision:* Since this water is the metallic tree, one can grow small offshoots from it, on a small Solar branch, which, if it grows, will cause by its odour that all imperfect metals will become similar to it.

*Alchemist:* How does one proceed with it?

*Vision:* It must be cooked continuously first in a moist atmosphere and then in a dry atmosphere.

*Alchemist:* Does one always repeat this the same way?

*Vision:* The first time round it is necessary to separate the body, the soul and the spirit. Then they must be joined together again. For if the Sun is joined to the Moon, then its soul is separated from its body and subsequently it returns to it from itself.

*Alchemist:* Is it possible to separate the body, the soul and the spirit?

*Vision:* Do not attempt this with anything other than water or leafy soil.

*Alchemist:* What do you mean by leafy soil?

*Vision:* Have you not read that there is a tiny island which can be seen in our Philosophical sea? This soil must first be powdered, and it will then become like a thick water mixed with oil. There you will have our leafy soil which must be combined in the correct proportions with its water.

*Alchemist:* What is this correct proportion?

*Vision:* The proportion of water must be plural whereas that of leafy soil must be singular.

*Alchemist:* Forgive me sir, but I find your explanations of the matter too difficult to understand.



*Vision:* I never use any terms or names other than those which the Philosophers have invented and those which they have left in written form. And all of this crowd of happy people whom you see: were they true Philosophers during their lives? Some of them were great Princes, others were kings or powerful Monarchs. These people were not ashamed to get their hands dirty and to sweat and toil in order to discover the secrets of Nature, and then wrote their findings for us. Read their works diligently and do not slander them in future but take note of their learned traditions and maxims. You shall keep well away from all discreditable dealings and all imposters, and then you will find joy in the hidden mirror of Nature.

Having thus spoken, the Vision immediately vanished. The Alchemist woke up, and was not sure what to make of this dream. But since all the words were still fresh in his memory, he immediately went to his bedroom and wrote them all down. He then carefully read the works of the Philosophers, and thus he was able to recognise all of his major faults and follies. Having thus discovered better the real foundation, he wrote his thoughts in German verse as follows:-

Discourse translated from Verse

One thing can be found in this world,  
Which is also everywhere and in every place,  
It is neither earth, nor fire, nor air nor water.  
But it never fails to be in any of these things  
However it can become fire, air water or earth.  
For it contains Nature in its entirety,  
In itself, purely and sincerely;  
It can become white or red, it is hot or cold  
It is moist and dry, and it spreads out by any means,  
Only the body of Wise men really knows of it,  
And calls it its Salt  
It is held in their Earth

It has caused the death of many foolish people  
For common ground does not yield anything here  
And nor indeed does vulgar Salt, in any way  
But rather the Salt of the earth  
Which contains all of life in itself  
This medicine which will cure you of all illnesses is  
derived from it.  
So if you want to get the Philosophical Elixir,  
You should start off with this Salt, which is undoubtedly  
metallic,  
As Nature has made it,  
And reduced it to a metallic form,  
Which is called our magnesia,  
From which our Salt is extracted;  
When you will thus have this same thing,  
Prepare it well for your use,  
And you will obtain from this clear salt its very heart  
which is so gentle,  
You should also remove from it its red soul  
And its excellent and gentle oil.  
And the blood of Sulphur is called,  
The supreme good of this work.  
These two substances will enable you to attain  
The supreme treasure of this Earth.  
Now, how must you prepare these two substances,  
By means of your Salt of the ground,  
I do not dare to write this openly,  
For God wishes that this remains hidden.  
And it must not fall into the hands of rogues under any  
circumstances.  
A meat made of precious pearls  
Always learn from me in great faith  
So that no stranger can enter into this work;  
In the same way that ice, by the warmth of fire,  
Is initially converted to water,  
It is also necessary that this Stone is made into water  
from itself  
It only needs a heat bath at a moderate temperature,  
In which it dissolves in itself  
By the method of putrefaction.  
Separate the water from it,  
And reduce the earth into a red oil  
Which is this purple coloured soul.  
And when you have obtained these two substances  
Combine them together gently,  
And place them into the Philosopher's egg,  
Seal it hermetically,  
Then place it on an Atanor,  
Which you should use according to the methods  
Which were customarily used by the Wise men.  
Use a very gentle fire in it,  
Such as a chicken would use  
In order to hatch her chickens.  
Eventually the water through a great effort draws itself  
into all the Sulphur,  
In such a way that you can no more detect any sulphur in  
it,  
This process never lasts for very long.

Since by its heat and its dryness  
It strives once more to manifest itself.  
Which is exactly what the cold Moon will try to prevent  
It is here that a great conflict between these two  
substances commences.  
During this conflict both one and the other rise above by  
extraordinary means  
But the wind forces them to come back down again  
This however does not stop them from climbing back again.  
And after they have continued these movements and  
circulations for a long time  
They finally remain stable at the bottom  
Where they are all completely liquefied  
Into their original great chaos.  
Then all of these substances turn black.  
Like soot in a chimney;  
Which is called the crow's head.  
It is the one which is not a small sign of the grace of  
God.  
When this has thus taken place,  
You will see there for a short period of time  
All sorts of colours,  
Red, yellow, blue and all the others  
These however will all rapidly disappear  
And you will then gradually see  
That everything will become green as leaves or grass.  
After that you will see the light of the Moon,  
It is for this reason that the heat has to be increased,  
And left at this level;  
The matter will then become as white as a bald man,  
whose old appearance resembles that of ice,  
It also becomes almost as white as silver.  
Look after your fire with great care  
And then you will straight away see in your vessel  
That your matter will have become as white as snow;  
And thus your Elixir is achieved for the work as a white  
matter;  
With time it will become similarly red.  
And for this reason you should once again increase the fire  
And it will become yellow or lemon coloured throughout.  
But at the very end it will become as red as a ruby.  
Then you should offer thanks to our Saviour the Lord,  
For you will have discovered such a great treasure,  
That there is nothing else in the world which can be  
compared to it for its excellence.  
This red stone tints on pure gold  
Tin, brass, iron, silver and lead  
And all other metallic bodies which there are.  
It is also capable of producing many other remarkable  
effects.  
By means of it all known illnesses of men can be expelled,  
And these people can then live as long as they wish,  
And it is for this reason that you should offer thanks to  
the Lord with all your heart,  
And with this heart you should offer generous help and  
friendship to your neighbour  
And use this Stone for the glory of the Highest  
Who will then give us the grace to be received into his

Heavenly Kingdom.

Glory, honour and virtue to the Lord God  
Almighty for ever. For he alone is wise and everlasting,  
the King of Kings, and the Saviour of Saviours, who is  
surrounded by an inaccessible light, and who alone is  
immortal and who has prevented the violence of death,  
and who has produced and shown us an everlasting spirit.  
And so be it.

END

*Process on the Central Salt (1598) - a summary.*

The work opens with a short introduction in which the Earth, which is influenced by the heavenly bodies, is described as being the mother of all material things. In the centre of the Earth there is virgin soil which has to be purified with the help of fire and water. This soil contains three elements, which have to be obtained from it and subsequently purified.

The three salts present are: the philosophical saltpetre, the heavenly and visible spirit of the World which is concealed in the volatile salt, and the fixed salt.

The extraction of these salts is described. There then follow eighteen short paragraphs and a conclusion. The contents of these paragraphs are summarized below:

1) The practical.

A sample of soil is taken, which has to be of a specific type, and obtained at the right time of the year. This has to be carefully divided into two portions. Philosophical saltpetre will be extracted from one part, and volatile and fixed salts from the other part.

2) Firstly on Saltpetre.

The preparation of what is clearly recognisable to us as fuming nitric acid, by distilling saltpetre with calcined soil, is described. Emphasis is laid on technique: in purification, separation and quantitative aspects. What we would identify as nitrogen dioxide gas is clearly described as one of the products.

### 3) Secondly on the volatile salt.

The preparation and purification, by repeated sublimation (dry distillation) of volatile salt from a mixture of farmyard soil with calcined soil is described.

### 4) The third work : on fixed salt.

This is prepared by taking the soil left from the previous preparation and heating it very strongly for 12 hours. The fixed salt is then extracted with distilled water in several stages. The resultant solution is concentrated and allowed to crystallize.

### 5) The Joining of the Three Salts.

By mixing, in suitable proportions which are stated, fixed and volatile salts with spirit of nitre, the triumphant mercury of the philosophers is obtained. This is a universal solvent and miraculous fiery water.

### 6) The execution of the universal work.

Mercury, gold and the universal solvent are reacted quantitatively. The resultant solution is sealed in a glass tube and placed into an atanor.

### 7) How to use the atanor.

The components of the atanor and their functions are described. The tube containing solution from the previous process is heated for a total of about 90 days in two stages. The first, lasting about 45 days, at moderate heat, and the second, lasting an equal period, at high heat. Various colour changes occur, and at the end a small scarlet crystal resembling ruby, is formed. This is deemed to be the seed of the sun - gold.

### 8) Execution of the great work.

The crystal is mixed with exactly ten times its mass of the universal solvent in a tube, sealed, and heated in an atanor for a period of about 80 days; once again at varying degrees of heat. Various colour changes are once again described. Continue the heating, until a sample of the red powder melts without emitting any smoke when it is heated in an open silver dish.

#### 9) Multiplication.

Take the one portion of the red powder and mix with ten parts of the universal solvent. Repeat the above procedure as frequently as is required.

#### 10) Fermentation.

One part of the red powder is added to ten parts of molten gold, which becomes brittle on solidification. One part of this solid is added to ten parts of hot mercury. The latter is transmuted into pure gold. In the first multiplication, one part gives ten parts of gold. In the second it gives 100 parts of gold etc.

There then follows a note about the nature of the transmuting powder, which is very difficult to understand.

#### 11) Preparation of saltpetre from secondary virgin soil.

Saltpetre is prepared by using solvent extraction and recrystallization. Wooden barrels with a layer of straw on the bottom, are filled with soil and water which is then allowed to stand for 24 days. The bottoms of the barrels are then unplugged and the solution is decanted, concentrated by evaporation, and allowed to crystallize. This recrystallization is repeated until the salt is a pure crystalline white.

This, according to the author, is the salt which holds the mystery of all the philosophers and contains concealed in it the earlier mentioned spirit of Nature, which gives both life and health.

#### 12) We enter the Chemical Laboratory

The saltpetre which has thus been obtained is very special because it is composed of three different salts. It contains the "spirit of the world", which is not solid, but of an intermediate type. It also contains the volatile salt and the alkaline salt. Thus it is three-in-one, like the Holy Trinity.

#### 13) How to obtain the spirit, and the volatile salt, from our saltpetre

One pound of saltpetre is mixed with three pounds of soil (left over from the earlier extraction) which had been calcined. The mixture is placed into a retort and is strongly heated. The vapours are dissolved in distilled water, and the crude volatile salt which collects is also dissolved in the spirit. The solid residue is kept for the next process, whereas the volatile salt is again separated from the spirit by redistillation, and subsequent resublimation of the solid residue.

#### 14) Preparation of fixed salt

The solid residue from the previous process is calcined and then leached with hot distilled water. The solution thus obtained is filtered and condensed to the highest degree of purity.

#### 15) The combination of the three elements which have been philosophically prepared

Until now, the body, soul, and spirit of the



Philosopher's Stone have existed separately. With the aid of heat, these three will be combined in a state of great purity. This will free them from their impure beginnings.

Mix the volatile and fixed salts as obtained previously and grind them to a fine powder. Then carefully add spirit of nitre and reflux the mixture. Remove any white precipitate which may form.

Having thus obtained the real and most secret key to the whole of philosophy and Nature, the experimenter should now be ecstatic with joy. For with this, he will be able to open all gates, untie all knots, close all metals, minerals and stones, and discover the greatest and most hidden secrets of Nature.

For this is the universal solvent in which all metals dissolve, especially gold.

This water will give life to all metals: it is the queen of liquids. It is philosophical milk - which becomes hard philosophical cheese through its interaction with gold.

#### 16) Combination of the ferment of the sun with our water

It has been recently said that gold combines readily with this liquid and is rejuvenated by it. The method for achieving this is described as follows: mix one part of gold with ten parts of this most holy mercurial water. Watch it dissolve easily and naturally. Then place it in a sealed tube in an atanor and heat - first gently for forty days, and then more strongly for a further fifty days. Then heat it in a sandbath even more strongly for a further fifty days. After displaying various colour changes and

after further heating, the whole solution turns red and a ruby coloured crystal is formed.

It can now be seen how Nature selects only the most pure QUINTESSENCE and rejects all other deposits and sulphurs. This seed is the true seed of gold which will enable an eternal fire, unlimited wealth, permanent health and a clean mind to be achieved. It can be multiplied by repeated moistening and coagulation as follows.

17) The combination of the Stone with its own mercurial liquid

Take one part of the Stone and ten parts of the real solvent and treat them as described in the first work until the product is not decomposed by heat.

18) The next multiplication

One part of the medicine is dissolved in ten parts of our water. The solution turns deep red. This process can be repeated as many times as is desired.

This is the same as the process described before, but it is much quicker, as long as the substance is dissolved in its own water. A sample of the tincture should always be kept and the multiplication can then be carried out an infinite number of times.

A factor of ten can be achieved in each multiplication.

**Conclusion**

The process for the preparation of the universal tincture has now been completely described. It should be used for the glory of God and for the love of others.

Let the Lord be praised.

## Appendix G

### *Statutes for a Society of Unknown Philosophers* (translation)

#### Treatises of Cosmopolite, Newly discovered

Having suggested the idea of a Philosophical Society, the author explains in several letters, the theory and practice of the Hermetic truths.

#### Idea for a new Philosophical Society

##### Preface

Having sailed around the unknown seas of the Ancient Philosophy for a very long time, we have finally arrived, through the mercy of our Lord, at a port. But since it is not just through destiny that we have avoided the dangers of such a sailing, we feel that we can best show the Lord our gratitude by dedicating to Him the infinite treasure which he has bestowed upon our hands, and to use it to His glory and for the service of others. Because if one is bestowed with the best things possible on Earth, where else should one's goal be directed, other than to heaven? For these are the sentiments which reason and our desire for salvation inspire in us. Knowledge on its own will inspire us just as much as these sentiments, but when we have neither of these motives, charity on its own will suffice. We are currently living in extremely bad times, when the whole Christian world is lamenting. It would therefore be a crime to hide in secret such a gift received from heaven; such a gift which could do so much to help the poor and miserable of whom there are so many in the world.

Inspired by these noble desires, and rather than restricting ourselves to just one part of the earth, we

should immediately resolve to travel around the whole world. This is because all people, but especially Christians, can make use of this divine bounty which we have been given. This gift can be used by everyone of us to repair damaged churches and re-establish holy places by building sound foundations.

Such initially, were our ideals, but alas it soon became clear that we would be unable to carry them out, without finding thousands of contradictions [sans y trouver mille contradictions], the malice of men, even though it is so far away, has caused my life to be in danger on more than one occasion; this is not to mention the dangers which threaten our Republic, if I extend my thoughts further.

I have therefore been compelled to follow other ideas and to search for another means of achieving our goal. After some deliberation I have come to a clear solution: we should establish among ourselves a certain Philosophical Society in which the true identity of members will be concealed, and which will become generally well-known and will thus spread to all kingdoms in a short space of time. All Associate members will thus be wise and sensible propagators of the precious treasures of the Hermetic Science, regardless of their nationality.

It is with this view in mind that I prayed for enlightenment from the Holy Spirit, in order that I may write the Statutes and Rules of this new Cabale. These rules will govern the manner of conduct of the members of this society. Next, I have chosen people of whom I approve, to be founder members. And finally, for those who would

hope to be able to join our ranks one day, I have written several treatises on this science. I have included in these works those ideas which my experience has taught me to be useful, so that even those people who are in the most distant lands will be able to gain some benefits from them.

The result will be, that if they think a little, I hope that they will easily recognise the essential points and basis of our Philosophical secret. For this is the subject that demands some attention. It is this material which, I hope, the Patrons of the society will pass on to those whom they meet. As for the rest of the theory and practice, members will have to acquire this through studying, reading and even through experiments - they will then arrive easily at their goals.

These goals will be reached easily, unless God allows the veil of obscurity to spread over them. For God alone understands the depths of our hearts, knows our intentions, our malice, and to where our thoughts aspire. Only He can remove a certain obscurity in the spirit of these people. This obscurity acts as a veil and hinders them from observing those things which are clearer than broad daylight. Thus it hides from them the explanations of natural phenomena [leur cachant par la ce que peuvent les causes naturelles], or at any rate, it prevents them from knowing for a while, until such a time when they have become enlightened.

Now on these treatises which I have written - I have allowed several of them to be printed. As for the others, which explain the same basic principles in some detail, I

have recommended that these should not be made available to the public, or if some have appeared, I have immediately stopped them, in the belief that it would be more convenient and more useful to have them published at another time.

However, in order that such a delay should not cause the slightest prejudice against our Society which is being formed, I have considered it appropriate to communicate by letters to our Elders, the best parts of these works. These are written in a simple and clear style. I have also requested that they should be made immediately available to our members, in accordance with the statutes and regulations which follow.

#### Statutes of the Unknown Philosophers

##### Chapter One

##### The organisation of the Society

##### Article I

##### The Nationality of Members

This society must not be limited by any Country, Nation, Kingdom or Province i.e. any particular place. It should spread to all inhabited lands and especially those where Jesus Christ is worshipped, or where His Law presides, or where virtue is known or where reason is adhered to. For a universal good cannot be enclosed into a small reserved space, it must be carried by all to where it can help others.

##### Article II

##### How the Society should be subdivided

For fear however, that there will be confusion from

such a vast array of countries, we have found it a good idea to divide the whole Society into companies, the companies into sections, and the sections into assemblies. These bodies should be distributed in such a way that each one is based at a fixed place and country. For example, each company should be enclosed in an imperium [Empire] which there should only be one president; each section should only be bounded by a Province, and the assembly should only stretch as far as a county of any particular country. Thus if someone from an unstable country [qui ne soit pas d'un pais stable] wishes to join the society, he will be obliged to choose such a place to live in, that he will not be a member of two companies, sections or assemblies at any particular time.

### Article III

#### The number of Members

As regards the number of members in each company, section or assembly, it is neither easy nor useful to suggest any particular number. The reason for this will shortly become apparent. Providence will see to this because the glory and service of God is the ultimate and only name of this Institution. All that one can say in general is that members must exercise prudence with those whom they admit. This will be done according to the time, place and requirements of their Body, and thus they will admit fewer or more people. They should remember however, that the veritable philosophy cannot be practised by a multitude of people - and thus we can be sure that the number of members will remain small. The most senior member

or the president of each company will keep a register of all members. This will contain their names and countries. Their membership numbers will also be kept, for reasons which we shall discuss next.

## Chapter 2

### Conditions for membership

#### Article I

##### The social status and religion of members

It is not at all necessary that those who are accepted into this society should be members of any one particular religion or profession, or that they should all be of equal social status. What is required of them however, is that they should all worship Jesus Christ, that they should all love virtue and have the proper frame of mind for the Philosophy. Those members of mediocre background will thus be able to succeed in achieving the sole aim, which is to help all poor Christians and to offer comfort to all those afflicted with poverty, regardless of their status or whereabouts. Thus they will be able to do this, as well as those people from a higher social background. It would be a very sad state in Christendom, if people of a modest background, who are of high moral calibre, were banished from our society, in favour of those from the upper classes.

There is no reason to believe that those who are not members of the Roman Church abuse the treasures given to them by the philosophy, to make war with Catholics or to overthrow the Holy Apostolic See. For it is not possible that God will allow them to successfully complete the Great



Work, of which our Philosophy discovers the principles, unless they purge their hearts of bad intentions even before they begin. They will never have their eyes opened to the mysteries of the Philosopher's Stone, if they do not cease to be blind to the mysteries of faith. If however, someone joins under the false pretences of being both keen and religious, and is subsequently discovered to be against Christianity, and especially against Roman Catholicism, he will be removed from the Society, even though he may already be a member.

## Article II

### Exclusion of People who have taken Holy Orders

Maybe it does not make any difference, as I am about to say, from what background members originate; but I believe however, that clerics should never be accepted, nor anyone who has taken monastic vows, and especially members of orders of Mendicant friars, if this does not conflict strongly with the wishes of other members of the Society. For the same laws apply to both slaves and all people who consecrate their lives to the service of God. The Philosophy demands people with free minds who are free to do as they wish; people who can work when they wish, and who can use their time freely on the Philosophy and on their new discoveries, without interfering in anyone's affairs.

## Article III

### Sovereigns only exceptionally to be admitted

Now among free people, the least suitable for this kind of occupation are kings, princes and other sovereigns.

One can include in this group people who are of a higher social status than the average person but who have ended up by loss of fortune, as ordinary commoners. For none of these groups of people are really suited to our Society, unless certain distinct virtues, which shine throughout their entire conduct, exclude them from this group. The reason for this is that ambition would not be the driving force of these kind of people; for wherever this unfortunate situation is found, people no longer act by the motivations of piety and Christian charity.

One also has to add to this list of exclusions the poor and the destitute of all sorts; on the grounds that they would not be in a position to prepare the most sought after secret of Nature, even if they possessed the work which would instruct them in its preparation.

#### Article IV

##### Behaviour befitting members

Anybody from any social or other background must satisfy the following conditions to show that he has genuine good intentions for entry into the Society. He has to:

- a) be a practising Christian with strong convictions
- b) have strong faith
- c) have strong hope
- d) be generous
- e) have a good business sense [un homme de bon commerce]
- f) be honest in conversations
- g) persevere with determination regardless of results
- h) not to have any bad intentions
- i) ensure that any people who assist him in helping others do not come to any harm themselves

Above all, one should guard against any unhealthy connections with wine and women. Did not Harpocrates guard his freedom among goblets? And Hermes - was he wise, when

surrounded by women? But what a mess! To achieve the reward of the highest virtues one must be prepared to sacrifice the pleasures of life.

#### Article V

Why these people should have a natural curiosity

It is not sufficient for our proselytes to have irreproachable manners: they must also have a genuine desire to penetrate the secrets of chemistry and a curiosity which stems from the bottom of the soul, and not to accept the false recipes of the charlatans, but the wonderful operations of the Hermetic Science. They must exercise care that they do not unintentionally start to scorn the Art, whose excellence cannot be appreciated all at once. This, after all, must not be understood in such a manner, that as soon as a man is curious, in the same way that the majority of alchemists are, he is immediately deemed to have that which is necessary to be admitted among us. For curiosity will never be more alive in those who, having been forewarned of false principles, devote themselves to the operations of a sophisticated chemistry. [car jamais la curiosité ne fut plus vive que dans ceux qui ayant été prevenus de faux principes, donnent dans les Operations d'une Chymie Sophistique;] Besides, we should never allow the incapable and the indignant to enter the sanctuary of our truths.

#### Article VI

Secrecy - also an essential condition

To conclude this list of desirable qualities, one must include a perfect secrecy - which Harpocrates was able to

keep so effectively. For if a man does not know how to keep his mouth shut and remain silent when the situation demands it, he will never have the characteristics of a true and perfect philosopher.

### Chapter 3

#### Procedure for admitting new members to the Society

##### Article I

###### How to become a patron

Whoever becomes admitted to our Society can in turn accept new members, of whom he becomes the Patron. It is up to him to make known the rules of the Society to the new member, and that this member does nothing without informing his Patron and obtaining his consent.

##### Article II

###### How to gain members

Thus if someone, who is drawn by the reputation of the Society, wishes to become a member of it, he should befriend a person who he believes to be already a member. The member will begin to observe closely the prospective candidate's behaviour and his general attitude, and will keep him "in suspense" for some time without making any promises, until he is sure that the prospective candidate has shown sufficient proof of his ability and intentions. The prospective candidate must be watched closely unless his reputation is so well established, that there is no reason to doubt his virtue and other qualities.

In this case, the member will propose membership to the person to whom he would become the Patron. He will explain to the new member frankly and without any diguises

and favours, his good and bad points. At the same time, he will naturally keep his own person, family and proper name secret in case the proposed member does not accept the invitation to join. Even if he does not give an immediate reply, he must be told not to mention under any circumstances the fact that he was offered membership of the Society.

For it is one of the most important features of this Society, that not only are all of its members anonymous to strangers, but they are anonymous even among themselves; hence the name: "Society of *Unknown Philosophers*". The result will be that true Philosophers will thus be more easily protected from false accusations, misunderstandings etc., which have been customarily used against them. This would apply particularly to those who had made the Stone, and might then be misled from their true friends by demonic influences. The Society would thus be in danger of collapsing within a short period of time. If, on the other hand, a certain member is discovered to be dishonest or a traitor to the Society, then as a result of the anonymity of members, his exposure will not endanger or damage their reputation and they will not be involved in his misfortunes and be able to continue their work and experiments without fear. If, after this warning, anyone is stupid enough to make known his affiliations, he himself will suffer the unpleasant consequences.

### Article III

#### The obligations of Patrons

The matter of the acceptance of a new member into the

Society is not to be treated lightly. The new Patron must first interview the proposed member and discuss with him in detail the implications of his proposed membership. If there is any reason whatsoever to doubt the intentions of the new applicant, then the Patron is obliged to make no promises to him. He must then submit and discuss his proposal at a meeting of the committee, and to act on their instructions.

#### Article IV

##### The prerogatives of the General Secretaries

The General Secretary, or the most senior member of a given company, section or assembly is exempt from the aforementioned rules, in addition to many others of a similar nature. If however, the number of members drops, then it will be necessary to amalgamate the various assemblies into one section. The General Secretary of an assembly will then naturally lose his privilege; this will be left as a matter for his own conscience. After the closing of such an assembly, no-one may succeed a General Secretary until such a time when growing numbers of members deem it necessary to reform more assemblies.

#### Article V

##### The Reception

When a new member has been accepted into the Society according to the principles already given, he must be received into the Society in the manner which I shall describe. If the newly accepted person is religious, then a Mass should be celebrated, with the intention of seeking guidance for him, from the Holy Spirit. If the

circumstances are not favourable for such a mode of reception, then the person who is receiving the new member should organise a suitable ceremony.

Next, the person who is received must promise to keep secret at all costs the aforementioned statutes and above all any work which he undertakes. This must be done regardless of what may happen to him, whether it be good or bad.

Furthermore, he will promise to be loyal to the Society, and to treat as his own brothers any members of the Society whom he may meet. If he should ever come into possession of the "Stone", he will even promise by oath if his Patron requires him, to (as in all the other laws of the Reception, of which he must be aware, both the quality and the merit of those that are received) use the Stone only for those purposes which are recommended by the Company.

After that, the person who has acted as Patron in receiving the promises, himself repeats the promises in the name of the Society and all the members; he reassures the new member of their friendship, fidelity and protection, and vows that all the members will respect the statutes of the Society in the same favourable manner, if he does so. After these promises have been made, he whispers to him in the language of the wise men, the name of the *Magnesia*, or the true and unique material, of which the Philosopher's Stone is composed.

It would however be considered wise to have given him previously some sort of vague description of this

substance, so that he may subsequently try to skilfully decipher it himself. If he has difficulties in solving the mystery ultimately, this information should at least be sufficient to give him some help in solving the problem himself.

#### Article VI

##### The Name which the new member must adopt

The new member will accept a cabalistic name. If at all possible, the name will be an anagramatic form of his surname or the name of an Ancient Philosopher. He should make this name known to his Patron, so that it may be inscribed without delay into the Register, or the Journal of the Society. This will be done by one of the Elders who will ensure that each President and each member of every section and assembly are aware of it.

#### Article VII

##### What the new member must give in written form to his Patron

In addition to that, if the Patron considers it necessary, he will demand, in order to bind the new member more closely, a handwritten acknowledgement of indebtedness which will be signed by him with his cabalistic name. He will have complete faith in the manner in which his affairs are handled, and in the oath which he has taken. The new member may likewise ask his Patron to give him a copy of the statutes, signed with his cabalistic name. This will serve as a proof for all members of the Society, that he is a member.

#### Article VIII

##### The Agreements which the Patron must receive from the new member



When he has the time, the new member will be permitted to copy out the statutes and the Table of signs and Cabalistic characters which are used in the Art, with his own interpretation. In case by chance he should meet someone from the Society, he and the other person will be able to mutually recognise one another, by use of the signs. Finally, he may also receive a list of Cabalistic names of members from his Patron. These names would naturally not be the real ones - for it would be assumed that the member knows the real ones.

As far as our other writings which the Patron might possess are concerned, the Patron is obliged to show these also to the new member either all at once, or a few at a time, as he sees fit. He must be careful to check however, that there are no false documents among those that he shows, or any other which are contrary to our doctrine. For a philosopher can disguise certain matters for a while, but he is never permitted to deceive him. The Patron will not be forced to make these sorts of communications, either faster or in larger numbers than he would wish. Furthermore, he does not have to send anything until he has tested the person who is to join and also shown that he obeys the statutes carefully.

#### Article IX

##### The obligations of a new member

There is nothing else left for the time being, except to encourage this new member to study with care our books or the works of other approved philosophers. He should do this either by himself or in the company of other members.

He should be particularly keen to learn practical techniques, which will give weight to the theory.

He must take care not to be overcome by weariness during long hours of work, and he must not lose his patience and give up, when working on a particular experiment. He must understand that all other members are working for him and with him, just the same as he is working with them and for them. Without this work, he cannot hope to participate in their progress. For perfect science and peace are the fruits of hard work, in the same manner that glory is the prize of soldiers and Heaven is the goal of all good people. The vices of laziness and weakness are only the result of ignorance and errors.

#### Chapter 4

Statutes and rules for all members

#### Article I

Anniversary of the Reception

On every anniversary of his reception, every member who is a Roman Catholic should attend a thanksgiving Mass in order to receive further guidance from the Holy Spirit, which gives enlightenment in Science. All Christians should celebrate their anniversaries in a similar manner, in accordance with their religion. If however, someone should forget their anniversary celebration, they should not feel too guilty since this is only a recommendation, and not a precept.

#### Article II

Members must avoid discreditable conduct

Members must not get involved in dubious activities

with metals, regardless of their nature. They must have nothing to do with charlatans or false recipe-mongers. For there can be no greater indignity than a Christian philosopher who is searching for truth and who wants to help others, and who gets involved in a deceitful act.

### Article III

#### Working in Groups

Those members who as yet have no experience of dealing in operations involving fire, and who are thus ignorant of the art of distillation, are allowed to attempt these operations with mineral, vegetable and animal substances, since these processes are frequently necessary. Metals must never be alloyed however, and even more, alloys must never be used. This is because they are bad and must therefore be kept away from our members.

### Article IV

It is possible to enlighten those who are on the wrong track

Occasionally it is possible to visit crude chemical laboratories, provided that the workers there are not of a bad reputation. Since it is people like these that eventually become members of the Society, they should be approached. If they are then seen to be in error, they should be made aware of the fact, and subsequently instructed correctly according to our writings. All of this advice should be given with modesty, and in a charitable spirit, in order that the person does not waste any more time.

It is important however, not to say too much on such occasions: for it is enough to simply prevent the blind man

from falling over the precipice and to put him on the correct track. One is under no obligation to guide him after that; indeed, this would positively be bad, especially if one then realises that the blind man lacks an enlightened spirit, and that he ignores virtue.

#### Article V

##### How to encourage people to join the Society

Consider someone, among those who are interested in chemistry, who is an honest person with a reputation, who respects wisdom and honesty and who is interested in the Hermetic science for curiosity's sake, and not for money. There will be no harm or danger in talking to him about the affairs of members of our Society, in order that if someone was called by heaven and destined for this work, this would be an opportunity for him to hit on the thought of joining us and fulfilling his destiny.

In these discussions however, the fact that one is a member must not be mentioned, until the correct qualities have been recognised in this person, and the consent of the Patron has first been obtained. Otherwise there would be a risk of losing the title "Unknown Philosopher", which is against our statutes.

#### Chapter 5

##### On the types of activities which members should conduct among themselves

#### Article I

##### They should meet from time to time

Those members who know each other should meet occasionally when the opportunity presents itself, at a fixed time and place. They should do this regardless of the

company, section or assembly of which they are members. At these meetings members can discuss matters concerning the Society, books which they have read, and experiments and ideas which they have had. This is in order that they can learn from one another, as in any branch of science. These meetings must be conducted in a civilised and dignified manner. Wherever they take place e.g. in inns, the participants must conduct themselves to the highest standards, and leave an impeccable impression. Whilst these meetings will undoubtedly be very useful, they are nevertheless not obligatory.

## Article II

### Communication by means of letters

It is also possible to conduct business by means of letters between members. It must be borne in mind however, that members must never use their own names and must keep secret the most important points of the letter. Members should only sign these letters with their Cabalistic names, which should also be used at the beginning of the letters. The letter should be sent in an envelope which will bear the proper name of the addressee. If there is reason to suspect that the letters may be intercepted, one should use either numbers, a code, or allegorical words.

Communications by means of letters in this manner can thus be extended to the most distant members of the Society. The letters can serve as a means whereby Patrons can explain certain problems to their members, which arise as a result of their Philosophical research.

## Article III

The way in members should help and correct one another

If it is observed that a member does not obey strictly all the rules of the Society, and his conduct is not of the highest order as we would wish, he should be cautioned by the member who saw him, or, more importantly, by his Patron, in a delicate and friendly manner. The cautioned man must accept the criticism with grace and good spirit, and act upon it. If the cautioned man does not accept the good advice, he must not be immediately cut off from all business with other members, but he should be denounced in front of all the members of his own company, section or assembly, so that they are aware, and can discuss matters with him more cautiously, and not speak to him too openly. It is nevertheless prudent to act with some caution, since if the person in question suspects that he will be banned from the Society, he may do no harm to others, but he may also never have a chance of obtaining the Stone.

## Chapter 6

### How to use the Stone

#### Article I

How the person who has already made the Stone, should give advice on it

If one of our members is fortunate enough to bring the Great Work to a successful end, he should immediately give others advice on how to achieve the same result. This should not be done by writing in the sort of manner which is used here, but by an anonymous undated letter which is addressed to all General Secretaries of the companies. This is in order that those who are not able to meet the fortunate member, can be given some hope that they too may

experience similar good fortune, and that they shall not get disheartened by their efforts.

It will be up to the person who possesses the great treasure to choose among members, both known and unknown, those to whom he would disclose his technique. Otherwise, he would have to give the method to everyone, even those towards whom the Society has no longer any obligation whatsoever. If he were to do this, he would expose the Society to great dangers.

#### Article II

He must divulge his technique to those who ask for it

The fortunate member who discovers the technique for making the Stone is obliged without fail to reveal his findings to his Patron, provided that he is worthy of it. After that he should reveal them to all members, both known and unknown, who ask for it, provided that they will obey carefully the rules for keeping the secret. They will also be obliged to work hard and in secret, and never to misuse the grace which has been accorded to them.

Failure to disclose one's findings in the manner described would be a criminal act which would be equivalent to disclosing the secret to traitors, cowards and others who want to make quick gains with a minimum of effort.

#### Article III

How to make the Stone

Now the means of communicating this secret is left entirely at the disposal of its possessor. He may wish to pass on a small quantity of the Powder which he has made, or explain clearly the procedure for making it, or he may

simply choose to help those friends of his whom he believes may be able to make it. The last mentioned method would probably be the best, since each person would then be able to acknowledge the effort and results of the man who achieved the ultimate goal.

Those who are enlightened by similar means will not be able to use the Stone for the benefit of the other members, and not even their own Patron, unless they had earlier asked for permission from their instructor. For the secret itself is the least gratification which we owe him. And even the person who discovered it will not give it away easily but only to those who are very worthy of it.

#### Article IV - the final one

The use to which the Stone must be put

Finally, we shall discuss the uses to which such a treasure may be put, in the manner which follows.

One third must be given to God. That is to say for the building of new churches, the repair of old churches, the building of church foundations and similar pious causes such as propagation of the faith, as long as this is done without spilling human blood. For the truth of the Christian faith is spread not by arms but by good deeds: Jesus Christ did not order his apostles to teach the Gospel with sword in hand, but He only wanted them to act through the Holy Spirit, and that they should use the gift of languages to communicate with all people.

A second third should be distributed among the poor, oppressed people, and to the afflicted, regardless of how they may be afflicted.



The final third may remain at the disposal of the person who earned the money, in order that he may help his parents and friends - but only as much as they need, and no more. Thus, they should praise God, serve their country, and strive peacefully towards their own salvation. He must remember that it is very difficult to maintain moderation when there is a sudden change of fortune. Even when one gives money to the poor, this must be done sincerely and not just to impress others, otherwise one may lose oneself.

End of the Statutes and Rules of the Cabalistic Society of  
Unknown Philosophers

*Operations on the Philosophical Elixir, 1586 - a summary.*

(Sendivogius was then 20. Length of original = 2800 words)

Twelve operations are described in which various substances are reacted in attempts to prepare the philosophical elixir - a substance which would transmute or convert non-auriferous metals into gold. Each operation is described as if Sendivogius had carried it out himself. The instructions are based on recipes which had been supplied by authors such as Lully or Paracelsus. They are written with sufficient clarity to enable them to be replicated. Each experiment ends in failure to produce the desired product. For each failure, Sendivogius offers an explanation which the modern scientist could recognise as chemical/physical in nature. Whilst he believes that the first part of the operation had always been carried out correctly, lack of faith had ultimately prevented success. In summary, he says that he knows many others who have also tried and failed several times.

There is a short conclusion in which Sendivogius once again relates the experiences of the ancient philosophers who, he says, had undoubtedly appreciated the lengthy and dangerous nature of these operations, and who understood how metals are generated and how they multiply and also where they contract diseases. These philosophers had discovered how to cure the metallic diseases. In so doing, they had come across the "metallic principle" or "philosophers' mercury". This principle can be extracted from metals but only by one method - and this is the

greatest secret.

"Let God, who gave philosophical mercury its material body, and who created it, be praised.", he says at the end.

The work concludes with two quotations from Aristotle:

- a) Topics "In order to reach the truth one must first get to know what is false"
- b) Ethics "He is a good judge who correctly interprets what he knows".

In addition to Aristotle, Sendivogius mentions twenty other authors with whose work he is familiar. These include Bernard of Treviso, Avicenna, Geber, Lully and Paracelsus.

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