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Artificial Gold, Sold as Natural

Francisco de Vitoria on a Latent Defect in the Merchandise

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1. Introduction

In early-modern scholasticism attention was paid to the question whether the seller is obliged to inform the buyer about possible defects in the merchandise.¹ This should not surprise us. The starting point for theological teaching and writing was ‘On justice and law’ (*De iustitia et iure*), a part of the *Summa Theologiae* of Thomas Aquinas (1225–1274).² In Aquinas’ treatise the question of defective merchandise is explicitly dealt with. Moreover, the moral theology of early-modern scholasticism was directed at the very practical and day-to-day moral choices to be faced. Many of these had a distinctly legal nature. Furthermore, the question to be discussed was raised in a dynamic socio-economic context, including the new flourishing commercial capitalism within the Spanish Empire and the discovery of America with its mineral riches, gold and silver which, when brought to Spain, caused inflation.

When discussing the various kinds of defects and the consequences of their existence for the *forum conscientiae*, early-modern scholastics appear to have taken into consideration several circumstances which we nowadays still consider relevant. Is the defect latent or patent? Did the buyer examine the merchandise? Did he ask anything about the goods? Is it known to the seller for which purpose the goods were to be bought? Is the sale concluded between professional merchants or is the buyer one whom we would today call a ‘consumer’? The entire debate in early-modern moral theology could have taken place today, although most examples concern the sale of horses, for horses were at that time of crucial economic importance, both for commercial transport and agriculture.

In this contribution, in honour of Eltjo Schrage, my predecessor in the Chair of European Legal History at the VU University, I would like to pay attention to one specific question, related to the seller’s duty to disclose

1 On this subject see: W. Decock & J. Hallebeek, *Pre-contractual duties to inform in early modern scholasticism*, TvR 78 (2010), p. 89–133.

2 The questions 57–80 of the *Secunda Secundae* (IIaIIae).

defects, as dealt with by one specific writer, belonging to the school of early-modern scholasticism. On the one hand, it is hardly conceivable that this very question would today be taken seriously as a moral and legal problem, but, on the other hand, the same question brings to mind present-day discussions, such as that concerning the qualities of genetically manipulated food. The question goes back to the *Summa Theologiae* (1270–1272), where Aquinas had raised the issue whether artificial gold may be sold as natural gold. Artificial gold is that produced by alchemists. Natural gold is that created as a mineral in the lithosphere. The scholar investigated in this paper is the Dominican theologian Francisco de Vitoria (1483/1492–1546). He was one of the first to lecture in Salamanca on the basis of Aquinas' *Summa Theologiae*. Before turning to Vitoria's commentary, however, we have to pay attention to Aquinas' text and to certain 14th and 15th century opinions concerning artificial gold. The most important of these for the doctrines of early-modern scholasticism are those of the canonist Johannes Andreae of the 14th century and of the theologian Konrad Summenhart of the 15th century.

2. Aquinas on the sale of artificial gold as natural gold

When discussing latent defects, Aquinas had identified three categories.³ Defects can exist in the *species* (substance), the quality or the quantity. The sale of artificial gold is presented to exemplify a question, arising from to the first category, viz. whether a latent defect in the substance renders the sale unjust and illicit.⁴ Artificial gold can be used for all usual purposes, Aquinas argued in his first objection (*objectum*), and accordingly a defect in the substance will not render the contract illicit. In his reply (*responsum*) to this objection, Aquinas distinguished between cases where the artificial gold does not have the qualities of natural gold, such as the attribute of putting one in a cheerful mood and of healing certain diseases, and cases where it does have these qualities. He concluded his reply by stating that, if alchemists were capable of producing true gold, it would not be illicit to sell it, because nothing prohibits art from producing natural and genuine effects by applying natural causes. Saint Augustine (354–430) had stated this, when dealing with things done through diabolic arts.⁵ Aquinas' objection suggests that it appears possible that alchemists can produce gold, but his reply is less positive. The possibility is indeed discussed, but in somewhat hypothetical terms. Aquinas here uses an irrealis-clause (conjunctivus imperfecti: *Si autem per alchymiam fieret aurum verum ...*), which indicates that he con-

3 *Summa Theologiae*, IIaIIae, q. 77 art. 2 co. See Thomas Aquinas, *Opera omnia iussu (...) Leonis XIII P.M. edita*, vol. IX, Rome 1897, p. 150–151.

4 *Summa Theologiae*, IIaIIae, q. 77 art. 2 ag 1 and ra 1.

5 Cf. Augustinus, *De Trinitate Libri XV*, Liber III, Caput V-11 (CCSL 50-2, p. 137–138).

sidered producing gold as a hypothetical issue. This is confirmed by a remark we find in one of his earlier works, the *Scriptum*, which is a commentary upon the Sentences of Peter Lombard (1095–1160). Here, Aquinas clearly rejected the possibility of producing gold. Alchemists only produce something which, as regards its exterior accidents, is similar to gold. This opinion he supported by the argument that the substantial form of gold is caused by the heat of the sun and not by the heat of fire, which the alchemists commonly use.⁶ These statements show that Aquinas presumed that alchemists were pretending that they were transmuting the substance of a metal. This also explains why the question of artificial gold is discussed in the light of substantive defects. Aquinas seems to raise no objections to the idea of transmuting substances, but this can be explained by the fact that he did not take it seriously. The *Decretum Gratiani* (1135/1140), on the other hand, did. Only God is allowed to transmute substances and there is little doubt that anyone who claims to be able to do so, is an infidel and worth less than a pagan.⁷

3. Johannes Andreae on alchemy

In Western Europe alchemy was probably introduced by Arab Moors on the Iberian Peninsula in the course of the twelfth century, the term itself being derived from the Arabic *alkimia* (transmutation). Although alchemy may have had many aspects, the text by Aquinas and the commentary upon Aquinas' text by Vitoria confine themselves to the producing of gold from less valuable metals. The *Corpus iuris civilis* and the medieval compilations of canon law hardly provided any starting points (*sedes materiae*) for discussing this issue, unless we should regard it as a kind of sorcery, which was prohibited in *Causa 26* of the *Decretum* or presume that artificial gold is produced for fraudulent purposes thus involving the crime of *falsum* which is treated in D. 48.10, C. 9.22 and X 5.21.

The most important legal text on producing artificial gold can be found in an addition by the canonist Johannes Andreae (1270-1348) to the *Speculum iudiciale* of Wilhelm Durand (ca. 1230-1296).⁸ The text refers to the section in the *Speculum* on the crime of *falsum*, i.e. fraud and deceit. According to Johannes Andreae the question arises whether alchemists should be threatened with the punishments for fraud. First he put forward arguments which indeed point in such a direction. Some scholars, he argued, apply to alchemists the words of Saint Paul in 2 Timothy 4.3–4: "There will be a time when they will not endure sound doctrine, but having itching ears, they shall

⁶ *Scriptum*, Lib. II, dist. 7, q. 3, art. 1, ra. 5.

⁷ C.26 q.5 c.12 § 2 *in fine*.

⁸ Addition to *Speculum Lib. IV, Part. IV, De crimine falsi*; see Wilhelm Durantis, *Speculum iudiciale*, Vol 2, Basle 1574, reprint Aalen 1975, p. 501–502.

look for teachers in accordance with their own lusts. And they shall turn away from the truth and eagerly listen to fables”.⁹ Moreover, alchemists produce the cause of deceptions, while alchemy does not belong to the sciences of piety (*scientiae pietatis*), mentioned in D.37 c.10 (these are: to know the Law, to understand the Prophets, to believe the Gospel and not to ignore the Apostles). Furthermore, it is said that the art, directed at producing gold, cannot be performed without melting gold, and this is prohibited in C. 10.74(72).1.1.

This having been said, Johannes Andreae put forward a number of arguments justifying the alchemists’ activities. Whoever produces noble metals out of base metals by his own craft without applying magic or doing anything prohibited by the law (such as by C. 10.15), is to be taken seriously. By so doing, the workers in metal promote the public interest (C. 11.7[6].1) and will be exempted from the provisions of C. 10.15.1 and D. 41.1.3, so that they may cross another’s property against the owner’s will to look for metals (C. 11.7.3). Furthermore, alchemists do not transmute one substance into another, separate substance, but it is the one and same substance of a metal that they improve, when they turn tin into silver and bronze into gold. This is no wonder, Johannes Andreae continued, because caterpillars (*vermes*) can produce silk and grass can produce glass, as we can read in the work *De Proprietatibus rerum* (properties of things). This work was a kind of encyclopedia, compiled around 1250 by the Franciscan monk Bartholomaeus Anglicus (ca. 1190-1250), and was widely spread during the Middle Ages. Referring to the *Metaphysics* of Aristotle (384 BC – 322 BC), the author of this work maintained that all metals are derived from sulphur and quicksilver (*argentum vivum*),¹⁰ which idea probably had its origin in the *libellus de alchimia*, erroneously ascribed to Albertus Magnus (ca. 1200-1280).¹¹ The influence of the heavenly bodies (*elementa*), however, is at one place stronger than at another. As a consequence, at one place (or mine) one will find tin, at another gold – so far *De Proprietatibus*. Subsequently, Johannes Andreae demonstrated that what alchemists do is an imitation of nature, comparable to an adoption, which according to D. 1.7.16 can only create a relationship of family law between two persons when by nature such a relationship could have been established between these persons.¹²

9 This text was in the Decretum applied to divination. See C.26 q.5 c.14 § 7 in medio: *et iuxta Pauli sententiam (...)*.

10 *De Proprietatibus Rerum*, Liber 16, capitulum 4 (*de auro*). We consulted the edition Nürnberg 1492 on <http://books.google.com/books?id=JG60sRiwlkMC> (last visited 6 August 2009).

11 V. Heines (ed.), *Libellus de alchimia, ascribed to Albertus Magnus*, Berkeley 1958.

12 Cf. Y. Thomas, Les artifices de la vérité en droit commun médiévale, *L’Homme. Revue française d’anthropologie* 175-176 (juillet-septembre 2005), p. 113–129. Legal fictions are restricted to certain ‘natural’ limits. For an adoption it is required that the adoptive father is older than the adopted child, and that he himself is capable of reproduction; see p. 124–125.

Thus, alchemists do not commit a sin, when they turn a metal into a more valuable metal by the virtue of plants, stones or some of the heavenly bodies, because both metals are of the same substance and origin. The underlying idea is that alchemists use the same tools to change metals as those by which these metals came into existence. To justify or explain this, reference is made to the *acceptilatio* of Roman law, where the obligation which came into being by pronouncing words, is also nullified by pronouncing words (Inst. 3.29.1). Subsequently, Johannes Andreae quoted some words from Saint Augustine, which he erroneously ascribed to *De Civitate Dei*, whereas the text is taken from the *Questionum in Heptateuchum Libri Septem*. This fragment deals with Exodus 7.12 where the rods, cast down by the Egyptian magicians and by Aaron, changed into serpents. Augustine tried to explain how these serpents came into being by stating the following words, which are reminiscent of the cosmic doctrine of the Greek natural philosopher Anaxagoras (499–428 BC): “In corporeal things there are, throughout all the elements, certain latent seminal dispositions, which, when there is a temporal and causal opportunity, turn into substances, determined by their own modes and ends”.¹³ The same quotation was adopted in the *Decretum Gratiani*.¹⁴ Furthermore Johannes Andreae stated that the punishment for the one who sold bronze as gold, even when he did so deliberately, is not too severe, but that at the same time this wrongdoer can be threatened with the specific punishments for the crime of *stellionatum* (see D. 13.7.1 i.f. and D. 47.20.2). Johannes Andreae concluded his addition to the *Speculum* with a remark concerning the physician and theologian Arnaldus Villanovanus († 1311/1312) who at the papal court of Boniface VIII (ca. 1235–1303) performed some experiments, producing rods of gold, which he submitted to anyone’s further investigation.

4. Reception of Johannes Andreae’s arguments

In all other jurists and theologians, arguing with legal arguments, who during the Middle Ages discussed the permissibility of alchemy we find arguments almost exclusively derived from Johannes Andreae’s addition. This should not surprise us. The *Speculum iudiciale* was an enormous success and the work including its additions was widely spread, even long before it was printed. Oldradus de Ponte († after 1337), Professor and Judge in the Curia at Avignon, adopted many of Johannes’ arguments in one of his

13 Augustinus, *Questionum in Heptateuchum Libri Septem*, Lib. II, q. 21 (CSEL XXVIII, 3-3, p. 102-103). See on this text M.C. Ferrari, *Aura levatitia. Naturbeherrschung und Naturexegese im Frühmittelalter*, in: P. Dilg (ed.), *Natur im Mittelalter, Konzeptionen, Erfahrungen, Wirkungen*, Berlin 2003, p. 163-177, esp. 173.

14 In the *Decretum* it is C.26 q.5 c.14 § 9: [...] Insunt enim rebus corporeis per omnia elementa quaedam occultae rationes seminariae, quibus cum data fuerit oportunitas temporalis atque causalis, prorumpunt in species debitas suis modis et finibus [...].

consilia, maintaining that an alchemist, as long as he does not use magic, does not sin and that alchemy is no forbidden art.¹⁵ The curious thing is that Oldradus is thought to have acted as councillor to Pope Johannes XXII (1316–1334), while the latter in 1317 promulgated the decretal *Spondent quas non exhibent* ('they promise that which they don't produce')¹⁶, in which alchemy was prohibited and alchemists were threatened with punishments, such as branding. The latter punishments also brought infamy. It may have been that Oldradus' consilium dates from before that time. Closer investigation of the decretal, however, indicates that it is not so much directed against alchemy as such, but against the abuse that can be made of artificial gold, especially by counterfeiting coins. The same can be said of what Andreas de Isernia (ca. 1220–1316), who taught at Naples, had written in his commentary on the *Libri Feudorum*, which emphasized the economic danger of alchemy, and did not criticize the art of alchemy as such. If alchemists produce counterfeit gold they cannot sell it and they cannot use it as legal tender (D. 13.7.24.1), for *electrum* is no gold (D. 30.4). If alchemists produce true gold, however, they own it and can sell it as long as they do not turn it into coins.¹⁷

After the papal decretal had been issued, most writers started to adopt a more critical attitude towards alchemy. The jurist Johannes de Platea, who at the beginning of the fifteenth century was teaching at Bologna, derived his arguments solely from Johannes Andreae, but he advised against practicing alchemy, because it can give rise to fraud and deceit.¹⁸ A similar view can be found in the works of the Italian Franciscan, Angelo Carletti de Chivasso (ca. 1414–1495) who, although being a theologian, in his *Summa Angelica* used many legal arguments, almost exclusively derived from Johannes Andreae. At the end of his article on alchemy, however, he came to the conclusion that alchemy is not permissible and has to be rejected. His arguments are the following. No man can be found who masters the art of alchemy. Alchemists are, as 2 Timothy 3.7 says, always willing to learn something new, but never finding the truth. So they waste their lives and whenever they produce true gold it is achieved at great cost or they are just deceiving people by legerdemain, producing true gold which they had secreted somewhere. All this is contrary to the common interest, particularly since alchemists commonly use their products for counterfeiting.¹⁹ The

15 Oldradus Pontanus Laudensis, *Consilia*, ed. Lyons 1550, consilium 74 (fo. 26vb–27ra).

16 Also adopted in the extravagantes communes (Extr. comm. 5.6 [cap. unicum]), which only in 1580 became authentic. See about this decretal: T. Nummedal, *Alchemy and Authority in the Holy Roman Empire*, Chicago etc. 2007, p. 149–153 (Alchemy and the law).

17 Andreas de Isernia, *Super usibus feudorum ... Commentaria*, Lyons 1541, ad L.F. 2.55(56) n. 20 (fo. 98va).

18 See Ioannes de Platea, *Super tribus ultimis libris codicis*, Lyons 1550, ad C. 10.78 (fo. 96vb–97ra).

19 Angelus de Clavasio, *Summa Angelica*, Lyons 1529, fo. 10vb–11ra.

same approach can be found in the *Catalogus gloriae mundi* (1529) in which the French jurist Barthélemy de Chasseneux (1480–1541) described the hierarchy in the world on the basis of all available legal, theological and philosophical knowledge. Chasseneux adopted arguments from Johannes Andreae, but eventually followed the reasoning of Angelo de Chivasso, and condemned alchemy as a wicked craft.²⁰

5. Konrad Summenhart

One of the late medieval theologians, who to a great extent influenced the doctrines of early-modern scholasticism, was Konrad Summenhart (ca. 1458–1502). In the sixteenth century he was usually referred to as Conradus. After having studied in Heidelberg and Paris, Summenhart spent the rest of his life working at Tübingen, where he taught at the University (founded in 1477). His thinking and writing covered many fields, including theology, law and economics. In one of his works, the influential treatise *De contractibus*, first published in 1500, he dealt with the question of artificial gold. There are, however, important differences between Summenhart's approach and that of the medieval writers, referred to above. Summenhart did not follow Johannes Andreae's addition as closely and, moreover, he treated the question in the context as outlined by Aquinas, namely: is there a defect in the substance, when artificial gold is sold as if it were natural gold? Summenhart noted that artificial gold or silver, sold as natural, is not a good example of defects in the substance, as Aquinas had argued. Generally speaking, it cannot be maintained that the gold or silver, produced by alchemists, is not, as regards substance, true gold. Alchemists can achieve such an application of natural active and passive powers that real gold comes into existence, just as demons, by their intent to direct certain natural active powers to certain seeds, can bring it about that genuine serpents and frogs come into being, which are of the same species as other serpents and frogs.²¹ The scholars deal with this in their commentaries on Exodus as does Saint Augustine in his work *De Trinitate*.²² And the foliage people produce

20 Bartholomaeus Chassanaeus, *Catalogus gloriae mundi*, Frankfurt 1603, Pars XI, consideratio 40 (p. 442–443).

21 Conradus Summenhart, *De Contractibus licitis, atque illicitis tractatus*, Venice 1580, III, q. 54 (p. 250). “[...] Nec videtur conveniens exemplum de defectu in substantia, quando venditur aurum artificiale, vel alchimicum pro auro vel argento a sola natura producto: si saltem intelligatur hoc exemplum universaliter, quia non est universaliter verum quod aurum vel argentum alchimicum non sit substantialiter verum aurum, vel argentum, cum per huiusmodi artem possit fieri talis applicatio naturalium activorum et passivorum, quod generabitur verum aurum, sicut demones sua industria applicando certa activa naturalia certis seminibus possunt procurare, quod inde nascentur veri serpentes, vel ranae etiam eiusdem speciei cum aliis serpentibus vel ranis [...]”.

22 Cf. Augustinus, *De Trinitate*, Liber III, Caput V-11. Also Aquinas referred to this fragment in *Summa Theologiae*, IIaIIae, q. 77 art. 2 ra 1.

in January in their homes by putting branches into water, is of the same substance as the foliage which nature alone produces in May, just as artificial and natural roundness of form are of the same substance. The fact that those who produce something and the process of producing are different does not suffice to cause differences in the result. For a rat generated through putrefaction and one generated by propagation do not differ. Adam and Eve were not different in their species from other humans. An eye produced by nature and one produced miraculously (cf. John 9.6–7), can be of the same species.²³

At this point in his reasoning, Summenhart admitted that the example of sale of artificial gold as natural, when understood specifically, might contain a truth, albeit not as an example of a defect in the substance, but of a defect in the quality. Sometimes alchemists do not reach their ultimate goal, and produce something which only resents gold. But even if the gold is genuine in substance, it can still have a defect in the quality, because seldom if ever does this art bring about such an application of active and passive powers, that such brilliant gold is produced, as comes into existence by the application caused by the sun. At the accidental time when alchemy makes this application, this will not coincide with the heavenly bodies, which are capable of giving gold such brilliance and quality.

As a consequence natural gold has certain features which alchemical gold does not have or not to the same extent, such as the capability of putting one in a cheerful mood and of healing certain diseases. Summenhart concluded his fragment on the sale of artificial gold by stating, as had Aquinas, that natural gold is also more pure, more effective and more durable in its pureness. Unlike Aquinas, however, he thought that, as a consequence, the sale of artificial gold as natural is an example of a defect of the third category (i.e. one in the quality).²⁴ It seems that Summenhart, unlike Johannes Andreae and his followers, considered that producing artificial gold was

23 *Ibid.*: “Et frondes illae, quas homines per applicationem ramorum ad aquam in domibus procurant etiam in Ianuario sunt eiusdem speciei cum aliis frondibus quae per naturam solam in Maio producuntur, sicut etiam rotunditas artificialis et naturalis sunt eiusdem specie. Nec distinctio agentium et modorum producendi sufficit distinctionum effectum. Nam mus per putrefactionem generatus et per propagationem non differunt specie et Adam et Eva non distinguebantur specie ab aliis hominibus et oculus per naturam productus et miraculose collatus possunt esse eiusdem speciei”.

24 *Ibid.*: “Posset tamen illud exemplum particulariter intellectum habere veritatem, quia alchimiztae aliquando non attingunt per suam artem, quod volunt, sed tantum procurant generationem metalli similis auro. Attamen etiamsi sit verum aurum in substantia, tamen potest illud deficere in qualitate, quia vix vel numquam potest ars talem facere applicationem activorum et passivorum quia ita virtuosum aurum inde procuretur, sicut natum est generari per eam applicationem, quae sit per solam naturam, quia forte eo tempore, quo ars illam applicationem facit, non concurrat talis influenza celestis, quae talem et tantam virtutem et qualitatem conferre potest auro. Unde aurum naturale quasdam habet proprietates, quas alchimizticum non habet, vel non tantas, ut proprietatem letificandi et sanandi quasdam infirmitates. Et etiam est purius, digestius et operabilius et magis diuturnum in sua puritate et tunc est exemplum de defectu tertio modo”.

transmuting the substance of metals. In this respect he took the same stance as Aquinas. There is a difference, however. Aquinas was very sceptical about the possibility of producing gold with the same substance as natural gold, whereas Summenhart presumed that it is certainly possible, albeit that such gold will usually not have the same quality.

6. Francisco de Vitoria

Francisco de Vitoria (1483–1546) belonged to the Dominican order and lectured from 1526 at the University of Salamanca. He is considered to be the founder of the School of Salamanca. His theological teaching was based on Aquinas' *Summa Theologiae* and no longer on the Sentences of Peter Lombard. We know that Vitoria lectured twice on the *Secunda Secundae*, viz. from 1526 until 1529 and from 1534 until 1537. Only lecture notes from the latter course, copied by his student Francisco Trigo, are preserved and can nowadays be found in the University Library of Salamanca (Ms 43, previously 4-6-15). It is this manuscript which, only in the 20th century, was edited by the historian Vicente Beltrán de Heredia OP (1885–1973) and which contains the fragment, reproduced below, on the question whether artificial gold can be sold as natural gold.²⁵

Vitoria dealt with the question in his commentary on the third article of question 77 of the *Secundae Secundae* (on defects in the quality) and not in his commentary on the second article. Whether this means that he saw artificial gold as containing a defect in the quality and not in the substance, as was the opinion of Summenhart, is difficult to say, because, as will appear below, Vitoria entirely rejected the possibility of producing gold. In this respect he certainly deviated from the teachings of Summenhart and from those of the Italian theologian and Dominican Sylvester Mazzolini da Prierio (1456/57–1523), whose *Summa Sylvestrina* (1514), a manual for confessors, he quoted several times. According to Sylvester it is allowed to sell artificial gold, just as day-to-day counterfeit corals, pearls and neck rings (*torques*) are sold, but in case this is not true gold, it should not be sold as if it were.²⁶ A contemporary commentary on the *Summa Theologiae*, that of Tommaso de Vio Gaetano (Cardinalis Cajetanus, 1469–1534), presumed that it is not entirely impossible to produce gold but that this will only happen occasionally if ever.²⁷

25 The discussion on whether artificial gold may be sold as natural gold can be found in: Franciscus de Vitoria, *De Justitia* (ed. V. Beltrán de Heredia), Vol. 2, Madrid 1934, p. 142–143 (ad IIamIIae, q. 77 art. 3, no 15).

26 Sylvester Prierias, *Summa Sylvestrina*, Pars I, Antwerp 1581, v. alchimia no 5 (p. 35).

27 See Thomas Aquinas (*supra* n. 3), p. 151.

In primo argumento articuli secundi movet dubium sanctus Thomas de auro vel argento alchimico, an licet vendere aurum alchimicum pro vero auro.

Respondet et dicit duo. Primum, quod utilitas auri vel argenti non solum est ad conficiendum vasa et ad ornatum et pulchritudinem, sed etiam quia habet virtutem sanativam, ut conductum aliquibus pharmacis.

Tunc clarum est quod aurum alchimicum non licet pro vero auro vendere.

Si tamen per alchimiam posset fieri aurum verum cum propriis proprietatibus veri auri, bene liceret vendere illud.

Vide ibi.

In the first objection of the second article Saint Thomas expresses doubt concerning alchemical gold or silver, viz. whether it is allowed to sell alchemical gold as true gold.

He replies and says two things. First, the use of gold or silver is not restricted to manufacturing bowls and for purposes of decoration and beauty but, because it has a healing virtue, as an ingredient in certain drugs.

Thus it is clearly not allowed to sell alchemical gold as true gold.

If, however, it were possible, through alchemy, for true gold to be produced with the proper properties of true gold, then it would certainly be allowed to sell it. See there.

Vitoria was a theologian but considered his discipline so all-embracing that there is no subject whatsoever, alien to theology.²⁸ Thus it should not surprise us that, before dealing with the question of whether alchemy can produce gold, Vitoria brought up a geometrical problem which he considered to be comparable. It was the ancient question of ‘squaring the circle’. In short, this question comes down to the construction of a square with exactly the same area as a given circle. Since time immemorial scholars were convinced this could be achieved, but all attempts failed. The problem was that in a circle there is always a constant ratio, no matter the size of the circle, between its diameter and its circumference. The latter is always approximately 22/7 times the diameter. From ancient times this ratio was indicated as π (pi). Now, the area of a circle is π multiplied by the radius (half the diameter) squared ($= \pi.r^2$). The area of a square, on the other hand, is the product of the lengths of its sides. Thus, suppose we want to construct a square with the same area as a circle with radius 1, then the square should have an area of π ($\pi.1^2$) and the length of the sides of the square should be $\sqrt{\pi}$. It may be clear by now that the problem of ‘squaring the circle’ is closely related to the exact value of π . From Antiquity it has been known that, if π is an incommensurable number (not to be written in decimals), it will never be possible to square the circle by compass and straight-edge. Aristotle dealt with the subject in several of his works²⁹, and criticized earlier

28 Francisco de Vitoria, *Relectiones undecim*, Salamanca 1565, Relectio de potestate civili I (p. 77): “Officium, ac munus Theologi tam late patet, ut nullum argumentum, nulla disputatio, nullus locus alienus videatur, a theologica professione et instituto”.

29 See: Excursus: On squaring the circle, in P.H. Wicksteed & F.M. Cornford (eds. and transl.), Aristotle, *Physics*, Vol. I [Loeb Classical Library, 228], Cambridge MA etc. 1980, p. 98–101.



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efforts to square the circle, such as those by Antiphon the Sophist (480–411 BC)³⁰ and Bryson of Heraclea (450–390 BC).³¹

As a ground for his comparison Vitoria stated that the two questions have something in common. Everyone says these things – i.e. to produce gold and to square a circle – are possible, but nobody knows how to do it. There may have been, however, more parallels, not mentioned by Vitoria. Geometry itself can never achieve the squaring of a circle. Only elementary mathematics can provide insight into whether this is possible or not. Thus, searching for an answer to the problem of squaring the circle implies that boundaries have to be crossed, just as when transmuting one substance into another. Moreover, what to think about the circle and the square, as such? In the Medieval world they were, besides geometric figures, also meaningful symbols, each with its own (metaphysical) substance.

De ista arte alchimia, omnes communiter dicunt quod verum aurum potest fieri per alchimiam, sed tamen nullus dicit quod sit factum verum aurum per istam artem, nec unquam demonstratur quomodo per alchimiam possit fieri.

Videtur hoc sicut de circulo quadrati. Aristoteles enim egregie probat quod potest demonstrari quod aliquis circulus est aequalis quadrato, quia ubicumque est majus et minus, potest dari aequale.

Si ergo potest dari aequalis circulus major quadrato, ergo etiam potest dari circulus aequalis quadrato. Sed quomodo fiat, non potest demonstrari.

Concerning this art of alchemy all agree that true gold can be produced by alchemy, and yet noone maintains that true gold has indeed been produced through this art, nor is it ever demonstrated how it can be produced.

This seems similar to ‘squaring the circle’. For Aristotle has perfectly proved that it can be demonstrated that a circle can be equal to a square, because, since where there is a larger and a smaller, there can also be an equal.

Thus, if there can be a circle, bigger than a square, there can also be a circle equal to a square. But how this is to be constructed, cannot be demonstrated.

Subsequently, Vitoria became more sceptical. He stated that he had always considered the idea of producing gold through alchemy to be nonsense. This he supported with two common-sense arguments. There is no proof that anyone has ever succeeded in producing gold through alchemy. Moreover if this technique were effective, why was not it applied to produce other minerals, such as emerald.

30 Aristotle, *Physics*, Book I, chapter 2, 185 a (Loeb 228, p. 14–20).

31 Aristotle, *Posterior Analytics*, Book I, chapter 9, 75 b 40 (Loeb 391, p. 64). See on the theories of Antiphon and Bryson on squaring the circle: E. W. Hobson, *Squaring the Circle: A History of the Problem*, Cambridge 1913, p. 14–16 and T.L. Heath, *History of Greek Mathematics*, Oxford 1921, Vol. I, p. 220–225.

Simile est in proposito. Ideo semper cogitavi quod est somnium dicere quod possit fieri verum aurum per alchimiam, per applicationem activorum ad passiva; nec alius fidedignus hactenus dixit quod ille fecerit, nec alius quod audiverit aliquem fecisse, immo experientia est in contrarium, quia multi tentaverunt facere et non potuerunt facere.

Non est inconveniens applicando activa passivis quod fiat aliquid, sed non est major ratio quod fiat aurum verum per alchimiam quam quaevis alia gemma de alio metallo.

Sed de alio metallo etsi minimo non dicitur quod fiat smaragdus per alchimiam.

Ergo quare debet dici quod posset fieri verum aurum per artem alchimiae?

Certe hoc dicere est mera insania.

The same is the case as regards our proposition. Accordingly, I have always thought it is a delusion to say that true gold can be produced through alchemy, by applying active forces to the passive; hitherto no credible person has said that he has produced it, nor that he has heard that anyone has produced it; experience, on the contrary, points in the opposite direction, namely that many have tried to produce it and were not able to do so.

It is not inconsistent that something is produced by applying the active forces to the passive, but that is no more reason to argue that true gold is produced through alchemy, than any other gem from another metal.

Now it is not said that any other metal, however valueless, is turned into emerald by means of alchemy.

Why then, should it be said that true gold can be produced by the art of alchemy?

Certainly, saying this is pure madness.

Vitoria's scepticism is not only based on common-sense arguments and experience, but also on rejecting the possibility that applying active powers to the passive results in any notable effects. Previously, this application of active powers, when under the influence of the heavenly bodies, was always accepted as a reasonable explanation as to why alchemists should be capable of either transmuting one substance into another, or improving one and the same substance. It was even based on the authority of Saint Augustine. On the one hand, Vitoria followed the idea of Aristotelian Physics that A can have the passive potential of becoming B if something else has the active power to produce this effect and he did not deny that the active forces can be applied to produce something. However, he minimized the possible effect. As we have seen, according to the generally accepted theory this effect was dependent on the position of the heavenly bodies. Alchemists who imitate nature have to compensate for the unfavourable position of the sun, moon, planets and stars at the time they practice their art. According to Vitoria, these possibilities are limited. Alchemists can do nothing to compensate for the fixed position of the stars. As a consequence, the effect of their art is limited and they themselves cannot be sure about the resulting virtues, e.g. in plants.

Item, quia dato quod posset fieri applicando activa passivis, scilicet herbis, quomodo tamen possunt cognoscere hoc?

Quia licet possent per artem supplere vicem solis et vicem lunae et mercurii, tamen revera non possunt supplere vicem stellarum fixarum quia non possunt scire, nec possunt scire virtutes omnium herbarum.

Quia si scirent, vel esset a casu, vel quia daemon docuit.

Non primum; nec secundum, quia nec daemon poterit facere nec in temporalibus vult daemon prodesse.

Unde impossibile est.

Furthermore because, suppose that it is possible to produce something by applying the active forces to the passive, viz. to plants, how do they come to know this?

Because, although they can by their art supply the position of the sun and the position of the moon and Mercury, they cannot actually supply the position of the fixed stars. Because they are not capable of knowing how to do this, they cannot know the virtues of all plants.

Because if they were to know this, it would be either by accident or because a demon had instructed them.

The first is not the case, nor the latter, because a demon is not capable of so doing, nor would a demon be willing to benefit temporal affairs.

Hence it is impossible.

After Vitoria reached the final conclusion that, since alchemists are not masters of their art, it should not be considered possible that they produce true gold, there follows a short anecdote out of his own experience. It concerned a personal encounter with someone claiming to be an alchemist and showing him something with the colour of sulphur. As stated above sulphur and quicksilver were from the earliest times considered to be the materials which could produce any metal. This experience seemed to have endorsed Vitoria's ideas. The man claimed to have mastered alchemy but refused to demonstrate his art.

Notate quod mihi contingit cum quodam in praesenti anno.

Venit quidam egregius philosophus, qui fatebatur et dixit se absolvisse artem alchimiae; et ostendebat laminam quamdam como de color de piedra azufre, et dicebat illud esse verum semen ad faciendum verum aurum.

Ego tamen saepius rogavi an ipse aliquando fecerit verum aurum, et ad hoc numquam voluit respondere.

Dicebat enim, satis est sibi invenisse artem, sed experientiam artis non ostendebat, quia dicebat non opus erat illud facere, quia sicut non opus est quaerere an ex frumento nascatur triticum, ita nec opus est quaerere an ex illo semine

Note what happened to me this year with a certain person.

An excellent scholar arrived who declared and said that he had mastered the art of alchemy; and he showed a certain plate coloured as sulphur and said it was genuine seed to produce true gold.

I, on the other hand, asked him more than once, whether he himself had ever produced true gold, and to that question he was never willing to give an answer.

For he said "it suffices to have mastered the art", but he never showed a proof of the art, because he said it was not necessary to do so, because, as it is not necessary to question whether grain is born from wheat, so it is not necessary to

fieret aurum.

question whether gold can be produced from that seed.

Eventually the visitor admitted that he had never produced any gold, which confirmed Vitoria's scepticism and disbelief. The visitor invoked in his turn the addition of Johannes Andreae to the *Speculum iudiciale*, which was, apparently, at the beginning of the sixteenth century still the main authority, but this did not convince Vitoria at all.

Sed adhuc ego dixi an ipse fecerit aliquando; et tandem dixit quod non, et ita dimisi illum cum sua arte, nihil credens ei.

But I still asked whether he had ever produced it himself and eventually he said he had not. And so I sent him away with his art, attaching no belief to him.

Unde ridiculum est putare quod per artem possit fieri verum aurum, nec credo quod illud possint facere, licet bene alias pulchras misiones faciant per illam misionem.

Hence it is ridiculous to think that through that art true gold can be made; and I do not believe that they can produce it, although by such blending they produce other excellent alloys.

Et ad suam opinionem adduxit mihi plusquam centum philosophos, et etiam Joannem Andream in quadam glossa.

To support his opinion he adduced for me more than one hundred scholars and also Johannes Andreae in a certain gloss.

Sed denique dico quod est somnium hoc putare et credere.

But I say again that it is a delusion to maintain or believe this.

7. Conclusions

As was shown above, medieval learned law initially did not disapprove of alchemy as such. Determinative for this traditional view seems to have been the addition by Johannes Andreae to the authoritative and widely spread *Speculum iudiciale*. What alchemists seem to do was justified, at least according to a number of jurists, by the fact that they improve one and the same substance. It was transmuting one substance into another that was demonical and illicit. Only after the decretal *Spondent quas non exhibent* had been issued (1317), did a different approach emerge. The theoretical concepts were not put aside, but on pragmatic grounds – the common interest and the risk of counterfeiting – it was recommended that the practice of alchemy, if not forbidden, should be discontinued.

Aquinas described alchemy as transmuting substances. This he did not explicitly reject, as did the *Decretum Gratiani*, but on the other hand he did not take the idea of producing gold by alchemy seriously. Relying on Saint Augustine's *De Trinitate*, he stipulated that those who produce something should only apply natural processes. Although Summenhart strongly relied on Aquinas, there is one significant difference. Whereas Aquinas did not seriously consider that true gold can be produced by alchemy, Summenhart did, but presumed at the same time that alchemists usually produce something of an inferior quality. Thus, for Summenhart selling artificial gold as

natural gold was more a problem of a defect in the quality than a defect in the substance.

Vitoria's approach was concise and combined with a practical orientation. On the grounds of both common-sense arguments and more doctrinal reasoning, he stringently rejected the possibility of producing gold, which was endorsed by his own personal experience. As a consequence of Vitoria's denial of the existence of artificial gold, produced by alchemists, the entire problem – i.e. is it allowed to sell artificial gold as natural gold? – turned, after almost 400 years, more or less into a non-issue. If we follow Vitoria's approach, many of the traditional arguments, derived from Johannes Andreae, Angelo de Chivasso or Summenhart, will become entirely redundant. It has to be noted, however, that not all early modern scholastics adopted this approach. Some still discussed the question of selling artificial gold. Even in the commentary on *De iure et iustitia* of the Augustinian scholar Miquel Bartolomé Salon (1539–1621) from Valencia, dating from about 1598, we find the question of selling artificial gold discussed as a serious problem, with all the arguments of Summenhart still present.³²

To conclude this paper, it may be said that in one respect Vitoria seems to be inconsistent. If the problem whether artificial gold can be produced is allied to the question whether a circle can be squared, as was apparently his view, why should only alchemy be consigned to fantasyland and not 'squaring the circle'. This did not become clear in the concise recording of Vitoria's lecture. From our present-day perspective this is all the more curious since it has been shown that squaring the circle, at least by compass and straight-edge, is impossible. In 1882 it was Ferdinand von Lindemann (1852–1939), at the time professor of Mathematics at Würzburg, who furnished the proof that π is not commensurable, but a transcendental number and that it can never be determined in decimals. Transmuting one element into another element, on the other hand, is something which can be achieved nowadays, albeit not through a chemical but through a nuclear reaction and physicists have actually transformed lead (*Pb*) into gold (*Au*). Such a thing cannot be done very easily and producing gold artificially would be far from profitable, but it is certainly possible. Could Vitoria have foreseen this, he would have had stronger grounds for rejecting Aristotle's ideas, than those of the visiting alchemist.³³

32 Michael Bartholomeus Salon (1539–1621), *Controversiae de iustitia et iure atque de contractibus et commerciis humanis licitis, ac illicitis*, vol. II, Venice 1608, ad Ilamllae q. 77 art. 3, no 3 and 16 (p. 81 and 87).

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