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‘The Development of Resources for
Electronic Music in the UK, with
Particular Reference to the bids to
establish a National Studio’

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Doctor of Philosophy

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Durham University

2012

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‘The Development of Resources for Electronic Music in the UK, with Particular Reference to the Bids to Establish a National Studio’

This thesis traces the history and development of the facilities for electronic music in the UK. It covers the early attempts to experiment with electronic music and create studios in less than ideal circumstances and the subsequent bids to create a national centre. It also covers some elements of worldwide development of electronic music and sound recording, in particular those which occurred before 1965. The thesis calls upon non-traditional sources and the author was able to access many documents in the personal archives of electronic music pioneers. There is substantial reference to committees and societies for electronic music and their effects on the development of facilities for electronic music in the UK. Some of the early pioneers are studied in detail; these include Daphne Oram, Tristram Cary and Hugh Davies. Unprecedented access to information on Hugh Davies and Daphne Oram was provided by the family estates of these recently deceased composers. This allowed the author to gain valuable insight into the working patterns and methodology of these composers. Many references to later pioneers such as Trevor Wishart are also made but the focus remains on the facilities available to composers rather than the composers and their works.

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consent and information derived from it should be acknowledged.

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In addition to the thanks given above I would like to express my gratitude to my supervisor, Peter Manning. Without Peter's support and encouragement I doubt if any of this thesis would have been written. I think this is the right place to try and explain why I did it.

Part way through the second year of my BA course I attended Peter's lecture on electroacoustic music. I was already interested in analogue technologies from studying tape techniques in the Electroacoustic Studies module. When I began to hear about the history of electronic music and its place in the wider context I immediately wanted to find out more. From here on I specialised in electroacoustics wherever possible. After researching analogue tape recording for my dissertation I decided to take this research further and study for a Masters. In the January of my MA year I was about to make plans to meet Hugh Davies when he passed away. What could have marked the end of my research did quite the opposite, when I discovered that Davies' archive had been passed to The British Library, I immediately made plans to see it. While Davies was alive it would not have been possible to access the collection in the manner I did. As soon as I saw the material I knew that from it I could fill in the gaps in the established history of electronic music in the UK. I then set out to do just that. I hope that this thesis has fulfilled its aims and given Davies the recognition he deserves.

Throughout my studies, guided by Peter, I discovered that I had excellent skills as a researcher and 'data miner', however, when it came to writing up the skills did not come naturally and I needed a great deal more support. Peter was always on hand to help and for this I am eternally grateful.

Aside those who helped me on the academic side, there are many family and friends to whom thanks are due.

My parents deserve the largest thanks, without their financial support this study would not have been possible. However my gratitude is not purely for financial reasons. Higher degrees are not uncommon in my family and I knew that their support came partly from love and partly from a genuine understanding of what I was going through. There was a point during this study when all four members of my family were studying for Doctorates and the value of a support network such as this cannot be underestimated. My family's never ending belief in my ability to succeed gave me a driving force to complete this work, thank you all.

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Thank you everyone, I am indebted to you all.

This thesis is dedicated to the pioneers
of electronic music in the UK, may you
one day get the recognition you deserve.

Chapter 1: Introduction

Part 1: Introduction to the thesis

This study researches the history of electronic music in the UK and identifies and evaluates the contributions of the pioneers in the genre. It will compare the generally known and accepted views of electronic music in the UK with thus far little known events and information gained directly from the pioneers and/or their estates, which in turn will throw significant new light on its evolution.

In so doing it investigates the proposition that whereas it is the works produced by the composers contributing to these developments that represent the creative legacy, these alone do not facilitate a full understanding of the development of the medium in the UK. To achieve this goal it is necessary to probe below the surface and study the circumstances that facilitated their composition, taking into account the important contributions of the many people behind the scenes, from the pioneers who designed and built the necessary facilities to those who both politically and practically made it possible for the associated studios to be established and supported.

Two major developments will receive particular prominence in the regard, the first being the circumstances that led to the establishment of the BBC Radiophonic Workshop, the second being the concerted and ultimately unsuccessful efforts of so many individuals to establish a national studio for electronic music in the UK. In so doing a perspective emerges that is both thought provoking and insightful within the larger perspective of developments elsewhere in electronic music after the Second World War. Much has been written about the development of the medium in continental Europe, the USA, and beyond, but so far the UK perspective has only received limited and arguably incomplete attention in this regard. Such is the effect of the passage of time it is also the case that many of the pioneers to be cited in this context are no longer well known names within the electronic music community. Their legacy, however, is of material importance in terms of understanding the evolution of the medium in the UK.

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Hugh Davies and David Lumsdaine are leading examples of practitioners whose substantial contributions are now all but forgotten. Hugh Davies worked hard to establish several studios in the UK and made contacts with many of the influential figures on the worldwide scene. His obsession and commitment not only resulted in material contributions to the development of suitable technologies, as a compulsive collector of documentation and associated correspondence he also produced a unique archive of materials embracing the development of electronic music in the UK up until his death in 2005. This archive, now housed at the British Library, has proved vital during this study. Similarly, David Lumsdaine made a notable contribution as a freelance composer first in London during the late 1960s and subsequently at Durham University where he established a pioneering studio in 1970. As one of the first university studios set up for the teaching of electronic composition (the others being York, Cardiff and Goldsmiths College London), it is now possibly the only studio in the country that proactively maintains a substantial repertory of analogue equipment dating from this period, now largely little more than a memory in the ever changing digital world. Lumsdaine subsequently was to be associated with the York University studio, and although now retired he still works as a composer, dividing his time between York and Australia.

Here the role of Lumsdaine's assistant at Durham from 1970 to 1980, Peter Manning, provides a useful additional perspective. The 'master and apprentice' culture which flourished in many studios at the time was crucial in the advancement of techniques in electronic composition. Manning, now a noted academic and also supervisor of this study, worked alongside Lumsdaine both as a student and studio assistant. The nature of the apparatus used in the production of new material often required more than one pair of hands to operate it. In such circumstances the composition of a work can never be wholly attributed to a single individual, it raises interesting questions on several levels. For example, how many technicians who assisted the leading pioneers in this regard ever received proper credit for their work? Stockhausen, for example, rarely makes any reference to his assistants in the notes accompanying his electroacoustic works, and the contribution of Hugh Davies, as his assistant at Cologne 1964-66, was rarely formally acknowledged.

Today the 'master and apprentice' relationship is only rarely encountered. However this notion that techniques were passed down from 'master' to 'apprentice' is highly relevant to the pioneering era of electronic music, as is the strong sense of community that existed at this time. These important factors are considered further in chapter three. The true extent of the

collective achievements of these early pioneers remains largely unknown even to committed practitioners with particular interests in the medium. It is likely, unless steps are taken to rectify this information deficit, that academics and composers in future years will be unaware that there have been several attempts to establish a national studio for electronic music in the UK.

As already noted, this study seeks to present a clear and suitably definitive account of the history of the early bids for a national studio. The issue of whether or not to establish a national studio was one that became essentially unique to the UK. In other countries, especially in Europe, the early establishment of major studios funded by broadcasting companies that, unlike the BBC Radiophonic Workshop, actively sought to support the national development of electronic music, albeit in a somewhat exclusive manner, essentially fulfilled such a purpose. This lack of a national studio goes part way to explaining why the development of electronic music in the UK was so different to elsewhere at the time. Its reliance on the support of academic institutions has parallels with the USA, but also some differences that will be studied more closely in due course.

Timescale

The pioneering era of British electronic music embraces a period of approximately twenty years from the early 1950s to the early 1970s. Although a number of accounts have been published on the history and early development of electronic music in both Europe and America none have done so with the specific purpose of considering in depth developments in the UK. It also became clear during early stages of this research project that none of these accounts individually provide a suitably authoritative and complete background perspective for embarking on such a critique. For this reason part two of this introduction necessarily studies the key technical and aesthetic features that were to prove especially important for developments in the UK.

The period to be considered embraces an era of significant change during the post-war years as developments in electronics snowballed. By the time a new item of equipment had appeared on the market an updated design was already under development. This rings true across many industries, no more so than those that were to embrace the technology of music. So far relatively little research has been carried out into these developments, and as a consequence articles on this period are few and far between and access to primary materials

relatively difficult. This whole area more generally is ripe for further investigation and the specific developments that underpinned the evolution of electronic music form the central focus of this thesis.

This early era can be associated with a number of key pioneers, for example, Daphne Oram; Delia Derbyshire; Richard Orton; Hugh Davies; Tristram Cary; Peter Zinovieff; Keith Winter; Jonathan Harvey and David Lumsdaine. As the timeline moves from the 1960s to the 1970s additional names come into focus, for example, Tim Souster; Simon Emmerson; Michael Clarke; Trevor Wishart; Peter Manning and Denis Smalley. Overall the perspective is of significant innovation and development during this transitional phase.

More often than not those pioneers who were rewarded with success, both in terms of access to resources and the production of creative outputs, were connected with the academic community, often as a full-time member of staff at a university or college of higher education with specific responsibilities for developing facilities for electronic music. In terms of the very first group of pioneers, Keith Winter, David Lumsdaine and Richard Orton, for example, fall into this category, working at Cardiff, Durham, and York Universities respectively. Although developments in the UK were at least initially very much on the periphery of developments in Europe and elsewhere, they were significantly influenced by such activities. The perspective that follows necessarily embraces not only developments post 1945 but also some key aspects of the inter-war period which preceded this rebirth.

Literature

The academic study of electronic music has remained a relatively limited pursuit, especially when comparisons are made with other aspects of musicology. As Landy wrote in *Organised Sound* in 1999, ‘the musicological study of electronic music is under represented’¹.

Pertinently he suggests that frameworks should be put in place to further the understanding of electronic music. Unlike conventional instrumental music, which can be readily disseminated in a notated form, electronic music exists for the most part in an entirely electronic format. Furthermore, the vast majority of electronic pieces are never published in the traditional sense and are therefore difficult to access.²

¹ Landy 1999:61-70

² Over the course of study this changed dramatically and at the time of writing (2012) it is now possible to access a great deal of this material online.

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The electroacoustic community has thus not been particularly well served by academic writings in terms of journals and other means of critical commentary and dissemination. In the latter context the number of leading peer refereed journals remains, even today, very limited. Although much the same can be said for the publication of more substantial reference texts and monographs it is evident nonetheless from a thorough study of the relevant literature that useful pointers do exist in some cases to primary and secondary sources both in terms of writings and also information on individuals directly associated with the pioneering era of the medium. The passage of time, however, poses a major threat, and there is thus an urgent need to seek these out and study the significance for the evolution of the medium as a whole in the UK.

There were a few available publications relevant to these early developments but each had their own idiosyncrasies to take into account. For example, the German publication *Die Reihe* was edited by Herbert Eimert who worked at the Cologne studio of *elektronische Musik*, it is likely, therefore, that this publication was heavily influenced by the aesthetics of that particular school of thought. At the other end of the spectrum are non-academic electronics magazines such as *Wireless World* from which many early composers of electronic music discovered the technology necessary to build equipment.

In terms of literature that goes beyond the basics of technology to engage with issues more directly connected with the creative development of the medium, a significant proportion has been written by researchers who are first and foremost academics. There is however a deeper layer of investigation to be carried out beneath the surface, seeking out the technicians, composers and persons whose interests in electronic music was not primarily academic. These activities provide an essential background to charting the history of electronic music in any context, not least the current study of electronic music in the UK. The information from those who are no longer household names holds the key to completing the jigsaw.

As already noted, the work of Hugh Davies is especially significant in this study. A significant proportion of the literature used in this study is derived from his archive at the British Library. Although as one might expect, his own writings and opinions are prominent in this collection, the additional documentation provides an important gateway to a much wider perspective. Davies served on a wide variety of important committees, such as the British Society for Electronic Music, the Electroacoustic Music Association, and Arts

Council Funding Boards. For all of these he kept detailed notes, as well as the minutes, from all meetings he attended. The information gained from these sources is especially interesting, and gives a detailed insight into what actually happened during the evolutionary era for electronic music in the UK. There are many facts that may be found surprising, especially those arising from the activities of many of those at the forefront of developments, and these will be examined more closely in due course. For example, it was very common for ideas on electronic music to change rapidly during the course of discussion, and ideas that seem foolish or pointless to us now would be pursued almost relentlessly, until it was finally realised that they would not work at all. It was thus not uncommon for a significant amount of time and money to be wasted unproductively on a number of these ventures.

This situation is not helped by the fact that suitably documented accounts, about a number of key events in this era, have either been lost or were never properly recorded. Much of the knowledge that has become established in the public domain is based on the recollections of those who subsequently have chosen to write about these developments. It becomes clear, when matching where possible these recollections to contemporary evidence, that the passage of time often blurs and distorts these recollections, and care must therefore be exercised in interpreting these at least partially anecdotal sources of information.

Documentation of Activity

The recollection of creative activity is especially challenging in this regard. Many early practitioners of electronic music did not keep records of their work and if they did these have been long since been discarded or lost. Also, the personnel associated with furthering the development of electronic music were drawn from a mix of disciplines, involving not only musicians but also electricians, physical scientists and mathematicians. This means that the genre was viewed from many different angles, this was good news in terms of stimulating creativity and discovering new ideas, but it meant that the genre developed in an unchecked manner, with little or no reflection on the past and with little thought to possible lessons for the future. It also has to be recognised as the years advance that the consequences of mortality increasingly take their toll in terms of direct access to such people. There was also a general lack of communication between early practitioners, and as a result people did not always know what each other were doing. Had a better sharing of ideas proved possible then electronic music in UK might have progressed at a more rapid rate. A secondary problem was that few of the early composers had any formal training in electronics, and their engagement

with the technology was very much a voyage of discovery and sometimes imperfect understanding. Also, on the other side of the coin, many people interested in the possibilities of electronic music were not from a musical background at all. It can thus be said that the playing field was certainly not level.

Obsolescence

In addition to the problem of literature, the rapid obsolescence of the recording media used at that time is creating a problem of access to materials. In particular the quick rate of decay associated with analogue tape (which has a shelf life of between thirty and forty years) means that tape works from the 1950s that have not already been archived on new media are very likely to prove unplayable. The same problem has arisen in terms of the fate of the computer-based technologies that were to follow. Diskettes and other computer media from earlier eras are now completely unusable, and as a result access to years of work has been lost forever. It is an unfortunate fact of life that with the passage of time, despite being still able to communicate directly with some of these early pioneers, this important legacy of resources is also slipping away.

Part 2: Locating the thesis in the wider context

Electronic music and popular culture

One key aspect which has often been omitted from other commentaries on the early development of the medium is that which can best be described as the 'social environment', which in turn extends beyond a more conventional context of electronic music to embrace all manner of cultures that wholly or in part have embraced audio technology. Although the discussion of community-related aspects in chapter three deals specifically with these issues it is useful in this introduction to establish some of the important considerations that will have to be taken into account in this context. The development of electronic musical instruments, for example, represents the largest change in instrumentation since the dawn of the western classical orchestra. The influence of electronic musical instruments on society was to prove extensive as the new 'pop' music began to take the nation's youth by storm. This new style of music went hand in hand with another important development. Many magazines such as *Wireless World* published instructions to build radios and similar small electrical devices, and a growing number of electronics enthusiasts thus built their own equipment. The

marriage of the popular nature of electronic instruments and the ability to build one's own equipment gave the genre a completely different scope to that associated with any other music.

The influence of radio and television is of paramount importance to the development of electronic music, not least in the UK. From the earliest experiments electronic music and radio were intrinsically linked. Later, as television developed, the two were also linked as electronic sounds were used as in soundtracks for programmes. Furthermore electronic music has become entrenched in popular culture. Looking back now it is hard to imagine any sort of music without some kind of technological influence; a concert of classical music is recorded using techniques with their roots in electronic music; a rock band plays electric guitars; a pop group sings along to an entirely synthetic backing track. All of these performance and recording techniques have their roots in the early days of electronic music and the influence of these extends to the entire genre today.

Electronic music and the individual enthusiast

Public interest in electronic equipment grew steadily through the 1930s, stimulated by the accessibility of radio broadcasts and a genuine interest in the possibilities of this new technology. Notwithstanding the inaccessibility of early professional equipment for production, manipulation and recording of electronic music, a number of pioneers in the UK were eventually to find affordable ways and means of exploring the medium, most notably Tristram Cary. It has already been noted many of the pioneers of electronic music came from non-musical backgrounds, and Cary is the example par excellence of someone whose initial interest in the medium came from work elsewhere, in this case as a result of military service. The true extent of his influence and contributions to electronic music in the UK have never been fully recognised and it is thus especially unfortunate that, following his death in 2008, opportunities to investigate this further first hand have been seriously curtailed.

During the war electronic music enthusiasts such as Cary had become skilled radio or radar engineers and when they returned home they put these skills to use creatively. Many built radios from kits and developed an interest in home sound recording and movie making. Enthusiast magazines during the late 1940s and 1950s began to print instructions on how to build radios and amplifiers using basic equipment which was readily available as redundant wartime radio equipment that could be modified for other purposes. Streets such as

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Tottenham Court Road in London were soon filled with second hand shops selling a variety of suitable products. A sub-culture of amateur radio builders thus emerged and it is this group that opened the gateway for the early pioneers of British electronic music. Although, in due course, some of these pioneers hoped that these growing developments would stimulate interest from specialist equipment manufacturers, the make-do-and-mend culture was to stay with electronic music for a great deal longer than anticipated.

By the mid 1960s the fashion for home made equipment had developed to a more sophisticated level, indeed devices made by British amateurs were similar in design to those commercially available elsewhere. Companies such as Heathkit marketed kits to build at home and gained a substantial following; indeed many of the resulting products have been kept by their builders and are still in working order today. Heathkit gave the budding engineer the initial starting point for his/her own ideas, and subsequent modifications to these kits to create individual designs sometimes led to enthusiasts gaining some commercial success with their equipment. The core repertory of devices available in kit form included not only laboratory signal generators, but also devices such as affordable reel-to-reel tape recorders. Although the quality of such home built devices was necessarily limited, in comparison to that of a professionally manufactured version, it provided the resources necessary for the basic recording and editing of sounds, thus opening the door to creative exploration.

The significance of a lack of institutional facilities for the pursuit of electronic music activities in the UK

The development of a British genre of electronic music was coloured by a number of impediments to progress along the way. The first and one of the most significant not least when viewed in relation to continental counterparts, was the closed door policy of the BBC regarding the use of their studios. The significance of this policy will be considered in more detail in due course.

A major impediment to progress in the earlier period (c.1950-1965) was the lack of support from government organisations. It took several years, for example, for the Arts Council to realise that electronic music was a genre worthy of investigation, never mind investment. It was sometimes the case that interest was paid to initiatives involving electronic music but not a great deal was actually achieved. In particular the Arts Council New Activities Committee,

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set up in May 1969, did little to support ventures such as the Drury Lane Arts Lab, which subsequently closed. Lack of action in situations such as this led to the inauguration of a protest group, Friends of the Arts Council Operative, who petitioned the Arts Council for action in this area.

As a direct result of this lack of governmental support many early practitioners worked in isolation. Developing individual ideas in such a context does not always lead to a productive gain in knowledge, no more so than in the context of electronic music in this pre-internet era. Many initiatives passed unnoticed or were simply ignored, especially by those who would have been best placed to support and develop them. As with any new idea there is a wealth of ideas to be investigated in exploring previously uncharted territory and if this is not done in a formal, organised way then some things are bound to slip through the net and investigations unwittingly repeated or replicated. This was certainly the case in the UK, as electronic music was openly rubbished and rejected by the establishment, it developed on the sidelines, in homes, garages and in one memorable case, by sneaking into BBC studios at night. Many of these early investigations would have discovered the same things, tapes could be played backwards, faster, slower etc. and although due credit should be given to those who discovered or so they thought, new and exciting compositional techniques, one must bear in mind that had there been a formal structure of any sort, this basic information would have been common knowledge. Here the importance of a community arises, and this aspect will be discussed further in chapter three.

The circumstances go a long way to explain why the advancement of electronic music in the UK during these formative years was far from assured when compared to those occurring in other countries across the world at this time, not least in continental Europe. They also explain why the UK was at a significant disadvantage in terms of access to technical and compositional knowledge. This lack of knowledge, combined with the slow dissemination of information, meant that British electronic composers were several years behind their European and American counterparts. The situation only became truly apparent when a British composer travelled abroad to attend a conference or, very rarely, to work at a studio. However, despite these problems, electronic music in the UK did make important strides during the formative post-war years, and eventually achieved, at least in part, the recognition it deserved.

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A possible explanation for this eventual success could be the sheer diversity of the strands of electronic music researched in the UK by so many different individuals. Since there was no national facility to guide developments in a particular direction, or indeed impose a particular aesthetic on what was pursued in a creative context, composers had no qualms about researching exactly what they were interested in. This certainly fostered a very broad ranging musical culture that was very different from other countries. An example of this is Peter Zinovieff's Electronic Music Studios (London) Limited (EMS). This company was responsible for some of the most significant first generation of commercial voltage control synthesisers, competing directly with the leading American manufacturers such as Moog, Buchla and ARP. Indeed the VCS-3, launched in 1969, provided a material stimulus to developments across the board. VCS-3s were purchased across the board, from schools and universities to the BBC and rock bands such as Pink Floyd.

In the early days, in a manner more closely aligned with developments in America than Europe, it was within higher education that electronic music received the support it required in order to achieve its creative potential, but even then this did not occur until the latter part of the 1960s. Nonetheless from 1967 onwards university studios began to spring up all over the country and they managed to achieve a unique environment through the willingness of the studio directors to talk to each other and seek common aims and objectives. This spawned the equipment pooling group known as Electronic Music Universities Co-Operative, and later the British Society for Electronic Music (BSEM), the magazine, *Contact* and, later still, the Electroacoustic Music Association (EMAS). In a number of respects the scope of such collaborative developments were to prove especially significant in ways which have, certainly in overall impact, no parallels with either Europe or the USA.

If one looks at the British studios for electronic music, for example one of the earliest at Goldsmiths College, it is easy to see that at the outset the pioneers lacked confidence in terms of what they were doing or even what they were ultimately intending to achieve. Fascination with the unknown and a genuine curiosity became the main drivers, both in a technical and creative sense. Although such a desire to explore the unknown without substantive preconceptions or ideologies such as those associated with *musique concrète* or *elektronische Musik* allowed considerable freedom in terms of exploration and discovery it also inhibited suitably proactive engagement with issues of purpose and direction. In addition, unlike the major studios in Europe, which were funded by broadcasting institutions, resources were few

and far between. Those early pioneers who were lucky enough to be charged with the creation of a particular studio had essentially free reign over how it was to be designed and run, albeit within often significant financial limitations. It is also the case that they would almost invariably tailor the studio to meet their own particular needs. This situation is not necessarily to be criticised, it is possible the designers only knew of the particular objectives they were working to and had no idea that there were other possibilities. This problem was exacerbated by the lack of literature on electronic music at this time. There were, however, some notable exceptions. The expert advice for the Goldsmiths studio, for example, was provided by Hugh Davies, then a young composer interested in electronic composition, and an instrument inventor. It was his time spent with Stockhausen which gave him the knowledge and authority to advise both Goldsmiths and others on studio design. However, an inevitable conclusion is that Davies' experiences up to that point would necessarily have had a particularly strong German influence. The Goldsmiths studio thus used a high proportion of German-made equipment, for example brands such as Uher and Revox, but care nonetheless must be exercised in drawing any definitive conclusions in this regard. These particular choices however could also be explained by the simple fact that Germany had a head start on producing suitable recording equipment, it was Germany where the tape recorder was developed during the Second World War, and so they and their Swiss associates had a natural advantage of time over their rival producers in other countries.

A national studio for electronic music in the UK

At several points during the development of electronic music in the UK there have been attempts to create a national studio. Such persistent endeavours to create such a resource both reflected the lack of institutional investment in the medium and also the strengths of collective purpose to achieve an outcome which might realistically match what had been achieved in Continental Western Europe and beyond. Different groups have been behind each of these bids and the situations surrounding them always different. The bids cover over thirty years and not one of them was successful, each having its own set of reasons for failure. The need for a national studio occupied the thoughts of many of the pioneers who felt the UK should have such a facility.

It begs the question, why did those involved in electronic music in the UK feel a national studio was necessary? It was certainly the case that many European countries had national studios, normally housed at the national broadcasting stations. Nordwestdeutscher Rundfunk

in Cologne (NWDR, later WDR) and Radiodiffusion Télévision Française (RTF) in Paris both had studios for electronic composition and famously developed two rival schools of thought on how the genre should be exploited. Although European studios had funding for national projects the problems associated with the European studios nonetheless cannot be ignored. On several occasions a seemingly national studio would actually be furthering the ideas of a single strand of electronic music, Stockhausen always had rather too much influence at the Cologne studio and it is well known that Boulez used IRCAM to further his own ideas. British composers were in the unusual, and now it could be said, enviable position where everyone could have their say and many ideas were not pushed aside for a well-established composer who had the monopoly on funding and resources. However tensions were to prove inevitable since at the end of the day not every aesthetic and technical preference could be accommodated, and making decisions by committee is not a sure recipe for success.

The development of broadcasting and studios in other countries

In order to provide a context for studying developments in the UK it is useful to consider at least the key features of parallel developments in other countries, especially those in Continental Western Europe. The development of broadcasting in France, Germany and Italy merits particular attention since in all three cases it was radio stations that took the initiative in establishing national electronic music studios. It is important to recognise that the policies and practices of state broadcasting corporations were to prove particularly significant in shaping the post-Second World War development of electronic music in their respective countries. The lack of early interest by the BBC restrained the development of a positive organisational culture and attitude towards the composition and broadcasting of new music in the UK.

The situation in the USA was more advanced than in the UK but not without its own problems. While Hiram Jome describes the UK and other countries as ‘backward in many phases of technical development’³ he does praise the broadcast system as it ‘avoids many of the evils of the American system’⁴. The system he is referring to is the overpopulation of radio stations causing interference on the airwaves. During the formative years of radio broadcasting in the UK the Postmaster General foresaw problems with multiple broadcasting

³ Jome 1925:209

⁴ *ibid*

stations and in 1922 called a conference of those companies who had applied to broadcast. He stated that broadcasting should cover the whole of the UK without discrimination and the number of stations should be limited so services did not interfere with each other. He states, ‘until just over two years ago, indeed, broadcasting was carried out from independent stations in an experimental way, at the expense of the individual manufacturers of apparatus. But this was never looked on as a permanent solution of the question’⁵. Thus it was that the BBC became a truly national broadcasting corporation, in marked contrast to the circumstances of the USA.

This lack of an institutional focus in regard to radio meant that those interested in electronic music had no national facility to look to. This might indicate significant parallels with the situation in the UK; however, the ability of both individuals and academic institutions to respond to the need for electronic music facilities in the USA far outstripped anything that was to prove possible in the UK for many years. Given the focus on national initiatives in Europe it is thus more instructive to study the reasons why the BBC behaved so differently from equivalent organisations on the continent than pursue possible parallels the other side of the Atlantic.

Early broadcasting in the UK

In order to understand fully the reasons why the BBC was to prove so intransigent in its attitude towards electronic music it is instructive to study the circumstances that brought it into being. These not only throw useful light on the prevailing culture at the time, they also provide important clues to the legacy of priorities and prejudices that were thus inherited by those responsible for the making and implementation of policy after the end of the Second World War, up to and including the development of the BBC Radiophonic Workshop in 1958 which is of key significance to the central focus of the thesis.

In 1922 a decision was taken to form the British Broadcasting Company Ltd. which ‘any radio manufacturer or dealer may join by subscribing for one or more £1 shares and by depositing £50’⁶. This meant that any company with an interest in broadcasting could enter into the business as shareholders. Many equipment manufacturers became shareholders and all existing broadcast stations were transferred to the company, and on 14th November 1922

⁵ Greville 1925:158

⁶ *ibid*

1. Introduction

the British Broadcasting Company Ltd. made its first broadcast from London. In January 1923 an agreement was made between the Postmaster General (representing the Government) and the company to ‘create eight main broadcast and eight relay stations in the British Isles, it was also agreed that the company would not broadcast advertisements’⁷. In return for this the Government granted the company an ‘exclusive right to broadcast for public reception . . . and undertook to issue licenses for the erection of receiving station and to pay over the fees received to the company.’⁸

The British public bought licences in their thousands, ‘In an island within easy reach of the enemy coast we took quite naturally to the idea of a Government monopoly of wireless communication. And since we have never had any other conditions there is no general resentment at the idea of a licence fee to be paid by listeners.’⁹ By 1924 home radio sets were gaining popularity and radio was rapidly ‘becoming a more and more vital amenity of the whole community’¹⁰ and over one million licences had been sold. As the broadcasting stations were so evenly distributed, the majority of these licence holders used crystal sets to listen to the radio¹¹. Crystal sets were easily made at home, and since power was taken from the radio signal no battery or mains connection was required. At the same time the so-called ‘wireless’ radio, using suitable electronics was developed as a commercial product. During this period output power levels were usually very low (a few watts) and radios often used headphones only as they could not suitably power a loudspeaker. Writing in 1925, Greville states that the British Broadcasting Company ‘hopes, in the not too distant future to make it possible for most listeners in the country to have a choice of two programmes, the one serious, and the other light, at all times’¹².

During the first four years of the British Broadcasting Company’s existence it was a public commercial company. A Government committee was set up in 1925 ‘to investigate the best type of constitution for broadcasting control in Great Britain’¹³. On 31st December 1926 the assets of the British Broadcasting Company were dissolved and, by Royal Charter, it became the British Broadcasting Corporation, commonly abbreviated as the ‘BBC’. The BBC began

⁷ Greville 1925:158

⁸ *ibid*

⁹ Greville 1925:157

¹⁰ *ibid*

¹¹ Jome 1925:210

¹² Greville 1925:158

¹³ Graves 1935:55

to provide a regular radio service and by 1927 the General Post Office had issued over 2.25 million receiving licences.

During these early years the only way to tune a radio set was using the oscillator, to search through the broadcast spectrum to find the desired radio signal. This searching meant listening to the crackling and hissing noises which were present on the wavelengths not being used for radio broadcast. One significant artefact associated with mistuning was a variable frequency sideband oscillatory tone that could only be eliminated when the station was perfectly tuned. It was not always easy to tune in a set and one could spend a good while doing so, and as these oscillations were often very loud one could often hear a neighbour tuning their set, which in turn would interfere with your own. Even up to the point when during the general strike, the BBC feared that strike action involving the production of ‘wholesale oscillation[s]’ would disrupt and interfere with all of their programmes¹⁴. During the 1930s the sound from these oscillators was a wholly annoying and disruptive noise, but in later decades it would become an art form, for example in Stockhausen’s *Telemusik* (1966).

The 1930s were important moreover for the development of music broadcasting, in particular the BBCs move into new premises in Delaware Road, Maida Vale, London with the specific intention of creating a music studio centre in a former roller skating palace. This large room proved ideal as a whole symphony orchestra could be accommodated on its sunken floor and recorded away from the hustle and bustle of central London. This building would subsequently house the BBC Radiophonic Workshop.

Magnetic tape recording

The post-war introduction of magnetic tape recorders was to prove especially significant not only for broadcasting but also the development of electronic music. Not only was it possible to record far longer tracks than the three or four minutes offered by the alternative wax discs. Up to thirty minutes could be recorded at fifteen inches of tape per second. It was also possible to cut and splice materials using no more than a razor blade and splicing tape. The initiative here came from Germany, as a by-product of wartime developments.

¹⁴ Briscoe & Curtis-Bramwell 1983:25

1. Introduction

In 1942 BASF developed a cellulose acetate tape which was coated on one side with magnetic particles. However this was prone to tearing and was soon replaced by a stronger tape made from polyvinyl chloride. BASF were perfecting the magnetic coating when a fire destroyed their factory in 1943. This halted BASF's monopoly on the further development of the medium. As the German army had started to use magnetic tape recorders in the field demand for tape was high, so another German company began production. Agfa made X-ray film as well as film for the motion picture industry, and successfully combined their research from those with BASF's knowledge of magnetic tape. By 1945 the Magnetophon was a standard facility in all German radio stations and the German army used specially constructed tape recorders called Tonscreibers, literally tone writers. In a marked contrast, national broadcasting stations in other countries, including both France and the UK, were still using pre-war shellac disc recorders. Indeed it was not until 1949-50 that the newer technology became generally available.

Throughout the war the Germans continued to work on improving the tape recording equipment for listening purposes, so much so that equipment recovered during the Allied invasion of Germany was far advanced than the primitive experiments of the British and American engineers. It was found that, during the last days of the war, the Magnetophon factory was producing parts for the K-7, the most sophisticated machine to date. Enough parts were found to assemble eighteen machines and they were sent to England, France and the USA.¹⁵

During the war Armour, an American company, manufactured a portable wire recorder but when 'several individuals brought AEG Magnetophons to the United States'¹⁶ and began to copy and improve upon the design, the portable wire recorder was doomed. Other research took place in wartime USA but mainly in the field of telephone answering services.¹⁷ When America entered the war several skilled scientists were sent on investigative missions, one of these was John Herbert Orr. Orr worked at the psychological warfare department and his duties included studying captured enemy radio equipment through which he discovered the Magnetophon. At the end of the war the information gleaned by Orr and his contemporaries was used by the USA Department of Commerce and then made available to the American

¹⁵ Morton 1963:598

¹⁶ Morton 1998:228

¹⁷ For more information see: Clark 1993

public¹⁸. Reports were published detailing how the Magnetophon worked which would have been extremely useful to those who brought Magnetophons to America. Consequently, the patents and drawings for the AEG Magnetophons fell into the control of the Allies as was customary, and the designs passed into the hands of the Americans who duly gave licence to two American companies, Ampex to produce tape machines and 3M to produce the tape¹⁹. The machines produced were certainly not portable machines like the Armour wire recorder, they were giant devices approximately the same size and cost as a high-quality studio disc recorder.²⁰

The first task for 3M was to improve the quality of the tape. They tested several backing materials, predominately acetate and polyester. In 1948, after a lengthy debate, decided on polyester as the best choice, ‘polyester tape has greater strength and stability, although acetate tape may be preferable for editing purposes’²¹. The two backing materials each have their own shortcomings; polyester will stretch if force is exerted on it, causing the sound to distort but will rarely snap, whereas acetate will snap under the same force that causes the polyester tape to stretch. Neither are good outcomes as distorted sound is rarely usable²² and splicing tape is a time consuming practice that can result in a slight ‘pop’. This also happens with acetate tape but the ‘pop’ is less audible. For modern tape the magnetic material is generally gamma ferric oxide, commonly found as rust on iron, but some machines, cassette and video recorders use chromium dioxide which has low noise and is less prone to print-through²³. The importance of these deficiencies must not be underestimated since, for all the flexibility of being able to cut and splice materials and in due course the introduction of first stereo and then multichannel recordings, problems associated with the deficiencies of the medium were materially to influence and constrain the processes of composition.

¹⁸ Morton 1963:598

¹⁹ Tingen 1996:53

²⁰ Morton 1998:228

²¹ Howe 1975:42

²² Stretched tape is useless because the sound is irretrievably ruined, however it can produce an interesting sound effect.

²³ Print-through occurs when a tape wound on a reel is subjected to heat or impact and the magnetization from one layer is transferred to another, stronger (= louder) signals thus being ‘ghosted’ as a faint echo on the adjacent segments of tape either side of the original. Whereas in the case of the following adjacent tape revolution such post-echoes are often masked by the continuing sound material, pre-echoes on the preceding tape revolution will sometimes be very evident, especially prior to the attack of a sound. Print-through is commonly found on commercial cassettes poorly stored in cars and in direct sunlight but can also happen if a studio reel is incorrectly stored. Reels should thus be stored ‘tail out’ to reduce the degree of detectable print-through.

Optical sound recording

Optical sound recording evolved from the film industry when the desire to combine sound and films resulted in the creation of film for the purpose. Although in comparison with magnetic tape recording, the impact of optical techniques on the development of electronic music was very small. Nonetheless it was to have a material impact on the pioneering work of Daphne Oram, to be considered later, leading to the construction of her Oramics machine. It is only recently that the true significance of this development has been fully appreciated, and it is thus instructive at this point to study the key characteristics of its development from this inter war period, given the importance of her subsequent contributions to the development of electronic music in the UK. It is deeply ironic to note that her isolation from developments elsewhere were to result in a voyage of discovery that was essentially parallel to that to be described below, rather than one directly informed by these other outcomes. This situation, however, reinforces the significance of the often highly insular approach of early pioneers in the UK, but not in a negative sense since it was to bring about a number of unique and distinctive initiatives, of which Oramics is arguably a shining exemplar.

Optical sound recording is a visual method of recording, and this medium for the representation of acoustic information was to open up powerful possibilities for sound synthesis by means of directly encoding waveforms. Some methods used successive photographs of waveform images, others employed directly drawn sounds. Sound and film were first combined successfully by the Tri-Ergon, Tobis-Klangfilm system. Using this system 'sound waves were translated via the microphone and a photosensitive selenium cell into patterns of light that were captured photochemically as tiny graphic traces on a small strip that ran parallel to the celluloid film images'²⁴. Previously to this sound and film ran on separate machines using the Vitaphone system, these 'talking pictures' or 'talkies' consisted of the picture element recorded on film and the sound element on a phonograph disc.

When sound is recorded for film it is recorded alongside the picture using the edge of the film. The sound is documented as black and white patterns and uses a small portion of the area of the film, the film is 35mm wide and the sound part is between 1.93 and 2.5mm wide²⁵. This is a very small area in which to work, nonetheless, several composers tried to create sound on film patterns and create new sounds. Sound on film patterns can take two basic

²⁴ Levin 2003:34

²⁵ Davies 'Drawn Sound' *Grove Music Online*

forms, 'variable area sound tracks and variable density sound tracks'²⁶. Variable area shows the sound as black patterns with the remainder of the tape left clear whereas variable density shows shades of grey across the whole film.

When the tape is stopped the sound can be seen as a physical representation, a means of verification not possible with other recording methods. Composers were quick to discover that 'these sound pictures could...be manipulated and altered, generating entirely new sounds and sound arrangements. Parts of a sound might be excised while individual sounds and entire pieces of music could be reordered, reversed, and superimposed by cutting, rearranging and splicing the film.'²⁷ Optical sound recording was the first and only method where sounds could physically be drawn; in Leningrad in 1929 Areseny Avraamov and Yevgeny Sholpo attempted to literally draw sound on photographic film. They conducted experiments drawing on film with a pin dipped in Indian ink but found it too intricate as the optical part of the film was so narrow²⁸.

Through their extensive research, the Bauhaus artists also discovered that the patterns could be altered using a paintbrush and solvent. The Bauhaus artists had more success than Avraamov and Sholpo, they discovered that that pitched sounds produce cyclic characteristics which are easily identifiable on the track. Percussive sounds do not produce such distinctive characteristics so they encountered problems drawing sound onto the tape as they did not know what sound would be produced, thus many of these initial experiments were simply trial and error.

As drawing sound proved too intricate, Avraamov and Sholpo changed tack to photographing individual drawings rather than drawing onto the film. From these photographs of drawings Avraamov produced the first drawn film soundtracks in 1930 then turning his attention to the creation of a microtonal scale using drawn sound techniques. They used photographs of geometric shapes, and 'any repeated pattern would produce a distinctive sound. Pitch was controlled by the frequency with which the shape appeared on the film and volume by the length of exposure, for example, they greyer the print, the quieter the sound.'²⁹

²⁶ James 1986:75

²⁷ *ibid*

²⁸ Davies 'Drawn Sound' *Grove Music Online*

²⁹ James 1986:81

‘Both methods completely circumvented the recording process, by painting sounds directly onto the sound-track film or by taking pictures of various designs with an ordinary animation camera and then reducing and combining them like an animation sequence.’³⁰ Yevgeny Sholpo went on to develop an audio-only composition machine in 1932³¹. This machine was known as the Variophone and used the full width of 35mm film as the recording area.

Also in 1932 a short documentary film entitled *Tonende Handschrift* featured the work of Rudolf Pfenniger, a German sound animator. His sound generation technique involved pictures of sine and saw-tooth waves and he achieved excellent dynamic control by varying the length of exposure.³² The best known practitioner of drawn sound is Norman McLaren, who ‘preferred techniques for drawing or scratching sounds directly onto the film’³³. His first sound track was turned down in 1937 by his employers the GPO in London. His later work in Canada was successful winning him many film awards and it is deeply ironic that this pioneering work was not supported in the UK.³⁴

The development of optical sound recording was essentially curtailed by the emergence of magnetic tape. The real benefit of optical sound recording is that it was the only method at the time where one could successfully alter patterns made by the sound and even draw sound using a paintbrush. It was the only method of sound recording prior to the introduction of computer-based techniques with graphic displays where one could physically see the recorded sound. It was the latter characteristic that was to prove so influential in Oram’s mission to develop a synthesiser based entirely on the principles of ‘drawn sound’.

Concluding remarks on the technical background to developments in the UK

The immediate post-war period provided ample opportunities for the creative exploration of electronic music in the UK on a par with those available in continental Europe and America. What was singularly lacking, as already noted, was any material support from industry and/or education to invest in the possibilities both in technical and human terms. As will become fully apparent in due course personal enterprise and ingenuity were to prove the primary drivers for pioneering developments, based significantly in the first instance on surplus

³⁰ James 1986:75-79

³¹ Davies ‘Drawn Sound’ *Grove Music Online*

³² James 1986:84

³³ *ibid*

³⁴ Davies ‘Drawn Sound’ *Grove Music Online*

electronic equipment from the war and in due course the availability of electronic kits which extended to such vital items of equipment as tape recorders and mixers. The significance of the former legacy must not be underestimated, for without it the singular lack of institutional investment and support would have made such endeavors almost impossible to achieve. It is with these considerations in mind that attention now turns to the primary sources of information that provided the foundations for the thesis.

Part 3: Key sources of information

The BBC Archive

When I began my research in 2004 the BBC Archive was the only formal archive with information on electronic music in the UK. Both the Hugh Davies Archive and the Daphne Oram Collection (see below) were yet to become available, and their appearances in 2007 were to prove fortuitous. The BBC Archive contains information on all aspects of the BBC and disaggregating information specific to electronic music therefore required an extensive scrutiny of documentation, much of which was to prove irrelevant. It is also subject to certain privacy criteria which meant that I was not able to access everything I would have wished. While the archive does contain significant information about the Radiophonic Workshop, it is harder to find information on key aspects of the circumstances that led to its establishment. Much information that it provides concerns the programmes for which theme music was created rather than informative commentary on the music itself. The BBC's essentially negative attitude to electronic music, which will be considered further in due course, is clearly evident in the archive. I was, nonetheless able to access important documents relating to the opening of the Radiophonic Workshop which proved extremely useful. Many of the important gaps in the information concerning the establishment of the Radiophonic Workshop were to be provided by another source, the Daphne Oram Collection.

The Daphne Oram Collection

Daphne Oram was one of the earliest pioneers of electronic music and one of the earliest staff at the BBC Radiophonic Workshop. She invented the Oramics system of composition. She researched, taught and wrote about electronic music from her early days at the BBC in the 1950s until her death in 2003. After her death her collection of papers, recordings and research passed to Hugh Davies, her long term friend and colleague and also, as mentioned, a

fellow pioneer. I am sure that it was his intention to catalogue these affects, and as they had worked together since 1961, there was no better person. After his death in 2005 her family asked the Sonic Arts Network to become custodians of her collection. In August 2007 Sonic Arts Network, in collaboration with Goldsmiths College, University of London, were awarded a grant by the Arts and Humanities Research Council to create an archive of her work. The, now complete, website states the intentions for the collection: 'It was with experimental electronic music practice in mind that Goldsmiths College Electronic Music Studios have collaborated with the Sonic Arts Network to bring this collection into the academic community where it can be properly studied and developed.'³⁵

I was lucky to be one of the first to visit the collection after it had been brought to Goldsmiths and I used the archive before it was catalogued. It provided significant insight into her working practices, intentions, opinions and grievances, especially while working for the BBC. Much of what is said about Oram in this thesis comes from the Daphne Oram Collection. Cataloguing of the archive is nearing completion (November 2011) and can be visited at Goldsmiths College.

The Hugh Davies Archive

The second archive to provide useful information in the specific context of the BBC Radiophonic Workshop, as well as more generally, is that of Hugh Davies. This has not yet been organised in the same manner as the Daphne Oram Collection but its importance has been far greater in terms of my own research. His archive is now housed at the British Library and can be visited by arrangement. It is an extensive collection and when I visited, as one of the first to be granted access, it was in disarray. I was later employed by the British Library to catalogue this collection. However, due to constraints of time and money it was not possible for me to complete this catalogue, but is in a usable state for those wishing to conduct further research.

There is an important distinction to be made between these two archives. Whereas the Oram archive is almost exclusively concerned with her own work albeit embracing her relationship with other pioneers the Davies archive is all embracing, reflecting his interest not only to engage proactively with developments within the UK but also document his correspondence

³⁵ *Daphne Oram Collection*. See the website: <http://www.gold.ac.uk/ems/oram/>.

and findings. An initial understanding of the archive and its significance is thus enhanced by a consideration of the man himself and the scope and nature of his activities.

Hugh Davies

Hugh Davies was a composer, inventor, teacher and pioneer of electronic music. He studied music at Worcester College, Oxford (1961-64) and for his dissertation wrote on electronic music in which he mentioned the need for a catalogue of electronic compositions.

Davies had contact with Daphne Oram from an early age. They first met in 1961 at a lecture she gave at the Mermaid Theatre. The following year he spent a weekend at her studio, learning the basics of electronic music and recording. Davies and Oram corresponded on matters relating to electronic music, from 1961 to her death in 2001. This early training from, and contact, with one of the significant pioneers of electronic music in the UK undoubtedly helped his career. In 1962 Davies inherited an unwanted commission from Oram. He was thus to compile a discography of electronic music and *musique concrète* for publication in *Recorded Sound*, the journal of the British Institute of Recorded Sound (later the National Sound Archive). In the latter part of 1962 Davies began to amass equipment of his own, he wrote to Oram for advice on this and in October 1962 she replied with a list of basic equipment for him to gather. By this point his work on the discography was well underway. During 1963, as part of his work in this context, he studied *Répertoire International des Musiques Expérimentales* produced by the Groupe de Recherches Musicales in Paris. This was to prove axiomatic in terms of his further work in this area, and the consequences will be discussed in more detail later in this chapter.

While Davies was at Oxford he was approached by publishers Barrie and Rockliffe offering him an advance to write a book on electronic music. At this time he was still an undergraduate and thus had clearly begun already to make a name for himself in the field. I have not found any reference indicating that this book was published, but I did find Davies' dissertation, entitled *Electronic music and musique concrète: A Historical Survey* in which he expresses interest in writing a catalogue of electronic music, which indeed was to come to pass. In 1964, soon after graduating, he moved to Cologne to study with Stockhausen, a significant achievement for such a young composer. Stockhausen was at the height of his fame, further highlighting Davies prominence in the field. While working as Stockhausen's assistant, he assisted in live performances of *Mixtur* and *Mikrophonie I and II*. Davies went

on to work as a researcher for the Groupe de Recherches Musicales in France and was contracted to produce the second edition of *Répertoire International des Musiques Expérimentales* to be titled *Répertoire International des Musiques Electroacoustiques* during his stay (1966-67). The precise dates are hard to establish but a letter from François Bayle of RTF addressed to Davies at the Hotel Ribera in Paris, discussing the publication of the second edition is dated 6th March 1967, and this gives a useful point of reference.

From 1967 Davies was the director of the studio at Goldsmiths, a position he sustained until 1986 and staying on as a research associate until 1991. He subsequently became a visiting lecturer and researcher in Sonic Art at Middlesex University. Although his skill in this area was great, he never took a full time post at a university, 'his resolutely freelance mentality and lack of sympathy with the more mundane requirements of academic life kept him apart from some of its rewards as well as its frustrations'³⁶.

In 1989 Davies wrote 'my publications have been printed in eleven languages in seventeen countries, and include contributions to nine dictionaries; some of them, such as my articles in four of the New Grove dictionaries over the last twenty years, have obliged academics to take seriously research areas that previously they had largely managed to ignore. So far this seems to have scarcely happened in Britain, but in some other countries there are encouraging signs.'³⁷

Davies was very well known in the field of electronic music in the 1960s and 1970s but as technology moved on, his contribution gradually faded into obscurity. He transcended the generations during the early bids to create a national studio and was part of both the British Society for Electronic Music and the Electroacoustic Music Association bids and was also asked by the Arts Council to be on the awarding panel for grants for electronic music. In later years he continued to work with amplification and created many electronic musical instruments. He also spent a great deal of time working with children bringing electronic music to schools.

Few people currently engaged with electronic music are like to be aware of the important contributions of Hugh Davies, and even those who consider themselves as contemporaries

³⁶ Potter 2005:1

³⁷ Davies 2002:16

perhaps do not fully appreciate the significance of his many contributions. Towards the end of his life Davies was increasingly frustrated at his lack of recognition in the field. It is my hope that this thesis will go some way towards rectifying this lack of recognition.

Upon his death in 2005, his widow passed his archive to the British Library. The collection has enabled me to piece together a detailed history and time line of the development of electronic music in the UK that hitherto has not been known. When I first visited the collections they were in the same state as when they were removed from Davies house. There were completely disorganised, partly because of the way they had been removed and transported without due attention and care, and partly because of Davies own idiosyncratic filing system. This may have served him well but does not serve the interests of those who wish to research its contents. It would appear that Davies retained almost every piece of correspondence he received, from council information on planning permission to letters from Stockhausen. The collection thus contains information meticulously collected regarding every aspect of electronic music in the UK. My initial cataloguing of the archive has identified the following key areas, as he chose to identify them:

i) Live performance, ii) found scores, iii) building equipment, iv) creating studios, v) electronic music in higher education, vi) several attempts to create a national studio for electronic music, vii) instrument building for school age children, viii) studying with Stockhausen, ix) participation in international festivals and competitions, x) national studio bids, xi) Arts Council funding applications, xii) British Society for Electronic Music committee minutes, xiii) Electroacoustic Music Association committee minutes.

Although there are elements of overlap in some cases, most noticeably in the case of vi) and x), the distinctions are interesting in terms of revealing his overall thinking in terms of challenges and issues. One might view Davies as a hoarder, and there are those who might wish superficially to dismiss a significant proportion of his archive as junk. It is, however, only when its contents are forensically studied that it becomes possible to appreciate the true value of what it contains. His inability to throw anything away has provided the author with many crucially important documents and links between electronic music events that are not available from any other source.

To reiterate, Davies' mentality as a freelance composer, inventor, musician and researcher meant that he never held a permanent full-time job. Thus, although he was to play a major part in the development of the studio at Goldsmiths he undertook this on an entirely part-time basis. All this together goes some way to explaining why he is perhaps often overlooked in the academic study of electronic music, but he certainly had significant influence over the development of many studios and was a person who was 'there when it happened'. He therefore cannot be overlooked in a historical sense. His contribution is simply too significant, not least in the context of gathering information together in order to inform the work of others.

Répertoire International des Musiques Expérimentales

During April 1961 the 24th Bi-Centennial of Contemporary Music was held in Venice. The Italian national broadcasting company, Radio Audizioni Italiane, organised a meeting at which representatives of the following institutional electronic studios were present: Baden Baden; Brussels; Cologne; Columbia; Milan; Paris; Tokyo; Utrecht and Warsaw. The following statement was published in the preface of the eventual catalogue:

'These meetings clearly showed the necessity of assembling and publication of such basic information on existing experimental music centres in the whole world as would facilitate future exchange of information among them; at the same time it was decided to organise specialised panels in view of studying in common certain problems, particularly those of a technical nature.'³⁸

The English translation is poor but it is clear what the meeting set out to achieve. During the Venice conference a questionnaire was created and distributed among delegates with the intention of circulating it worldwide. From the replies a catalogue of compositions was produced, it included all known works that had been produced to date and a list of studios and their equipment. *Répertoire International des Musiques Expérimentales* was published by the Groupe de Recherches Musicales in Paris. It was a survey of the prominent electronic music studios in 1961, containing a list of studios and works realised at each, stating their year and duration, as well as a list of equipment in use at each studio and a bibliography of available information. This edition, published in 1962, has been out of print for over thirty

³⁸ Service de la recherche de le R.T.F. 1961:7

years and is often overlooked by researchers. It is also unknown as to how this edition was distributed, and it possible that the intention may have simply been to create a document internal to the Groupe de Recherches Musicales. The inside of the back cover bears the legend ‘Service de la recherché de la R.T.F’ providing evidence to suggest it was a publication internal to the Groupe de Recherches Musicales. For this reason many assume that the 1968 edition, *Répertoire International des Musiques Electroacoustiques*, is the only one that was ever produced. The 1962 edition was indeed thought lost until the author discovered a copy in Hugh Davies Archives in 2007. It transpires that only one other copy is known to exist, to be found at the Groupe de Recherches Musicales in Paris. Davies was in possession of a copy because he was asked to update this for publication of *Répertoire International des Musiques Electroacoustiques* in 1968.

A discography in Recorded Sound

Of those present at the Venice conference, the UK is noticeably absent. By this time the BBC Radiophonic Workshop had been established (1957) but, as will be discussed later, compositional activities of any significance in the UK were still few and far between, with little or no interest in the aims and objectives of the conference even within the Workshop itself.

To return to the original approach for assistance from Daphne Oram, on 5th February 1962 Patrick Saul, the Secretary of the British Institute of Recorded Sound contacted Daphne Oram enquiring if she would consider compiling a discography of electronic music and musique concrète for publication in Recorded Sound. Saul states that:

‘such a discography would of course be very useful to us in our efforts to build up a comprehensive collection of records of experimental music, and so far as I am aware, none has been compiled.’³⁹

At this stage Oram had just received her Gulbenkian Foundation grant and thus felt unable to complete the task herself. She accordingly passed the work to Hugh Davies. A letter from the British Institute of Recorded Sound, dated 5th March 1962, was sent to Hugh Davies at Worcester College, Oxford. It states:

³⁹ Saul 1962a:Letter

‘Oram states that she has been in touch with you about our interest in publishing a discography of recordings of experimental music and that you very kindly agreed to help.’⁴⁰

In an obituary for Oram on the BBC website Davies added some comments which have helped to pin down the above facts. Davies notes that:

‘I then inherited from her an unwanted commission to compile a discography of electronic music and musique concrète for the journal of the original incarnation of the National Sound Archive.’⁴¹

In October 1962 Oram remarked to Davies that they needed to work out ‘where to draw the line’ and, about Mr Saul, ‘unless he publishes the list jolly quickly after receiving it, it will soon be out of date! What a snowball the E.M world is becoming’⁴². How right she was. The world of electronic music was rapidly expanding and anything written about it was soon to prove out of date. Davies did indeed produce the discographies for Recorded Sound and Tristram Cary remarked in a 1966 letter to Davies how much he enjoyed them⁴³.

Répertoire International des Musiques Electroacoustiques

The title of the second edition was *Répertoire International des Musiques Electroacoustiques*, translated as the *International Electronic Music Catalogue*, compiled by Hugh Davies. Davies used *Répertoire International des Musiques Expérimentales* when compiling these discographies, the date 22nd February 1963 is written in Davies handwriting on his copy of the document, giving a useful pointer as to when he received it. The updated and expanded edition was published as a collaborative effort between Groupe de Recherches Musicales and the Independent Electronic Music Center Inc. of New York. The catalogue was a special edition of *Electronic Music Review*, an American publication associated with the Independent Electronic Music Center Inc. edited by ‘Ren and Yael’⁴⁴, friends of Davies. His frequent correspondence with the editors gives some important clues to the nature of the

⁴⁰ Saul 1962b:Letter

⁴¹ Davies comments on Wilson: 2003:1

⁴² Oram 1962b:Letter

⁴³ Cary 1966b:Letter

⁴⁴ Although no concrete evidence indicates this in the Hugh Davies Archive, it can reasonably be conjectured that these are Reynold Weidenaar (Resident Director of the Independent Electronic Music Center, New York) and his partner Yael Gani.

1. Introduction

publication. The catalogue was published by MIT Press, Cambridge, Massachusetts. There are substantial gaps in the information available about how the catalogue came to fruition. All that is known is that Davies completed a draft in August 1966 and sent it to *Electronic Music Review* for approval. Published in 1968, it was widely distributed but lacked certain features of the original. For example, the extremely useful equipment lists. It contained a comprehensive list of studios in the UK and individuals who had studio facilities, albeit for the most part of a relatively rudimentary nature, but aside from the listings of works composed, little more. Furthermore, it transpires it was a somewhat poorly edited edition with inadequate translations, shortcomings that caused Davies considerable annoyance.

In a letter to Ren and Yael, dated 14th October 1968, Davies registers his profound disappointment at these inaccuracies. Many of the translations do not make sense and some of the facts recorded are evidently wrong. It thus becomes evident that a significant amount of the activity taken on Davies' part to locate the information required to complete an authoritative catalogue was simply ignored, and this clearly took its toll on his further interest in the project. In the same letter Davies declared 'I was finished with the whole business'⁴⁵. From then on he undertook no more official work for the catalogue. However, in a private capacity, he continued to record information on studios and compositions until his death in 2005, and it is relevant to note that subsequent to this event it transpires from his archive that he continued to make substantial annotations to the 1968 document.

Despite these important qualifications it is still the case that *Répertoire International des Musiques Electroacoustiques* is an invaluable source of information on works written prior to 1968; nothing in the same genre has been published since. In reference to the catalogue Keith Potter states that:

'It sought to list and describe every piece of electronic music that had been composed in the world at just about the last moment in history when such a project could have been even conceivable.'⁴⁶

Potter is correct in this supposition. After 1970 electronic studios world-wide sprang up at such a rate it would be impossible to keep track of all such developments. It should be noted,

⁴⁵ Davies 1968b

⁴⁶ Potter 2005:1

however, that at the time of writing John Dack from Middlesex University is proactively seeking funding to set up an online catalogue where composers world-wide can upload details of their work. Davies worked alongside John Dack as a researcher in Sonic Art at the Centre for Electronic Arts at Middlesex University, and it is clear that this association has been a major stimulus for this initiative.

Davies thus continually updated the 1968 catalogue with details of studios, composers and works until shortly before his death on January 1st 2005, and his own annotated version of this update is currently located at Middlesex University.⁴⁷ These documents are an important source of reference in tracking the development of electronic music. They provide researchers today with comprehensive information on the composition of electronic music, not least in terms of developments in the UK.

This background perspective of relevant technologies, people, and documentation reinforces the unique context that underpins the birth and development of electronic music in the UK. The very sense of a quasi-random series of individual initiatives and at least initially the lack of any material support from institutions, not least the BBC, provides important clues as to why first the concept of a national studio and then a series of determined but sadly unsuccessful efforts to bring it into being became such an important factor in terms of the subsequent development of the medium. The lack of a definitive account of these initiatives is thus a serious consideration in terms of our knowledge and understanding of UK electronic music and the rectification of this deficiency has been a primary objective of the research which has led to this thesis.

⁴⁷ It should be noted that access to this material is limited, it exists only in handwritten form, the author would like to express thanks to John Dack for his help in using this material.

Chapter 2: The Evolution of the Studio

Although in the twenty-first century the concept of the studio is increasingly concentrated on compact computer-based systems including the essentially self-contained Digital Audio Workstation (DAW) the circumstances associated with the development of facilities for electronic music in the UK were altogether very different. Indeed the very desire to establish a national studio was predicated on a belief that the only way electronic composers could get access to truly sophisticated and versatile resources was through significant investment in such a resource. As will become clear in due course it was changing circumstances in this regard as the result of the development of increasingly affordable technology that was ultimately to undermine this quest. These processes of change, however, were gradual, and in turn were to influence the nature of successive bids, with an increasing realisation of the need for such a studio to be a hub of activities and not an exclusive and wholly self-contained venture.

The physical role of the studio has thus changed dramatically since the earliest ventures. In the early days the constituent parts of the studio were vital, whereas today with the advancement of technology, the community surrounding the studio seems more relevant. The characteristics to be studied here are primarily associated with the formative years of their evolution, from the end of the Second World War to the early, essentially pre-digital era of the commercial synthesiser, from the mid-1960s to the early 1980s. Nonetheless in embracing at least part of the transitional phase the impact of the new technology insofar that it was becoming apparent by this time is important and is suitably considered. The situation in the UK was to prove radically different to that associated with parallel developments elsewhere in Continental Western Europe, and as already noted hitherto the significance of these differences and the reasons why this should be so have not received the attention that they deserve. Although the wider geographical context is indeed significant in establishing both the technical and the musical imperatives for developments in the UK, and key features of these external influences will be referred to during the course of the critique that follows, both the circumstances and the approaches taken to overcome the associated challenges are arguably unique. Having established an overarching perspective of the considerations that need to inform such a critique in chapter one it is helpful now to review the key features

already identified in this context specifically to do with the development of the electronic studio and use these as the basis for a more detailed study of its evolution.

Whereas on the continent the development of electronic music can be primarily attributed to the initiative and enterprise of national broadcasting corporations, for example Radiodiffusion Télévision Française (RTF) in Paris, Nordwestdeutscher Rundfunk (NWDR) in Cologne, and Radio Audizioni Italiane (RAI) in Milan, support from the equivalent broadcasting association in the UK, the BBC, was to prove far less forthcoming. It is also the case that unlike in America, where the early involvement of a number of educational institutions proved a productive alternative to a similar lack of interest from state broadcasters, it was not until the late 1960s that UK universities finally began to embrace the possibilities of electronic music. Nonetheless a small but significant number of pioneers laid important foundations during the 1950s and early 1960s.

As essentially self-funded individuals their achievements are notable for their invention and enterprise, using equipment in the first instance that was communications and test gear originally developed for the forces in the Second World War and now surplus to requirements. Newer items such as tape recorders were very expensive, but nonetheless by the late 1950s such essential items for any electronic music studio were beginning to become more affordable. A major landmark in terms of UK developments was the eventual involvement of the BBC in the form of a state-funded studio, the BBC Radiophonic Workshop, established in 1958. The circumstances that led to this development, not least as a result of the vision and enthusiasm of individuals driven in the first instance by personal imperatives, will also form a key component of this part of the critique. The issues to be considered here are necessarily rather complex, given that developments in the UK were inspired by individuals drawn from a variety of backgrounds rather than led by initiatives of a corporate nature until very late in the day. Nonetheless by considering the contributions of each pioneer a useful perspective emerges, not least in terms of how the foundations for the subsequent series of initiatives to establish a national studio for electronic music came into being.

The early development of electronic music in the UK can be attributed to the work of four pioneers, Tristram Cary; Daphne Oram; Roberto Gerhard and Hugh Davies. By the late 1950s and the founding of the BBC Radiophonic Workshop this spectrum of activities had

expanded to include others, notably Peter Zinovieff who was subsequently to found a private commercial company Electronic Music Studios (London) Limited (EMS), and indeed prove instrumental in the very first bid to establish a national studio. Oram's key role stimulating developments within the BBC laid the foundations for others to follow suit, notably Douglas Cleverdon, Donald McWhinnie and Desmond Briscoe, and their respective contributions also merit close scrutiny, not least in establishing the reasons why Oram should leave the Radiophonic Workshop so soon after its opening to set up her own private studio. One further composer, Delia Derbyshire, was also to make a particularly distinctive contribution to the Radiophonic Workshop before entering into an important partnership with Peter Zinovieff that will be discussed later in the chapter. Others were to make some useful contributions to the early development of electronic music in the UK, and from time to time their work will be suitably referenced. It is, however, the work of the above that lies at the heart of the following account. Given the essentially private nature of so many of the pioneering efforts to establish studios issues such as dating the commencements of activities are especially challenging. Here the work carried out by Hugh Davies in developing the first comprehensive register of studios world-wide, *Répertoire International des Musiques Electroacoustiques*, already cited in chapter one, has proved an invaluable source of information.

Tristram Cary

One of the earliest private studios in London was that belonging to Tristram Cary. Cary's interest in electronic music stems from his days in the Navy, and his work in telecommunications. Many of those who had encountered radio technology during the war maintained an interest in it when they returned to their civilian occupations. As Cary state

‘We all knew about tape recorders but nobody had seen one – we had aboard the ship a very poor wire recorder – but what seemed quite clear was that tape was going to make possible editing sound in a way that was not possible before’⁴⁸.

With his demob grant of £50 Cary bought his first equipment, a disc recorder and a reversible multi-speed playback turntable. He modified his disc recorder by adding additional pickups that ran behind the groove to create echo effects. Much of his equipment came from junk shops in Soho, London, where redundant wartime electrical equipment could readily be bought. Notwithstanding the significant cost of new equipment Cary bought his first tape

⁴⁸ Chadabe 1997a:52

recorder in 1952⁴⁹, thus creating opportunities for the first time to cut and splice sound extracts. Although in *Répertoire International des Musiques Electroacoustiques* Cary is listed as undertaking ‘experimental studies’⁵⁰ from 1947 onwards, his first listed work is *The Japanese Fisherman*, completed in 1955. This was a BBC commission to accompany a radio play of the same name based on the experiences of a fishing boat caught up in the Pacific hydrogen bomb tests of 1954. In the same year Cary finally assembled all the equipment necessary to set up a private studio in London. Unfortunately relatively little is known of the workings of this early studio, but sixteen works were completed here up to 1963⁵¹ when he moved his activities to a farmhouse in Diss, Norfolk.

By 1957 he had acquired three tape recorders, a number of turntables, and three or four oscillators, some home-made and some from kits. Cary most often worked with recorded material as his sound generation equipment was limited. From the mid to late 1950s he wrote the sound tracks to several short films of which *The Little Island* (by Richard Williams) won best experimental film of the year at the Venice Festival in 1958 and the British Film Academy award for Best Cartoon in 1959. From 1955 Cary often wrote incidental music for BBC radio and television, in particular composing incidental music for *Doctor Who* from 1963-72. His inventiveness was frequently inspired by encountering situations where he knew what sound he wanted to create but did not have the facilities with which to create it. He would then stop composing and invent the equipment necessary.

Cary’s work was both instrumental and electronic and combines techniques of musique concrète and elektronische Musik. His output also extended to music for films, for example, *Quatermass and the Pit* (1967) and *Blood from the Mummy's Tomb* (1970). He was also responsible for key aspects of the sound design which accompanied the BBC TV series *Doctor Who*, 1963, notably the sound of the daleks. In a letter to Hugh Davies (1966) he says ‘some of these pieces I would put forward as serious works in their own right’⁵². This blurring of the boundary between film music and sound design is interesting, indicating a particularly holistic approach to art and craft of electronic sound production. In the same communication he indeed suggests that Davies should include these sound tracks in *Répertoire International des Musiques Electroacoustiques*, and these were duly included.

⁴⁹ Ayres 2008:1

⁵⁰ Le Groupe de Recherches Musicales de l’O.R.T.F. and The Independent Electronic Music Center, Inc. 1968:158

⁵¹ *ibid*

⁵² Davies 1966:Letter

In the same year Cary wrote an article in the *Musical Times* entitled *Electronic Music: A Call for Action* in which he laid out his ideas about developing studios for electronic music at universities and his idea for a national centre for electronic music, and this is the earliest reference to a national facility that has so far been traced. In 1968 he founded the electronic music studio at the Royal College of Music, London and co-founded EMS with David Cockerell and Peter Zinovieff. Cary worked from the outset on the very first commercial EMS product, the VCS-3. The potential for selling such products to the higher education sector in turn provided a major stimulus for the founding of studios in universities. For example, he demonstrated a prototype to Peter Manning (Durham) in June 1970 which led to the purchase of two VCS-3s and a keyboard for the newly established university studio.

Cary taught an electronic music course at the Royal College of Music between 1967 and 1970 to which several notable electronic composers subscribed including Lawrence Casserly. More information on the Royal College of Music studio is detailed elsewhere. In 1970 Cary departed to Australia, taking his substantial studio with him. Although at this point his contributions to electronic music in the UK abruptly ceased the significance of his pioneering contributions should not be underestimated. He continued to compose until his death in 2008.

Roberto Gerhard

Gerhard's background, unlike Cary's, was as a composer. He was an early convert to both serial technique and electronic music, despite him being over fifty years old when he took up electronics. Gerhard died in 1970 and was thus unable to take full advantage of the UK electronic studio developments.

Roberto Gerhard is credited as the first British composer to adopt electronic music techniques and 'it seems probable that he was, by a few months, the creator of the first British score to involve tape'⁵³. His 1954 score for Bridget Boland's play *The Prisoner* may be that piece. It seems that he just beat Cary to the first complete work of electronic music in the UK. Cary's *The Japanese Fisherman* was completed in 1955, a few months after *The Prisoner*. As early as 1947 Gerhard composed incidental music for Shakespeare plays. Always contemporary in nature his works attracted few positive reviews. His composition for *King Lear* in 1955,

⁵³ Davies 1981:35

referred to as a 'sound-score', 'was one the earliest works in this country to use musique concrète'⁵⁴.

Between 1954 and 1957 Gerhard created nearly a dozen works of incidental music for theatre, radio and film. These incidental works were 'initially to provide special effects as an extension of the possibilities of a chamber ensemble – such as piano sounds played backwards'⁵⁵. It is unclear where Gerhard created his early works as he did not establish a studio at his home until 1958 when, according to Hugh Davies, he had 'assembled sufficient equipment to make a very small studio, apparently little more than a couple of tape recorders, at his home in Cambridge'⁵⁶. However, in a later letter to the Arts Council, Gerhard states 'I have always been working with shoestring equipment in electronics. . . one microphone, five tape recorders, a track mixer of five channels. . . I've never used oscillators or white noise generators. I am allergic to [the]sine tone'⁵⁷.

Later, specifically for the creation of BBC commissions, he was allowed to use the BBC Radiophonic Workshop where, in 1959, he was able to carry out, in Gerhard's own words, the 'final assembly of the ingredients'. This was the creation of a montage of overlaid sounds using several tape recorders and is referred to by Davies as such. His access to the Radiophonic Workshop merits closer attention given that the circumstances were arguably unique in the sense that a composer was allowed to use its resources for something significantly more than background music for a production. The key undoubtedly was the fact that this was a BBC commission, and without this status, to be accorded to very few in this context, access would not have been granted. This issue will be returned to later. In 1960 Gerhard realised the score of his *Collages* at the Radiophonic Workshop. For this Gerhard used both live and tape music, though the elements of live and tape music may not have been combined in the way we have come to expect as there are separate cues for each in the score.

Between 1961 and 1963 Gerhard's works were mainly background music for theatre or film. Only one work was composed for concert use, *Sculpture I* (1963) was based on sounds produced by a small sculpture of brass rods. While creating this work Gerhard generated enough material for a further four *Sculptures* but these were never realised. Two further

⁵⁴ Cholij 1996:30

⁵⁵ Davies 1981:35

⁵⁶ *ibid*

⁵⁷ Cholij 1996:30

concert works were created out of background music, *Caligula* (1961) and *DNA in Reflection* (1963). In 1965 Gerhard stated that electronic music should be ‘integrated with [the orchestra] and not listened to by and for itself’⁵⁸, he felt very strongly about this. Gerhard also wrote several electronic film, radio and theatre scores, a notable early example being a 1955 Royal Shakespeare production of *King Lear*.

Daphne Oram

Unlike Gerhard and Cary, who came to electronic music later in their careers, Daphne Oram began her career at the BBC, already with an interest in electronics. As a child Oram gained hands-on practical experience building radio receivers and transmitters with her older brothers, and her burgeoning interests in sound technology and acoustics were thus to prove decisive in her choice of career. Her formative educational years were spent at Sherborne, a large public school for girls, where her studies included piano, organ and violin as well as music theory where she reached a standard sufficient to be offered a place at the Royal College of Music. She discovered, however, that unless she was prepared to be trained as a music teacher, she would be placed on the government register for call-up to the forces and thus be required to interrupt her studies at little or no notice. Since she was only interested in a career in performing she turned down the offer and undertook initial training in anatomy and physiology in order to become an electro-therapist in King’s College Hospital. She quickly became disillusioned with these studies and decided instead to submit an application to the BBC. Thus it was in 1943, at the age of eighteen, she started work for the BBC as a Junior Programme Engineer. This created an opportunity for her to combine her musical interests with her other passion, that of broadcast technology. Her initial responsibilities at the BBC were twofold. Firstly she was required to sequence on air the playback of classical recordings on 78 rpm discs. This involved changing records every four to four and a half minutes using a pair of playback units and associated level controls to fade from the end of one disc to the start of the next seamlessly. Secondly she was required to assist more senior engineers with the positioning and balancing of microphones in studios, a role that also led her into direct contact with many of the leading artists of the time, for example Dame Myra Hess, Leon Goossens and Kathleen Ferrier.

⁵⁸ Cholij 1996:30

One key feature of the BBC was the scope and depth of the in-house training given to staff directly involved in technical operations. This included attendance at a residential course offered at the BBC's Evesham training centre, which in her case focused specifically on broadcast engineering. Also at this time her interest in 'synthetic sound' was awakened by reading passages in two books, Kurt London's *Film Music* and Leopold Stowkowski's *Music for All of Us*⁵⁹. The knowledge she acquired provided a major stimulus for her interests in the creative possibilities of studio equipment. One device that made a particular impression during her training was the cathode ray oscilloscope, a device which could be used to display the characteristics of waveforms graphically. During a training course in 1944 she asked, 'if it might be possible to reverse the process and draw waveforms that could be converted into sound'⁶⁰. The teacher dismissed her thoughts but the seed of an idea was already planted, which would eventually manifest itself in the design of her Oramics system. In her own words 'she was intrigued by the possibilities of manipulating magnetic tape sound . . . and as early as 1948 began to build special equipment for the experiments'⁶¹. As will be seen in due course, much of this work was unofficial and thus lacked the institutional support that was secured by her European counterparts.

By the early 1950s she had qualified as a studio manager with a thorough grasp of all the practical and creative aspects of mixing, recording and editing music. These skills allowed her to further her interest in combining electronics and music but her activities were subject to a number of constraints placed by her employers. In essence her day to day responsibilities were limited to servicing the requirements of producers who had responsibility for all decisions of a creative nature, in turn following an agenda very much determined by higher level management. There was thus little or no opportunity for Oram to develop her own creative ideas, which by this stage had become a tenacious mission to use technology as a means of composing. In 1950 she completed a work, *Still Point, for double orchestra and five microphones* where the orchestra are divided in two, one half plays in a reverberant space and the other behind acoustic screens to create as dry an acoustic as possible. The piece also contains passages where pre-recorded sections are played back on 78rpm gramophone discs, slowed down or reversed. Oram has this to say about *Still Point*:

⁵⁹ Davies 2003:1

⁶⁰ *ibid*

⁶¹ Oram 1991:1

‘I’ll show you a score of a piece I wrote in 1950 and you’ll find that that is for two orchestras in two different acoustics, one rather dead with close miking and one of how we would more normally balance a symphony orchestra, and you’ll find that there are all sorts of instructions there as to which microphone is meant to come up at what moment . . . At the back you will find a very faded piece of paper which tells me how to record onto disc, remember there was no tape when I was writing . . . it in ‘48 and ‘49. . . Some [of the materials] are to be played backwards. We had one special machine in the BBC which could play from the inside of the record out.’⁶²

She submitted the work to the BBC as an example of what could be achieved by electronic means as part of her campaign for facilities, but to no avail. She observes ‘I was told they couldn’t understand it, it didn’t make any sense at all’⁶³. *Still Point* remains unperformed, an undoubtedly pioneering work, Davies claims that it was ‘the first work by any composer to feature real-time electronic treatments’⁶⁴. Undaunted she continued to lobby the BBC for resources but to no effect. Her growing sense of frustration led her to seek a meeting with the Head of the BBC Research Department. The precise date of this meeting is unclear. Her recollection in the interview is simply that it took place in 1952 or 1953, but the outcome was to prove truly devastating, an experience she clearly never forgot. She had previously given a somewhat diplomatically worded account of this meeting in an interview for a BBC Radio programme *We Also Have Sound Houses*, transmitted in 1979, and it is this that has hitherto served as the primary reference source. The much fuller account that is given in the unedited version of her 1991 interview, however, is much more revealing:

‘I went to see the Head of Research and I said I’ve got an idea of writing graphic music. Could I have some equipment please? And he pulled himself up to his full height and said “Miss Oram, we employ a hundred musicians to make all the songs we want. Thank You”. And this imprinted on my mind and I thought you so and so, but that was the attitude, that was the official attitude, they had, the BBC Symphony Orchestra, and it was there to make all the music they wanted, and nothing else was of any interest.

⁶² Oram 1991:1

⁶³ *ibid*

⁶⁴ Davies 2003:1

So I didn't get any equipment. One or two people tried to back me. The training school tried to back me. The Head of that saw my point and wanted to set something up... I would try as hard as I could and get nowhere and then because I talked too much about it they heard from Germany that Germany was going to do something about radio music... So they got me along and asked me about it, and I was summoned for a number of interviews by a number of high-ups to tell them all I knew, and I got excited. I thought, Oh Yippee, you know, they were really going to begin to do things. And all they wanted was the knowledge. They didn't want me.'⁶⁵

The completion of the Cologne studio early in 1953 suggests that these interviews would probably have taken place around the same time. It was, however, to be a further three years before the BBC finally initiated the processes that would eventually lead to the establishment of the Radiophonic Workshop.

Also in 1953 Oram wrote a letter to a Dr Alexander dated 23rd January in which she lays out her plans. Later she refers to Dr Alexander as the 'top expert in Britain', it is unclear exactly who he is but it is possible that he was a lecturer on the BBC training course. Her letter is reproduced below:

'I visualise recording a number of short lengths of tape which are then dubbed together by using three tape machines. The German way of superimposing the one on the other would be most useful if it left you the originals as well as the combined lot. If not, I foresee much lost effort if the process of superimposing happened not to give the right result.

Would you mind keeping all of these musings of mine 'under your hat' at the moment until the time is ripe. Meanwhile can you recommend any books giving photos of sound waves other than Dayton Miller? Until I can start making sounds from squiggles I might as well study the squiggles we get from sounds'⁶⁶

Thus, by 1953 she already had the main ideas of Oramics planned out. Her continuous campaigning for BBC facilities was to prove fruitless. For many years she continually

⁶⁵ Oram 1991:1

⁶⁶ Oram 1953:Letter

pressured the BBC for facilities and equipment to make electronic music. In her own words, similar to those stated in 1991, she stated in a Radio 4 interview in 1979:

‘I went along to the research department in Nightingale Square to ask one of the high up engineers there whether he would allow me some equipment and guide me technically towards this music that I was imagining. He reduced me to a very small height and said, ‘Miss Oram, the BBC employs a hundred musicians to make all the sounds they require, thank you’.’⁶⁷

Even when the Radiophonic Workshop was finally established it was not on the terms she desired, and this issue will be returned to later in this chapter.

The BBC Radiophonic Workshop

Following the precedent set by other European countries the development of a studio at the BBC became an increasingly compelling proposition, and finally attitudes were to change. This was good news to those, such as Oram, who were campaigning for such a studio; however it was to become apparent that the intentions of the BBC were somewhat different to equivalent organisations elsewhere. The BBC saw the production of electronic music, dubbed first ‘electrophonics’ then ‘radiophonics’, as a sound effect accompaniment to drama and features, and specifically not as a musical art form.

A little known fact is that, in 1954, the BBC aired a radio programme entitled *Journey into Space* which used an early electronic music technique of recorded oscillator tones passed through a reverberation chamber. As there was certainly no such resource as a reverberation chamber in the BBC in 1954, the facilities at the National Physical Laboratory were used to attempt to produce ‘spacey’ sounds.⁶⁸ This was a lone venture, not to be repeated until the Workshop was up and running in 1958. Around the time of this broadcast several BBC employees had an interest in electronic music, in addition to Daphne Oram the most notable of these were Douglas Cleverdon, Donald McWhinnie and Desmond Briscoe.

Douglas Cleverdon was a senior producer in the Features Department, with a keen personal interest in experimental radio drama. His standing within the BBC was also especially

⁶⁷ Hutton 2003:50

⁶⁸ Briscoe & Curtis-Bramwell 1983:25

significant. One of his most notable achievements, the fruits of his efforts over a period of many years, was to persuade Dylan Thomas to write *Under Milkwood* as a radio play which he produced in 1954. It was this production, not least the very positive public reaction to it, that convinced the BBC that experimental radio drama, as opposed to experimental music, had a secure future, recognising the need to develop all the ancillary aspects of sound design that would be required in such a context. The techniques employed in *Under Milkwood* fired the imagination of Desmond Briscoe, a senior studio manager who had followed a very similar career path to that of Daphne Oram.

Desmond Briscoe was a programme engineer. His job was to look after sound effects and balance of music which was then stored on phonograph records. He was, however, aware of the existence of tape recorders which had been recovered from Germany after the war. As the British and Americans held the patents, the BBC began to use tape recorders during rehearsals. Briscoe was certainly involved and keen to work with tape. He alerted Douglas Cleverdon and Donald McWhinnie to the possibilities tape recorders offered. Briscoe recalls that by 1954:

‘Tape machines, which had existed during the war in Germany, were now becoming available in England and a few were used by the BBC for rehearsal purposes. Seeing the broadcaster Desmond Carrington taking extracts on tape from the sound track of films to link with narrative to produce radio versions of movies, Briscoe was suddenly aware that tape was an object of considerable potential. You could cut it up with scissors and join the pieces together. Suddenly sound on tape was for me an entirely different thing with limitless possibilities.’⁶⁹

‘BBC Sound recording is excellent, although the BBC is slow to convert from discs to magnetic tape.’⁷⁰ As late as 1951 disc recording was used exclusively; in 1954 the BBC still only ‘hoped’ to transfer 60% of its sound recording to tape; and not until 1955 did it report that tape had ‘to a large extent replaced the use of discs’⁷¹ the Germans on the other hand had

⁶⁹ Paulu 1956:140

⁷⁰ *ibid*

⁷¹ *ibid*

pioneered magnetic tape recording during the Second World War and as was to prove the case in the USA the change to the new medium was all but complete by 1949.⁷²

Donald McWhinnie, a BBC engineer, was keen to develop electronic music in the BBC, and indeed was responsible for much of the campaigning for the cause. In 1956 he visited the Club d'Essai studio in Paris and saw the need to set up such a facility in London. He also observed rifts in the setup of the studio, particularly between Schaeffer and Henry, who had by then been working together for a number of years. Nonetheless in recognition of their achievements he proposed that the BBC committee for radiophonics should listen to some French tapes in order to understand the stimulus behind the music and in order to prepare a list of requirements for the proposed studio. McWhinnie considered the basic essentials to be:

‘a room containing two or three tape reproduction machines, turntables for slow speed of 78s, a tape-recorder, facilities for echo, filters, etc. and a small studio with two or three microphone points, an old piano, various percussive instruments and space for two or three actors’⁷³.

Also in 1956 the BBC commissioned Samuel Beckett's first radio play *All That Fall*, and Briscoe was invited to create the accompanying sound effects. He, like Oram and McWhinnie, had developed an interest in musique concrète and, in response to Beckett's specific request that these effects should embody artificial transformations of natural sounds, Briscoe produced a highly developed soundscape based on these techniques of tape editing and manipulation, using farm animal sounds as the primary source material.

The BBC eventually considered the view of those interested in the possibilities of electric sound and saw fit to create the Electrophonic Effects Committee to examine the possibilities of this art and whether a studio was feasible. In a memo dated 16th November 1956 R.V.A. George states that a committee should be set up to ‘keep pace with the developments elsewhere in the field of electronic music’⁷⁴. The first meeting was on 14th December 1956 but this may not have been to discuss the ideals that Oram, McWhinnie, Briscoe and Cleverdon held dear. The BBC Archive contains little information on early electronic music in the BBC; the first mention is a memo from ‘Organiser, Studio Ops’ to ‘HCP Ops’ dated 8th November 1956 regarding Financial Implications. It states that:

⁷² Paulu 1956:140

⁷³ Briscoe & Curtis-Bramwell 1983:27-28

⁷⁴ George 1956:Letter

‘If manufactured sounds can be used in place of incidental music then there is a considerable saving in the musicians’ and copyright fees that are payable when incidental music is especially composed and used in programming’⁷⁵.

The above is a fairly bold statement anticipating a time when commercial equipment was indeed seen by some as a very real threat to traditional performance. It is perhaps ironic to note that concerns are currently being raised about whether to extend the copyright period on electronic recordings which are themselves being seen as right for commercial exploitation out of copyright. On a similar money-saving note, in June 1957 Frank Wade, Head of Light Music Programmes (Sound), sought financial approval for the purchase of a Colour Tone Instrument, a type of electronic instrument which was capable of providing new musical sounds ‘electronically generated for combination into established musical patterns’⁷⁶. Wade stated that ‘savings in programme costs will result through adding colour and dynamic to small groups of conventional musical instruments’⁷⁷.

Of particular interest is a document that accompanied this recommendation (November 1956) which provides not only the historical context and rationale for a suitable facility at the BBC but also a detailed specification for both its physical design and also the equipment that would be required. It is signed by four contributing authors; Daphne Oram, André Almuro, Douglas Cleverdon, and Tom Eckersley. Almuro, the one external contributor, was a producer from RTF in Paris who had become involved in the preparation of this brief following an earlier visit by Daphne Oram to Schaeffer’s studio. The influence of the latter can clearly be detected in the proposed list of equipment, notably the recording facilities which extended to no less than six tape recorders, four of which were to be of a special design with extended and variable speed ranges and some additional functions such as variable intensity erase heads and facilities for playing tape loops. However the specification also included both audio frequency generators and filters, underpinned by the statement ‘no method of making or developing timbres should be unexamined as they are the raw material of radiophonic music’⁷⁸. Oram’s growing interest in the development of optical means of sound synthesis is also reflected in the additional specification that ‘a sum must be allocated

⁷⁵ Garrard 1956:Letter

⁷⁶ Wade 1957:Letter

⁷⁷ *ibid*

⁷⁸ Garrard 1956:Letter

for research into tone generation and methods of reproducing a set-up or printed wave form onto glass or the periphery of a wheel'⁷⁹.

All That Fall was transmitted on 13th January 1957, and like *Under Milkwood* was favourably received. Its timing could not have been more appropriate as the Electro-Phonic Effects Committee had just been set up. Indeed it was to act as a catalyst for a major surge of interest in the possibilities of what was to become known as radiophonic sound. It was an exciting time for those involved in the Electro-Phonic Effects Committee, except for Oram who felt that the BBC were shunning music in favour of drama. Some sense of her reaction to this can be gained from the following comment in her 1991 interview concerning developments at the start of 1957:

‘Alas the drama department got interested that something was happening and they also now heard a little about Pierre Schaeffer in Paris playing discs the wrong way around and things like that.’⁸⁰

In a sign perhaps of the intention to embrace all the radio arts, in March 1957 the name of the committee was changed to The Radiophonic Effects Committee.

Minutes of the Radiophonic Effects Committee from 4th April 1957 state that an estimate is being prepared and a choice of accommodation was The Langham. They also state that the facility would need lots of staff as initial attempts to create Radiophonic Effects had fatigued staff, and they would therefore have to be changed frequently. It is interesting to note that the BBC felt that radiophonic music was draining on the brain!

During 1957 (‘More than twelve months before April 1958’⁸¹) there were quiet but fervent activities taking place to investigate the possibilities of *musique concrète*. According to Briscoe and Curtis-Bramwell’s 1983 book, the interested parties comprised producers: John Gibson, Douglas Cleverdon, Donald McWhinnie and Michael Bakewell; writer/producer Fredrick Bradnum; a playwright Giles Cooper; and studio managers, Daphne Oram, Desmond Briscoe and Norman Bain.⁸²

⁷⁹ Garrard 1956:Letter

⁸⁰ Oram 1991:1

⁸¹ Briscoe & Curtis-Bramwell 1983:13

⁸² Briscoe & Curtis-Bramwell 1983:13

Keen to further this interest within the BBC, Cleverdon of the Features Department arranged concerts of musique concrète for invited audiences, mainly comprised of senior staff. In a letter dated 2nd May 1957 he outlines his plan:

‘It is hoped to arrange, from time to time, BBC playbacks of experimental recordings in the fields of electronic music, music concrète, and other forms which may generally be described as radiophonic music. These playbacks are designed for composers, poets, writers, music critics, technicians, producers, and any others who may be professionally interested.’⁸³

The first of these performances took place in the Council Chamber of Broadcasting House a week later on 9th May 1957. The programme consisted of Jim Fasset’s *Symphony of the Birds*; pieces by Stockhausen, Eimert, Berio and Maderna; as well as Maurice Jarre’s *Ruisselle*. Cleverdon concludes his letter with a plea to invite all who may be interested to the event. It is clear that he wanted as many interested parties there as possible, perhaps in order to sway the BBC into creating a studio. It is worth noting that all of the pieces in the programme are from countries other than the UK, reflecting the lack of such creative activity in the UK.

In June 1957, during the BBC Features Department Conference, two talks were given on recent developments in radiophonic music, the first by Pierre Henry on ‘Concrete Music’ [sic] and the second by Arthur Jacobs on ‘Electronic Music’. Given Henry’s standing as a composer not least in the context of his work at the Paris studio, this was a major milestone, especially in terms of underpinning the desire to strengthen the case for pursuing musical imperatives in their own right. The report, by an unknown author, states that the overriding consideration was the viability of musique concrète as ‘an ingredient in sound radio programmes, particularly in association with speakers’⁸⁴. It also shows that the situation in Paris was far from ideal and that Pierre Henry ‘is no longer on good terms with Schaeffer’⁸⁵ and ‘there appear to be internecine feuds and jealousies, which cause difficulties’⁸⁶.

Despite this, much interest was shown in Henry’s musical examples of his own work, a discussion took place between Studio Managers and Features Producers and the report states that ‘there can be no doubt that concrete music [sic] has considerable possibilities as an

⁸³ Cleverdon 1957:Letter

⁸⁴ Unknown 1957a:Letter

⁸⁵ ibid

⁸⁶ ibid

ingredient in sound radio programmes, particularly in association with speakers or singers'⁸⁷. The report also states that one of Henry's pieces *Concerto des Ambiguités* 'is well worth consideration for Third [Programme]'⁸⁸, showing that the author of the report was a likely supporter of radiophonic music.

Following the conference there was a recital of Henry's music in the Council Chamber at Broadcasting House, arranged by Cleverdon. Present was an invited audience of around forty composers, writers and technicians. In conclusion the reporter states that 'we might explore the possibility of commissioning Pierre Henry to provide concrete music [sic] for a text by an English writer'⁸⁹, which shows some hope. But the writer is quick to retain British control and states 'If the work could be carried out at the Club d'Essai with a BBC Producer and a BBC Technician in attendance, this would provide invaluable experience for our own developments in radiophonic music'⁹⁰.

An altogether different impression was gleaned of German elektronische Musik. 'All these composers take their music very seriously and are not interested in applying it to radio or ballet or film'⁹¹. And the authors held the belief that 'it may be that electronic music does not lend itself to dramatic effects as powerfully as does concrete music [sic]'⁹² but also that 'there is plenty of room for experimentation here in England'⁹³.

A temporary studio for radiophonics

Oram, Briscoe, Bain and McWhinnie continued their experiments and in 1957 they used laboratory test oscillators, a Motosacoche tape recorder and home-made filters to compose the music for a television play *Amphitryon 38*. As no studio existed they would wait until late at night and collect up all of the equipment required from studios, working between midnight and 4am. Oram states: 'I could not, of course, use the very special equipment I needed... so, I evolved techniques, akin to Cologne and Paris, which could be achieved with the normal broadcasting equipment I had available'⁹⁴. These compositional activities normally took place in Piccadilly Two, a studio favoured by the radiophonic experimenters as it had its own recording room.

⁸⁷ Unknown 1957a:1

⁸⁸ *ibid*

⁸⁹ *ibid*

⁹⁰ *ibid*

⁹¹ *ibid*

⁹² *ibid*

⁹³ *ibid*

⁹⁴ Hutton 2003:50

Amphitryon 38 received favourable reviews and Briscoe and Oram were soon inundated with requests to produce electronic music for radio plays. One of the earliest was Fredrick Bradnum's *Private Dreams and Public Nightmares*, subtitled *A Radiophonic Poem*, which aired on The Third Programme on 7th October 1957. This was the first play with explicit instructions for a 'sound montage' within the script. Here the influence of musique concrète is once again very evident, and there can be no doubt that Oram made a material contribution to its realisation. The script for this work should be noted. The poem itself was written down the right hand side of the page and the sound effects on the left hand side in line with the specific stanza they were to be synchronised with. This technique is commonplace in theatre and may well be taken from the 'prompt copy' method of ensuring accurate synchronisation of text and effects. Bradnum likens his work to Wagnerian opera. 'The text of a radiophonic poem can, I think, be compared only to certain opera libretti – Wagner's for instance'⁹⁵. This twelve minute piece had a daunting task for it 'was destined to bring 'radiophonic' to the public attention for the first time'⁹⁶. Nothing was left to chance for the broadcast and the sound engineers were instructed thus: 'don't attempt to alter anything that sounds strange – it's deliberately meant to sound that way'⁹⁷. As this was such an unusual broadcast McWhinnie organised a press listening session before the first broadcast. He explained what was being attempted using the following speech:

'This programme is an experiment – an exploration. It's been put together with enormous enthusiasm and equipment designed for other purposes. It's not a masterpiece, not even a minor one, and it's not a stunt. We think it is worth broadcasting as a perfectly serious first attempt to find out whether we can convey a new kind of emotional and intellectual experience by what we call radiophonic effects.

By radiophonic effects we mean something very near to what the French have labelled musique concrète - concrete music. Not music at all really. It doesn't necessarily come out of musical instruments and it can't be written down. It's simply sound, or patterns of sound, which are manufactured by technical processes. The basis of it is an unlimited supply of magnetic tape, recording machine, razor blade and

⁹⁵ BBC Press Service 1957:1

⁹⁶ Briscoe & Curtis-Bramwell 1983:20

⁹⁷ Briscoe & Curtis-Bramwell 1983:22

something to stick the bits together with, and a group of technicians who think nothing is too much trouble, providing it works.

You take a sound, any sound and record it and then change its nature by a multiplicity of operations. You add it to itself over and over again. You adjust filters, echoes, acoustic qualities. You combine segments of magnetic tape. By these means and many others you can create sounds which no one has ever heard before. Sounds which have an indefinable and unique quality of their own. You can compose a vast and subtle symphony from the noise of a pin dropping. In fact, one of the most vibrant and elemental sounding noises in tonight's programme started life as an extremely tinny cow bell.

It's a sort of modern magic. Many of you may be familiar with it – they've been exploiting it on the continent for years – but strangely enough we've held aloof, partly through distrust – is it simply a new toy? – Partly through complacency, ignorance too. But we're saying at last that we think there's something in it, but we aren't calling it *musique concrète* – in fact, we've decided not to use the word music at all.

Some musicians believe that it can become an art form complete in itself. Others are sceptical. That's not our immediate concern. We're interested in its application to radio writing, dramatic or poetic – adding a new dimension – a form which is essentially radio.

Properly used, radiophonic effects have no near relationship with any existing sound. They're free of irrelevant associations. They have an emotional life of their own and could be a new and invaluable strand in the texture of radio and theatre and cinema and television.

Fredrick Bradnum has given us a text specifically designed to exploit some of these new sounds and dependent on them for full effect. The sub-title is *A Radiophonic Poem*. We believe that such an art form may exist, quite distinct from the poem on the page or the poem read aloud. A poetic experience which only exists in terms of a sound complex. And the programme isn't a model – it simply tries to indicate the sort of possibilities that are within reach and I'm not suggesting that your ears should now

be bombarded by programmes of this kind. There are any number of ways of using these new techniques. They've already been applied in a modest way in thrillers and science fiction plays. Indeed, the broad effects are the easiest to achieve – horror, hysterical comedy. It's much more difficult to manage tenderness, lyrical beauty, sweetness and light – perhaps because of the inhuman element in the actual process of manufacture. But I do believe that many writers will find an imaginative stimulus in this demonstration of a new mode of expression, a new adjunct to the spoken word and, as we learn more and improve our equipment, the possibilities will increase.

One thought does occur to me from time to time – not entirely frivolously – would it not be more illuminating to play the whole thing backwards?'⁹⁸

Before Private Dreams and Public Nightmares, was aired on 7th October 1957 the continuity announcer read an adapted version of the above speech to try to explain the work 'in order that the public should not be alarmed'⁹⁹. Jo Hutton refers to McWhinnie's announcement as 'an excuse and warning'¹⁰⁰ and the adapted version gives the impression that the announcer is trying to justify the existence of the programme. He states:

'What is radiophonic sound? It is new sound – suggestive of emotion, sensation, mood, rather than the literal moaning of a wind or the opening of a door. Created by technical means from basic sounds which may vary from the rustle of paper to a note from an electronic oscillator, radiophonic sound provides the writer and producer with an entirely new field in which to convey his intentions with the utmost subtlety of expression. Its functions are quite different from those of what is usually termed *musique concrète*, and although some of the techniques are similar radiophonic sound is not an art in itself'¹⁰¹.

Another blow to the champions of electronic music, before the programme had even aired it was given negative press. The last line of this quotation sums up the BBC's attitude to electronic music: it is not an art in itself. How wrong they were. Notwithstanding the fact that

⁹⁸ Briscoe & Curtis-Bramwell 1983:22

⁹⁹ Briscoe & Curtis-Bramwell 1983:20

¹⁰⁰ Hutton 2003:50

¹⁰¹ BBC Press Service 1958

many composers believed it to be an art; despite the fact that studios existed on the continent that viewed the medium as such, and that it did achieve that status in the UK in later years.

Even in the BBC press release there were excuses. McWhinnie is quoted saying ‘I hope you won’t dismiss this work. Nothing has come out of your loudspeaker before quite like this serious first attempt to find out whether we can convey a new kind of emotional and intellectual experience by means of what we call radiophonic effects.’¹⁰²

In *The Daily Telegraph*, on Monday 7th October 1957 the following article appeared entitled *Horror on the Third*:

‘The Third Programme presents tonight what it chooses to call a radiophonic poem. *Private Dreams and Public Nightmares*. Listening to a recording last week I found it strange and discomforting. It is the beginning of a new technique in sound, using electronics to produce and distort noise. In this programme, which has a tendency to be horrific, a bucket, a matchbox and a cowbell were among articles used to provide atmosphere for the poem. Donald McWhinne, the producer, claims that the technique can produce a “symphony” out of a single basic sound, a pin drop. The BBC is spending £2000 on equipment and setting up a team to exploit the possibilities of the idea for imaginative writers.’¹⁰³

Although *Private Dreams and Public Nightmares* received mixed reactions from the press it did assist the cause. Public interest in radiophonic sound grew. Hutton stated in 2003 that the critic for *The Times* stated: ‘Though he didn’t think highly of the programme, he did applaud the fact that it gave English listeners the opportunity of hearing the actual sounds of musique concrète rather than just the argument against them’¹⁰⁴.

The BBC’s attitude towards radiophonic sounds was to be a major factor in Oram’s decision to leave the BBC before the Radiophonic Workshop was even a year old. ‘We’ve decided not to use the word music at all’ must have been a dead blow to so many of those championing the cause, no less than Oram, who was further unimpressed with the decision to make the first broadcast of radiophonic music a ‘nightmare’ piece. *Private Dreams and Public*

¹⁰² BBC Press Service 1957

¹⁰³ Unknown 1957b:1

¹⁰⁴ Hutton 2003:50

Nightmares was set in a mental hospital and Oram felt it set the tone for radiophonics to follow. To quote again from the 1991 interview:

‘Unfortunately... [they] chose a nightmare poem... if only they’d chosen something beautiful instead of a nightmare thing. I thought it very sad because it rather set the tone of radiophonics for ever more, that it was ‘out of space’ and nightmareish’... we could have started [the Workshop] in this country as being something beautiful and we could have tried to achieve beautiful sounds but alas we were pushed into this and it was this drama department.’¹⁰⁵

Also broadcast in 1957 was Giles Cooper’s *The Disagreeable Oyster* which ‘showed that radiophonic experimenters could also be funny – something that was to surprise those critics who associated radiophonic sound exclusively with nightmares, horror and madness.’¹⁰⁶

As stated by Fredrick Bradnum: ‘The group of people who made the programme were the real people whom we can thank for keeping the whole interest going. They were dedicated to finding out just what could technically be done. When it came to setting up the workshop they had a hell of a battle down the line.’¹⁰⁷

Directorship of the BBC Radiophonic Workshop

Both Daphne Oram and Desmond Briscoe have been credited as the first Director of the Radiophonic Workshop. As will shortly become clear it is difficult to ascertain with absolute certainty which accreditation is correct. The following extract from a letter written by Daphne Oram to her parents on 5th October 1957, just two days before the first broadcast of *Private Dreams and Public Nightmares*, has a particular significance in this context. Having first discussed the publicity that had been generated by this work she finishes her letter as follows:

‘The rest of the week I have spent working out the design of our special radiophonic studio which is going to be at Maida Vale. So far I have been given a terrific free-hand to say what equipment I need, and where it is to be put. It’s rather fun having to decide whether I shall have four recording machines and three microphones, six

¹⁰⁵ Oram 1991:1

¹⁰⁶ Briscoe & Curtis-Bramwell 1983:19

¹⁰⁷ Briscoe & Curtis-Bramwell 1983:24

filters, eight amplifiers and an artificial echo machine or whether I must reduce these numbers in order to have a disc recording machine and four gramophones. Everyone seems to take it for granted that I should be running the workshop.’¹⁰⁸

The closing sentence usefully contextualises this difficult issue. It is clear from the earlier references to Briscoe’s obituaries that the establishment view for the most part accords him with this honour. The evidence, however, suggests very much the contrary, and this is most certainly Daphne Oram’s view. The dust jacket to her book *An Individual Note on Music, Sound, and Electronics*, published in 1971, states that she helped design the Radiophonic Workshop and then directed it. There are also many documents in the archives which also lay claim to this view, for example programme notes and biographical notes associated with her work which date back to the 1960s. It does seem from further evidence that has recently come to light through conversations with Oram’s Radiophonic Workshop colleagues (Delia Derbyshire, Maddalena Fagandini and Glynnis Jones), that Daphne Oram was indeed the first Director of the Radiophonic Workshop. However, her name is not included in Asa Briggs’ *The History of Broadcasting in the UK*. She is also not included (nor is any other female) in Nick Brown’s article on *The History of the Radiophonic Workshop* (1979). Intriguingly she was only included in *The International Who’s Who in Music* until the 12th edition (1991) and is thereafter omitted.

Daphne Oram is certainly in no doubt both about her own status in this regard, and also that of Briscoe. The following extract from her 1991 interview is especially informative in this regard. In describing the final stages of assembling the Workshop in March 1958 she observes:

‘There was a lot of preparation before you could do anything... and I got this fellow Desmond Briscoe to come in and give a hand... he came to the Workshop in October ’58 when I was sent... to the World Exhibition at Brussels... So this man Desmond Briscoe was seconded to the Workshop to organise it whilst I was absent in Brussels, and that was his first, I think, official position there.’¹⁰⁹

Oram noted in 1983:

¹⁰⁸ Oram 1957:Letter

¹⁰⁹ Oram 1991:1

‘In March 1958 I disbanded the radiophonic unit and moved to Maida Vale to take charge of the workshop. The other permanent member of staff was Mr Richard Bird, recording engineer. My policy there was to arrange that the Studio Manager, who was to work on the final studio production, came along to the workshop for a few days to see and assist the creating of the specialised sound so that, subsequently, it would be sympathetically handled for transmission. Hence many Drama Studio Managers, including Mr Briscoe, were employed at the workshop for short periods at a time. This is why Mr Briscoe’s memory covers such separated patches only - he was there as holiday relief (July 1958) but he was not posted permanently to the Workshop until some four years later’¹¹⁰

When Oram left in January 1959 Desmond Briscoe took over responsibility for running the Radiophonic Workshop, he was officially credited as director from March 1960, a position that he was to hold until his retirement in 1983. Richard (‘Dickie’) Bird was the first Workshop engineer.

The following passage, by Peter Manning, sums up the situation:

‘Developments were few and far between in Great Britain during the 1950s and early 1960s. The establishment of a Radiophonic Workshop by the British Broadcasting BBC (BBC) in London in 1958 could have provided a major focal point for British Electronic Music. The unenlightened artistic policy of the Music Department at the BBC, however, was to direct otherwise, for the studio was required to serve the day to day needs of the radio and television drama groups, leaving little time for serious composition. The principle composing members of the studio staff, Daphne Oram, Desmond Briscoe, and Delia Derbyshire, thus experienced a working environment quite different from that enjoyed by their continental counterparts. With the notable exception of Roberto Gerhard, few other composers were granted access to the facilities. Artistic advance was thus left largely in the hands of a few spirited pioneers such as Tristram Cary, struggling with little or no financial help to establish private studios of their own.’¹¹¹

The opening of the Radiophonic Workshop

¹¹⁰ Oram 1983:Letter

¹¹¹ Manning 2004:73

2. The Evolution of the Studio

The BBC Radiophonic Workshop opened on 1st April 1958, but was in chaos for the first few weeks as staff worked out how equipment worked and what could be done with it. As it was cobbled together from different sources, much of it was designed for different uses and there was a huge variation in ages of the equipment and its electronic compatibility, so not all of it fitted together easily. Connections had to be altered and circuitry ‘tweaked’. The workshop began in Maida Vale in a studio called ‘Room 13’. Most of the equipment was sourced from that redundant in other departments and supplemented with a budget of just £200.

Much of this equipment was in poor condition and was overhauled and repaired by workshop technicians. The mixer in particular, previously located in the BBC recording suite in the Royal Albert Hall, required specialist attention. It was an old outside-broadcast valve mixer that had been accidentally dropped from the commentary box on to the floor below on removal. As a result it had to be almost completely rebuilt, but eventually it was sufficiently in working order to be of use to the Workshop.

The following statement appeared in a Press Release dated 22nd May 1958:

‘The BBC has set up a Radiophonic Workshop at Maida Vale in London, the first installation of its kind in this country to deal exclusively with the production of radiophonic effects. Thus the BBC is now equipped to provide an aid to productions which neither music nor conventional sound effects can give.’¹¹²

The following appeared in *The Times* on 24th May 1958:

‘A “workshop” for producing synthetic sounds, partly by electronic oscillators and partly by trickery with conventional sounds recorded on tape, has been set up by the BBC at Maida Vale studios. It is being used to provide an imaginative background to drama productions which cannot be obtained from ordinary music or from the stock-in-trade of sound effects.’¹¹³

The apparatus for the production of radiophonic sound is listed alongside the Press Release. It consists of the following, tape recorders; filters; oscillators; an artificial reverberator; echo

¹¹² BBC Press Service 1958:1

¹¹³ Unknown 1958a:1

devices and the control panel and jackfield. The control panel and jackfield 'enables any piece of apparatus to be cross-connected or combined with the mixer-control panel'¹¹⁴.

Composition at the Radiophonic Workshop

Interest and support for the Radiophonic Workshop came primarily from the Drama and Features Departments, with some support from Light Music. The remit of the workshop was to produce sound effects and soundscapes for radio and television plays. They had no obligations from the Classical Music department. Cleverdon recalled:

'I don't think the music department at the BBC were particularly interested; they were concerned with transmitting music rather than initiating it, except to commission the occasionally symphony. Most of the earlier experimentation came from Features Department and Drama under McWhinnie.'¹¹⁵

As Brian Hodgson stated, the workshop 'was much more part of the 50s theatre revolution than the music revolution'¹¹⁶ and this is where the term workshop came from, it was a theatre term. He goes on to say that if it had been formed a decade later it would have probably been called a 'laboratory'¹¹⁷.

In October 1958 a group of BBC delegates, including Oram and E.W.S. Porter, visited the Journées Internationales de Musique Expérimentales in Brussels. The experiences of Oram and Porter could not be more different. While Oram was delighted with the experience which undoubtedly influenced the subsequent establishment of her own studio, Porter reported back 'a lack of mutual understanding, bad organisation, tape machines constantly breaking down, and compositions which were much too loud and noisy'¹¹⁸.

The Classical Music Department was singularly unenthusiastic about electronic music, a view that was to harden and be sustained for many years. Good evidence of this can be found in the BBC archives. A memo from the Assistant Head of Central Programme Operations (Studio) to the Radiophonic Effects Committee dated 13th August 1959, for example, notes:

¹¹⁴ Roberts 1958:1

¹¹⁵ Briscoe & Curtis-Bramwell 1983:28-29

¹¹⁶ Reynolds 2008:1

¹¹⁷ *ibid*

¹¹⁸ Briscoe & Curtis-Bramwell 1983:34

‘An approach has been made to the BBC to extend the scope of the Radiophonic Workshop to enable it to be used for the composition of electronic music on the continental pattern. Such a suggestion obviously raises many problems.’¹¹⁹

Any possible doubts as to the strength of opposition from the Music Department are addressed by another memo from E.W.S Porter, the Assistant Head of Central Programming Operations, sent to William Glock, Controller of Music on 8th October 1960, which unequivocally states that ‘until now the policy has been that the BBC should not enter into the field of electronic music’¹²⁰. He went on to say that ‘if this movement gathers momentum, the BBC will be forced eventually to participate, employing composers. . . A competent studio manager will have to do the job with the composer replacing a producer. . . I left Brussels fully convinced that the way the BBC develops and uses radiophonics is the right way. Vive Le Workshop!’¹²¹

The implications of this attitude to electronic music were to affect not only Oram’s personal ambitions as a composer but also both the practical design and working culture of the Workshop itself. There are material differences between the requirements of drama and music in this context and even in circumstances where strong support is provided from both quarters these provide the basis for material tensions and disagreements.

‘Because the support for its foundation had come from drama producers, and the music department was not involved, there was no requirement to produce concert works.’¹²²

Such a conflict of interests indeed arose in the context of the Cologne studio, although in this case it was the composers that won the day. A classic example of the difficulties thus faced by Oram comes to light in her recollection of a subsequent discussion with McWhinnie in October 1957 concerning the construction of a special tape recorder which would allow a number of tape loops to be played simultaneously, driven by a common capstan. She notes:

‘This man McWhinnie... said “Oh no, all I want is a microphone and a few sound effect devices” and things like this and “this isn’t going to be music”. So unbeknown

¹¹⁹ Unknown 1959:Letter

¹²⁰ Briscoe & Curtis-Bramwell 1983:34

¹²¹ *ibid*

¹²² Davies 2003:1

to me I was being undermined all the time that it would be Drama and not Music, and here I was still thinking it was going to be music.'¹²³

As Assistant Head of Sound Drama Donald McWhinnie was in a position of seniority, placing Daphne Oram, as a Studio Manager, at a disadvantage when seeking to win the argument. Her ongoing disagreements with him were also materially to contribute to her decision to resign. Handwritten notes prepared for *The First Twenty-Five Years of the BBC Radiophonic Workshop*, found in the Daphne Oram Collection, list the following as a primary reason: 'didn't think Donald McWhinnie had any respect for music or knowledge of it'¹²⁴.

The constraints that were imposed on the use of these facilities for creative as opposed to purely production work involved not only an embargo on their use by composers external to the BBC, other than in some very special circumstances usually associated with a BBC commission, but also material constraints on the Radiophonic Workshop staff themselves in terms of their use of the resources for any purpose other than that specifically dictated by the BBC. Correspondence dating to July 1958 highlights the strength of debates that were to emerge in this context. Discussions were taking place over whether composers should be allowed to work in the Radiophonic Workshop. Such questions were raised as:

'What work would we do for them?'; 'How is it to be organised?'; 'what equipment / accommodation do we need?'¹²⁵

Following this meeting several composers were invited to the Radiophonic Workshop. Roberto Gerhard, Matyas Seiber and Humphrey Searle each completed a weekend's work in March 1959, while John Beckett dropped out at the last minute and Daniel Jones failed to reply to the invitation. During his weekend in the Radiophonic Workshop Gerhard began work on music for two BBC broadcasts and had ideas of a longer, concert piece involving live performance and tape, of which he said:

'The very nature of the new medium is bound to lead to new structural ideas which may well have considerable repercussions on the ways of using and organising sound in the traditional media.'¹²⁶

¹²³ Oram *Handwritten notes*

¹²⁴ Oram 1983:1

¹²⁵ Unknown 1958b:Letter

In 1961 Gerhard undertook a BBC commission *Collages* for orchestra and tape; he made the initial recordings at his home and then completed the piece in the Radiophonic Workshop. It was performed at a public concert in the Royal Festival Hall and was generally well received.

Gerhard is often referred to as the only ‘real’ composer to work at the Radiophonic Workshop. However, there appear to be discrepancies regarding this statement, as it is clear that two other people worked there in 1959. Perhaps they did not achieve anything worth noting, or perhaps the BBC liked Gerhard’s work and offered him more time in the studio to create his work. Also he was by that time an senior and respected composer.

The birth of Oramics

Daphne Oram’s diaries identify 18th February 1957 as the first day on which she started work on her own in Broadcasting House, starting a punishing work schedule which began at 5.30pm, at the end of her daytime responsibilities, and regularly continued until about 4.00am, a work pattern that continued right through to October. In addition, much of the equipment she required had to be borrowed from other studios at the start of each session and then returned at the end.

Oram pressed ahead with her own agenda to engage creatively with the medium, almost certainly without the approval of her employers. It was undoubtedly the case that she was still explicitly denied any official access to equipment for such purposes, this did not deter her. She worked in her own time, out of hours, tracking down suitable resources in unoccupied studios. The true extent of her unapproved activities at this time becomes clear in this extract:

‘[It was at this time] each studio listening room in Broadcasting House... got its first tape recorder, which were Ferrographs, very nice recorders and these were all brand new... so I rushed into Broadcasting House after midnight and collected these machines, as many as I could, into [studio] 6A, absolutely forbidden... I knew it was a drama studio [and] I knew how it all worked... I hadn’t done tape recording really. I knew it was going on. But it was done by recording engineers in recording rooms away from the studios and this was the first time there were tape recorders in the studio... so I got these all together and linked them up via the mixing desk... and I got some research departments test 78 records of oscillator sounds... so you could

¹²⁶ Gerhard 1956:16

really say I was doing electronic music at that stage because they were electronic oscillators.¹²⁷

This account is interesting for number of reasons. Firstly it confirms that Oram was actively exploring the creative possibilities of electronic audio equipment by this stage. Moreover it identifies the first time she was able to work with tape recorders, clearly a crucial milestone both in terms of her composing interests and also her accumulating knowledge and expertise in terms of the criteria for developing a custom-designed studio. As has already been noted, the BBC was very slow in making the transition from disc recorders to tape recorders, at least two to three years behind its counterparts in other countries, and these developments were not a day too soon from her point of view.

The reference to oscillators is also significant. A primary driver for her own compositional interests had been the manipulation of microphone recordings using multiple recording units, relating very much to the aesthetics associated with Pierre Schaeffer's *musique concrète*. At the same time she recognised the significance of synthetic means of sound generation, leading in time to her pursuit of the possibilities of 'drawn sound', resulting in the technique which formed the basis of her subsequent Oramics system.

It was an approach from Harold Clayton, a senior BBC television producer, which finally gave her the opportunity to realise a soundtrack, the first and sadly the last major work to be completed by her at the BBC. The project was a television production of the play *Amphitryon 38* by Jean Giraudoux which lasted seventy-five minutes, a major undertaking for her. What is especially interesting about this work was her use of electronic synthesis techniques using oscillators and filters, rather than acoustic sound sources, once again demonstrating her growing interest in synthetic sound production. Most references give the completion date as 1957. The work, however, was first transmitted in early March 1958, just before the official opening of the Radiophonic Workshop in April.

By 1958, the first year of the Radiophonic Workshop, Oram was already disheartened with the BBC. As noted earlier, she had been sent as an observer to the *Journées Internationales de Musique Expérimentale* at The Brussels World Fair in October 1958 where she heard recent

¹²⁷ Oram 1991:1

works from major studios. She observed working conditions very different to those at the BBC and these observations were indeed the root cause of Oram's decision to pursue a freelance career barely a year after the official opening of the Radiophonic Workshop. Whereas such a turn of events might seem quite extraordinary given all her efforts over many years to bring about such a development, they become markedly less so once attention is focused on her own aspirations and frustrations along the way. It is a matter of considerable regret that her role in bringing about the establishment of the Radiophonic Workshop has rarely been accorded the attention and recognition it deserves.

Oram resigned from the BBC on 31st January 1959, by which time she had managed to buy a property in Kent in which to create her studio. She took her pension and set up her own company, Essconic Ltd, so that she could take advantage of discount 'trade' prices when buying parts for her studio.

Oram gives her own reasons for leaving in a note found in the Daphne Oram Collection. She states that:

'I left 1959 'cos:

Had bought TF [Tower Folly] to be my studio

Had been encouraged by Prof. Anklow in 1955/56

Dislike of All That Fall – Death of A Maiden didn't think Donald McWhinnie had any respect for music or knowledge of it. Drama strongly interested.

Dr Alexander – to become the top British Expert on Eon(?)

Talks with Roberto Gerhard – Bernard Keefe's verbal punch up quarrel with Roberto – both decided to go it alone – music department Hugh Middlemiss not interested (Humphrey Searle, Pip Porter, Dr Alex)

Control by Committee – nothing done "check out equipment" (motosikosh, RAH mixer) my suggestions ignored. Committee no experience whatsoever in composition.

My tapes disappeared from the R. Workshop'¹²⁸

¹²⁸ Oram *Notes for 25 Years of the BBC Radiophonic Workshop book*.

Thus it was, finally, that her career moved onto pastures new, in an environment where she was finally in control of her destiny, single-mindedly pursuing her innovative ideas both in terms of musical creativity and also via her development of her unique system for sound synthesis, Oramics, the technical means by which to bring them to fruition.

Oram began working on her own electronic instrument, strongly influenced by her encounter with graphic representation of sound on the BBC sound engineering course in 1944.

‘Like Schaeffer and Stockhausen, she worked in broadcast studio operations for national radio and television. As a child she had always been interested in creating inventions for making sound and, according to her father from as young as seven, planned to build a machine that could produce any sound she desired.’¹²⁹

This machine was later realised in the form of her Oramics machine, built for that purpose. She observed representation of sound in an oscilloscope and wondered ‘if it might be possible to reverse the process and draw waveforms that could be converted into sound’¹³⁰.

She completed her first major composition in 1959, *Four Aspects* for two-track magnetic tape which was performed at The Queen Elizabeth Hall.¹³¹ Her output was mainly commercial but covered a wider range than the Radiophonic Workshop. She wrote for theatre, radio, television, industrial and public information films and sonic environments as well as major concert works and films. Most significantly, given the closed door policy of the BBC, she invited several composers to work in her studio. Tape parts were created there by Thea Musgrave, Hugh Davies and Ivor Walsworth among others.

From 1959 Oram gave lectures at Morley College, University of London, and ran weekend courses at her own studio to supplement these as the college did not have its own studio. Morley College was the first higher education establishment to give classes in electronic music. Oram continued to run courses for students from Morley College and give lectures at Cambridge University and the Institute of Physics until 1964, when her Oramics project took centre stage. The image below shows Oram giving a class on tape loops.

¹²⁹ Hutton 2003:49

¹³⁰ Davies 2003:1

¹³¹ Hutton 2003:51



Fig. 1. Oram giving a class on tape loops at an unknown location¹³²

She experimented with drawn sound techniques all through her time at the BBC and in 1961 demonstrated them at lecture/concerts at the Edinburgh Festival and Mermaid Theatre, London. In 1962 Oram received a Gulbenkian Foundation grant for the development of the system which meant she could reduce the amount of time spent on commercial work. She began constructing the system in 1962 and, with the aid of a second grant, it was completed in 1965.

¹³² See the website: <http://whitefiles.org/rwg/large-32.html>.



Fig. 2. Daphne Oram with the Oramics system in 1971¹³³

The Oramics System

The Oramics system of composition was based on the principles of converting graphic information into sound. It had grounding in the drawn sound principles discussed in earlier chapters. The mechanism was a table-like structure involving ten strips of perforated 35mm film, mounted in parallel, travelling from right to left over photoelectric cells with a light source above.

As the film passed over the photoelectric cells the light intensity reaching them changed. This was translated into differing voltages which in turn controlled various studio devices. Patterns are drawn onto the film with ink or stuck on with tape, forming masks which limit the amount of light reaching the photoelectric cell. 10cm of tape was used per second of sound. The strips of film were divided into two banks of five, the topmost bank for discrete control and the bottom for continuously variable characteristics. The upper bank provided pitch

¹³³ Located in the Daphne Oram archive (ORAM.7.9.036)

control information and the lower bank the timbral information. Pitch was notated by a series of neumes (or marks) on a faint grid drawn on the upper three films. A range of seven octaves was possible. The remaining two upper strips operate internal and external devices. Drawings on the lower bank of five films controlled envelope, dynamics, vibrato, reverberation and timbre.

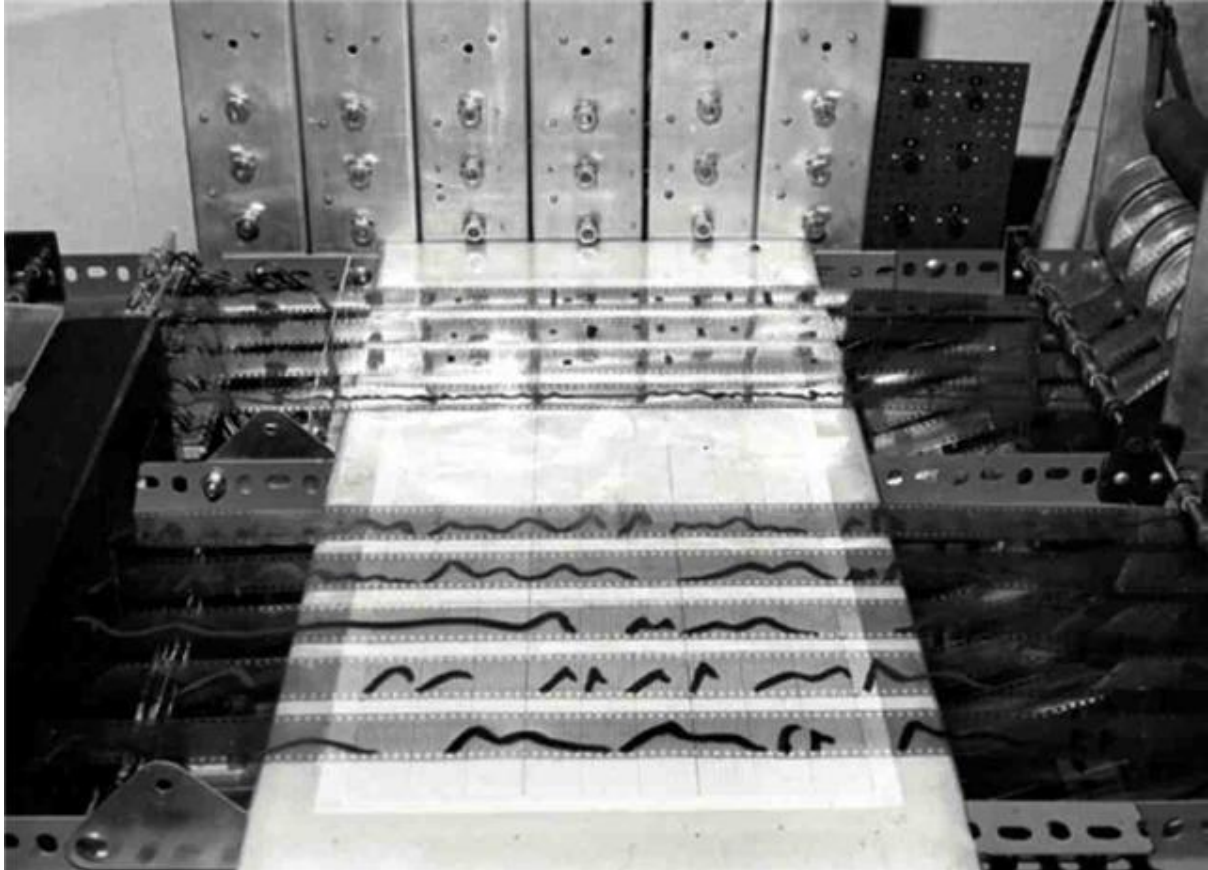


Fig. 3. The Oramics System¹³⁴

The Oramics system does not require any specialist knowledge to operate it, unlike many early synthesisers. It is unlikely however, that other composers were given the chance to work with Oramics as Oram was very secretive about the system, for ‘fear of being ripped off’¹³⁵. Oramics was used to produce mainly film scores, *Rockets in Ursa Major* (1962), *Hamlet* (1963), and *Purple Dust* (1964). Tapes discovered in her personal collection include advert jingles for Horlicks.

¹³⁴ Located in the Daphne Oram archive (ORAM.7.9.097)

¹³⁵ Davies 2003:1

Even though Oramics was only ever monophonic (as was the case with all synthesisers up to the mid-1970s), it is widely regarded to be the most sophisticated graphic and photoelectric music production system of its time.

In 1972 Oram published a book, *An Individual note of music, sound and electronics*, which detailed the Oramics system.

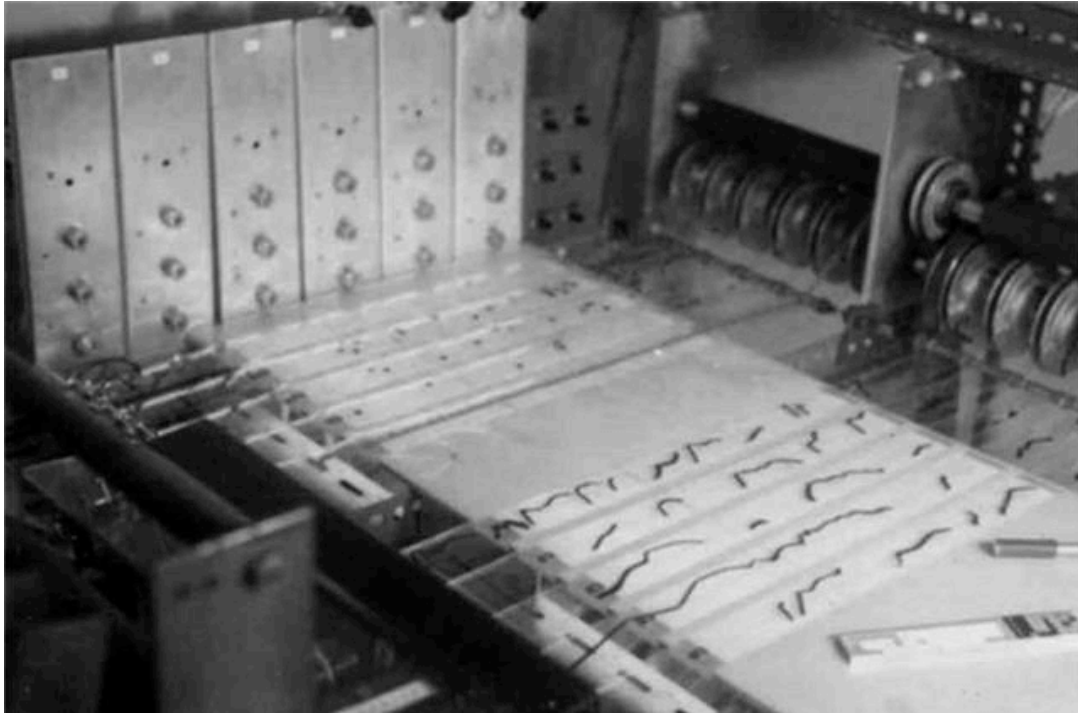


Fig. 4. Showing the Oramics machine from the side¹³⁶

The Radiophonic Workshop – into the 1960s

During the 1960s the Radiophonic Workshop and its output expanded significantly. In October 1960 the BBC Controller, William Glock, welcomed the plans for electronic music and appointed Bruno Maderna, from Milan, as adviser to the workshop. The appointment of Maderna, and his advice was to have a significant impact on the development of the Radiophonic Workshop. The two main outcomes were 1) the construction of an oscillator bank, and 2) the development of custom-designed ring modulators. The oscillator bank consisted of twelve oscillators manufactured by Jason (originally nine but a further three were soon added to provide a complete tempered scale of one octave). Although these became the main bank, additional oscillators, made by Advance (which had an extended

¹³⁶ Thanks to Peter Manning for this picture

range) were soon added and from then on the number of oscillators available became something of a movable feast.

Technological advances were taken heed of and new facilities were acquired. In the same way that the technology associated with Schaeffer's studio had influenced the founding of the Radiophonic Workshop in the previous decade, so it was Milan (arguably the most sophisticated European studio of the time) that was to shape the Radiophonic Workshop's further development in the 1960s. As Maida Vale was an active studio centre, the Radiophonic Workshop composers had access to a pipe organ and a Multicolour Tone Instrument, installed in Maida Vale 3 in November 1959 having been moved from the Royal Festival Hall. This gave more scope than the single room, which previously contained the whole of the Radiophonic Workshop.

Nearly fifty programmes were made in the first year of the workshop. By the end of the first year and following Oram's departure, sound tracks for television programmes were being undertaken. Initially it was feared that works for television would swamp the Workshop's resources but in actual fact television programmes probably helped the workshop to grow. Fredrick Bradnum stated that 'if they had been making sounds for radio only the whole thing may never have gone beyond a little backroom studio.'¹³⁷

In its second year the workshop struggled for life, as the earlier-mentioned management concerns over the perceived stress levels working with electronic materials started to impact in a highly counterproductive way. It was felt that staff should not work there for more than a few months so there was a constant process of reinventing the creative wheel. There was little time to pass on techniques and experiences so perhaps the studio did not progress as far as it could have done. One rather interesting reference to this can be found at the BBC Archive:

'Desmond Briscoe will not be working at the Radiophonic Workshop after the end of the month. He is to be rested to avoid battle fatigue'¹³⁸.

Briscoe states in relation to this that staff were 'changed frequently' due to a belief that there was a very real danger 'the lunatic fringe' might take over and the place develop an uncontrollable life of its own'¹³⁹. In addition to this engineers from television departments

¹³⁷ Briscoe & Curtis-Bramwell 1983:36

¹³⁸ Garrard 1959:Leter

¹³⁹ Briscoe & Curtis-Bramwell 1983:36 -37

were also placed on three month placements in the Radiophonic Workshop, further adding to the transitory nature of the studio membership.

In contrast, the staff in the studios in Paris, Cologne and Milan stayed the same for many years allowing individual techniques to build up and facilitate a sharing of ideas with visiting composers. These studios allowed composers to work there, whereas the BBC adopted a closed door policy. All work in the studio was strictly for BBC commitments. The BBC followed this policy almost to a fault, as when, by then ex-BBC employee, Daphne Oram was discovered to be using the workshop for her own purposes and very extreme action was taken. The Assistant Head of Central Programming Operations, E. W. S. Porter, stated in a memo on 20th March 1959 to D. H. Morgan, P. K. Young and Briscoe:

‘Daphne Oram is still using the Radiophonic Workshop now that she has left the BBC. This must stop immediately and the workshop is only to be used for BBC programme commitments.’¹⁴⁰

The severity of this response raises questions surrounding Oram’s departure from the BBC. There were internal tensions in the Radiophonic Workshop, notably the reluctance of the BBC to allow individuals to pursue their own creative objectives, which certainly influenced Oram’s decision to leave.

Despite this lack of continuity in April 1959 the go ahead was given for an improvement scheme with radio and television contributing to the costs on a 60:40 basis. Around this time, sound effects began to be created for *The Goon Show*, one of the best known production to come from the Radiophonic Workshop.

Another piece which sparked considerable interest was the 1960 re-writing of Eric Coates’ *Television March* which was done by Briscoe to mark the opening of Television Centre. This was a re-hash of a well known piece of introductory music and caused a great deal of controversy among the older generation who had a disdain for the new music. This is the same sort of reaction that electronic music experienced the world over, despite which there were several parties in the UK to whom the developments were welcome.

¹⁴⁰ Porter 1959:Letter

By 19th December 1961 the Radiophonic Workshop had expanded to include: two operational rooms, rooms 12 and 13, which could not be used separately; an office in room 6; room 15 which contained the effects workshop; room 16 which contained the reverberation plate and an accumulation of tapes still awaiting classification and cataloguing; and room 24 which was for stores and maintenance. Perhaps the most important development in 1961 was the installation of a custom built mixer. The output of the workshop continued to grow with these new facilities and a Radiophonic Workshop report from December 1961 states the following:

‘To date some one hundred and ten commitments have been taken in 1961 for sound and TV, the technical quality has improved due to some new equipment and handling time is also reduced as engineers know the workshop.’¹⁴¹

1962 saw the BBC making major investments in new tape recorders right across the board and the Workshop received six of these machines. These Philips tape recorders replaced the antique Motosacoche recorders and the engineers began to experiment with the possibilities offered by the new technology. Brian Hodgson and the team discovered that tape delay using up to three recorders was possible. Three tape recorders can be seen in normal use below.

¹⁴¹ Unknown 1961a:Letter



Fig . 5. Three Philips tape machines in the BBC Radiophonic Workshop¹⁴²

Approximately two years later they also acquired a Leavers-Rich machine with a variable speed capstan allowing the same tape manipulation techniques as were possible with Schaeffer's phonogènes.



Fig 6. John Baker working at the Leavers-Rich tape machine¹⁴³

¹⁴² See the website: <http://whiteflies.org/rwg/large-35.html>.

Also in 1962, the influential figure of Delia Derbyshire joined the Workshop who, the following year, was responsible for creating the best known piece of radiophonic music, the theme to *Doctor Who*.

Delia Derbyshire

Delia Derbyshire gained a degree in music and maths from Cambridge University and joined the BBC in 1960 as a trainee Studio Manager. Derbyshire wished, like many before her, to use the facilities at the Radiophonic Workshop to create electronic music. She stated in a 2000 interview with Jo Hutton that the only way into the Radiophonic Workshop was as a trainee Studio Manager, not long after her arrival she requested to spend her days off observing work in the Workshop. In 1962 she was transferred there. However, 'The BBC made it quite clear that they didn't employ composers and we weren't supposed to be doing music'¹⁴⁴.

Derbyshire defends herself by saying 'I was against doing anything that would put any musician out of work. I was more interested in doing complex sounds and complex probabilities'¹⁴⁵. Her skills in mathematics were documented in *The First Twenty-Five Years of the BBC Radiophonic Workshop*, 'The mathematics of sound came naturally to her and she could take a set of figures and build them into music in a way quite different from anyone else...She stayed on to contribute an enormous amount of very beautiful – almost unearthly – and quite remarkable music'¹⁴⁶. Some of this music is incredibly well known. Derbyshire's work on the theme tune to the hit TV series *Doctor Who* is discussed further later in this chapter.

The first work on *Doctor Who* was done in 1963, before this Derbyshire was Berio's assistant at the 1962 Dartington Summer School. In 1964 she collaborated with the poet Barry Bermange on *The Dreams* and *Amor Dei* for the Third Programme. In Hodgson's opinion this showed 'her true talent'¹⁴⁷ and 'at her elegant best'¹⁴⁸. In the mid 1960s she worked extensively with Peter Zinovieff and was part of the group that set up Unit Delta Plus in 1965, the original incarnation of EMS, discussed below. Derbyshire was particularly

¹⁴³ See the website: <http://whitefiles.org/rwg/large-103.html>.

¹⁴⁴ Hutton 2000:1

¹⁴⁵ Hutton 2000:1

¹⁴⁶ Briscoe & Curtis-Bramwell 1983:83

¹⁴⁷ Hodgson 2001:1

¹⁴⁸ *ibid*

interested in the computer and hoped it would allow her to pursue links between music and maths.

In 1967 she worked on Guy Woolfenden's electronic score for Sir Peter Hall's Royal Shakespeare Company production of *Macbeth*. Later, in collaboration with David Vorhaus and Brian Hodgson, she set up Kaleidophon, an independent studio in Camden Town. There she worked on the album *Electric Storm* which was released on Island Records in 1968. At Kaleidophon many works were created for the London theatre scene, including *Medea* and *Macbeth* for Greenwich Theatre and music for Tony Richardson's *Hamlet* at the Roundhouse. Also at the Roundhouse she took part in a concert of electronic music featuring works by Paul McCartney, whom she had first met at the Unit Delta Plus studio.

Derbyshire also visited the Oramics studio but was not interested in the visual side of composition. 'My attitude was that the ear is a better judge of what it hears than the eye can be in constructing sound'.¹⁴⁹

Derbyshire stayed at the Radiophonic Workshop until 1973 and continued her investigations 'on the side'¹⁵⁰ while doing official work. After leaving the BBC she worked privately for a short time and then gave up composition entirely until the late 1990s. By then she had become a cult figure with a younger generation which included bands such as Aphex Twin and Sonic Boom. She continued to compose until her death in 2001.

Doctor Who

In 1963, Desmond Briscoe received a telephone call from Producer Verity Lambert. 'There's a children's science fiction series that's going to run for six weeks. Can you do a signature tune?'¹⁵¹ This telephone call would do more for the public awareness of electronic music than was ever imaginable. The programme would be revived and new series produced several times and even now, nearly fifty years later, is as popular as ever both with the nation's youth and those who watched it in the early years. The title theme, with its blatantly electronic character, inherently appealed to children – perhaps they were intrigued by the fact that it was 'different' or by their parent's distaste for it. Whatever the case, *Doctor Who* was a hit.

¹⁴⁹ Hutton 2003:54

¹⁵⁰ Oram 1991:1

¹⁵¹ Briscoe & Curtis-Bramwell 1983:101

2. The Evolution of the Studio

Delia Derbyshire states that ‘Ron [Grainer] had worked the tune very carefully to fit in with the graphics which had been done by a technique which was very new and unusual for those days – camera feedback. He used delightful expressions for the sort of noises he wanted: ‘wind, bubbles and clouds.’¹⁵² Derbyshire and her engineer, Dick Mills, employed techniques from musique concrète, using tape recorders they edited and re-recorded the sounds until the splicing was seamless. They realised the score and as stated by Hodgson, she used ‘sine- and square-wave oscillators, tuning the results, filtering and treating, cutting so that the joins were seamless, combining the sound on individual tape recorders, re-recording the results, and repeating the process, over and over again’¹⁵³. The oscillators in the Radiophonic Workshop were known as ‘Jasons’ after the name of their manufacturer and were, in Derbyshire’s words, ‘swoopy’. These oscillators play a distinctive role in the *Doctor Who* theme. Derbyshire worked as accurately as possible to create the swoops. It should be noted that these swoops were created by hand and the quality achieved by Derbyshire is outstanding. The picture below shows the north end of Room 12 with the twelve Jason oscillators used to create the *Doctor Who* theme on top of the mixing desk.

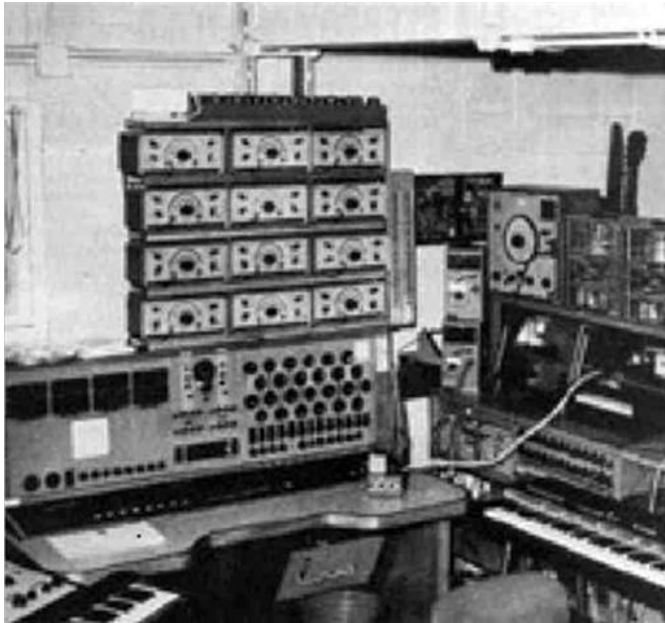


Fig 7. The north end of Room 12 showing the twelve Jason oscillators¹⁵⁴

¹⁵² Hodgson 2001:1

¹⁵³ *ibid*

¹⁵⁴ See the website: <http://whitefiles.org/rwg/large-59.html>.

2. The Evolution of the Studio

In a 2000 interview with Jo Hutton, Derbyshire stated ‘Ron Grainer brought me the score. He expected me to hire a band to play it but when he heard what I had done electronically, he’d never imagined it would be so good’¹⁵⁵.

The creation of this signature tune highlights two of the main bugbears of electronic music, who should be credited with the creation of a piece of electronic music and who was involved in the process but absent from the credits? Grainer, if you like, designed the piece and Derbyshire was responsible for realising it. In this case there is not just the composer and technician but a third person in the form of Derbyshire’s engineer. In fact Grainer offered Derbyshire half of the royalties but the BBC would not allow it. She got a free copy of the *Radio Times* but as she states in the same interview, ‘the boss wouldn’t let anyone have any sort of credit.’¹⁵⁶

It is quite clear today that if a different workshop composer had realised Grainer’s plan then it would have sounded very different. This raises the interesting question – who should take the credit for the creation of a piece of electronic music and how should this be expressed? Should it be the ‘composer’; ‘writer’; ‘designer’; or ‘realiser’? In this case, Grainer wrote the instructions and Derbyshire realised them, so who should be credited with the work?

‘Desmond Briscoe believes that any success of the Radiophonic Workshop has had may be directly attributed to the fact that no technician is ever allowed to come between the composer and his music’¹⁵⁷. ‘The Workshop is perhaps unique among electronic music studios in that the composing staff are their own operators, and indeed the operational techniques have always been regarded as part of the creative process.’¹⁵⁸

The *Doctor Who* theme meant instant public awareness for the Radiophonic Workshop. From the early 1960s onwards, intrigued pop musicians began to pay visits to the Radiophonic Workshop including Pink Floyd, Jimi Hendrix, The Rolling Stones and The Beatles. It is important to remember that in 1963 the Radiophonic Workshop was probably the only fully equipped studio in the UK where such compositional activities could take place until Peter Zinovieff’s EMS was established in Putney.

¹⁵⁵ Hutton 2000:1

¹⁵⁶ *ibid*

¹⁵⁷ Briscoe & Curtis-Bramwell 1983:42

¹⁵⁸ Briscoe & Curtis-Bramwell 1983:42-43

Synthesisers at the Radiophonic Workshop

Following the unexpected death of Dickie Bird, David Young succeeded him as engineer at the Workshop in 1962. Young was very much of the same school as Cary. An ex-RAF man, he would visit Portobello Road market, where there were many stalls selling redundant electronic equipment, every week and build all of the desired equipment that was unavailable elsewhere. He made devices such as the 'Crystal Palace' and 'Do Not Fiddle With', remote start units for tape recorders and a primitive synthesiser. This primitive synthesiser was known as a 'keying unit' and was created from the bank of twelve oscillators and a keyboard which gated the sound so that the oscillators could produce notes across an octave¹⁵⁹. 'A piano keyboard was adapted to make the necessary contacts to switch in the signals obtained from either a bank of signal generators or any other source of sound'¹⁶⁰. It should be noted that, at this point in time, all synthesiser control was entirely manual and this keying device predated the first synthesisers which offered a form of control for oscillator sounds.

The late 1960s were to see technical developments which were materially to affect studios world-wide, and the Radiophonic Workshop was no exception. The commercial synthesiser revolution initiated by Robert Moog and Donald Buchla was to inspire Peter Zinovieff to found his commercial company, EMS, and its association with the Radiophonic Workshop was to prove significant. In 1971 the Radiophonic Workshop presented a concert at the Royal Festival Hall where the EMS Delaware Synthesiser was first performed live.

The essentially traditional design of the Radiophonic Workshop, based on individual items of equipment very much in the tradition of the 1950s European studios, augmented by in-house custom designed enhancements prevailed until the late 1960s. It was clear by this point that the revolution in commercial synthesiser design pioneered by Robert Moog in the early 1960s was now a material consideration for the future. Although by this point a number of American manufacturers were producing an attractive range of products, notably Moog, Buchla and ARP, staff at the Radiophonic Workshop became aware of the activities of Peter Zinovieff in this context, and the possibility of a UK-based synthesiser industry. The resulting development of EMS is studied in the next chapter, but its significant impact on the Radiophonic Workshop needs to be acknowledged here.

¹⁵⁹ Briscoe & Curtis-Bramwell 1983:47

¹⁶⁰ Brooker 1965:27

In 1969 EMS began manufacture of its first self-contained voltage controlled synthesiser, the VCS-3, and the Radiophonic Workshop purchased one of the first production models. Zinovieff however, had ambitious ideas for a much larger synthesiser which could be afforded by larger institutions, and there was thus a compelling case for persuading the BBC to purchase one of the very first models. Thus it was that in 1972 the Radiophonic Workshop took delivery of what became the Synthi 100. The exclusivity of these synthesisers led to each being given a unique name. In the case of the BBC it was known as the Delaware.



Fig. 8. John Baker and Paddy Kingsland working at the EMS Synthi100¹⁶¹

This introduction of commercial equipment established the shape of things to come, and by the late 1970s the uniqueness of the Radiophonic Workshop during the pioneering years was to become significantly less evident. By this point university studios were beginning to make a significant impact on the development of electronic music in the UK, progressively diminishing the importance of the Radiophonic Workshop in a national context. Its continuing exclusivity thus isolated it from the forefront of developments, and by the time of its enforced closure in 1998 it was in every sense redundant.

¹⁶¹ See the website: <http://whitefiles.org/rwg/large-132.html>.

In 1983 a book entitled *The First Twenty-Five Years of the BBC Radiophonic Workshop* was published. Written by Desmond Briscoe and Roy Curtis-Bramwell it gives a useful history of the workshop which has been vital in the writing of this history of electronic music in the UK.

Peter Zinovieff

Peter Zinovieff was born in London in 1933, his mother a Russian Princess and his father an aristocrat. While at school Zinovieff became interested in building crystal radios and transmitters, subsequently, while studying Geology at Oxford University he became interested in experimental music. He played prepared piano and made instruments from discarded items such as biscuit tins. Zinovieff also recorded this music on a Grundig tape recorder and experimented with speed change but never went as far as to investigate the creative possibilities of tape splicing. He worked as a mathematician and, similarly to Derbyshire, was interested in the properties of random numbers.

Crucially his wife at the time, Victoria, had substantial financial means and was willing to commit significant funding to his ambitions. This allowed Zinovieff to give up work and turn his attention, full time, to the production of electronic music. Zinovieff was significantly influenced by the teaching of Daphne Oram in terms of developing his techniques of composing electronic music. In a letter to Hugh Davies, dated 3rd February 1963, Oram mentions that Davies must include Zinovieff in his list of private studios in the UK. 'He's a pupil of mine and has quite a lot of equipment at his London house'¹⁶². Writing on 18th February 1963, Oram states that, Zinovieff was 'only just starting up in EM'¹⁶³, thus providing a useful marker for the start of his work.

He experimented with building a crude synthesiser from analogue telephone exchange equipment but was dissatisfied with the results. What he really desired was an electronic version; he came a step closer to this when he was introduced, through a mutual friend, to David Cockerell.

¹⁶² Oram 1963:Letter

¹⁶³ *ibid*

Unit Delta Plus

Peter Zinovieff is an elusive figure and although his work at EMS is well known, little is known of the precursor to the company, Unit Delta Plus. In 1966 Cockerell and Zinovieff approached Derbyshire and Brian Hodgson to join them to form Unit Delta Plus. In November 1965 Derbyshire stated in a letter to Hugh Davies that:

‘Brian Hodgson, from the workshop, and I are setting up in partnership with Peter Zinovieff doing electronic music and his shed is really rather a splendid one – I’m sure you’d love it.’¹⁶⁴

They worked during the day at the BBC and then spent their evenings working at Zinovieff’s house in Putney, which ironically was much better equipped than the BBC. Their aim was to ‘create electronic music and promote its use in television, film and advertising’¹⁶⁵. The Unit Delta Plus studio was one of the early forms of the studio based in Zinovieff’s house in Putney which later became EMS.

David Cockerell, born in 1942, began building crystal radios as a child and then built amplifiers for a band he was a member of. Later he dropped out of his philosophy course to take night classes in electrical engineering and work as a technician through the day, where he discovered his talent for making electronic devices for music. He was able to turn Zinovieff’s dreams for a synthesiser into reality. In 1964 Zinovieff and Cockerell built a sequencer from an article by Robert Moog. They asked Cary to look at their creation, who observed that ‘it was the most complete sequencing you could do short of using a computer’¹⁶⁶.

Following Cary’s approval Zinovieff and Cockerell decided to experiment with the new fashion of the day, a computer, to sample sounds. Despite Zinovieff’s considerable wealth a computer was a significant outlay. Funding was found through the sale of Zinovieff’s wife’s tiara¹⁶⁷ for the purchase of a PDP-8 DEC computer with 4k of memory¹⁶⁸. It was by modern

¹⁶⁴ Derbyshire 1965:Letter

¹⁶⁵ See the website: www.delia-derbyshire.org/unitdeltaplus.php

¹⁶⁶ Chadabe 1997b:50

¹⁶⁷ Evidence of this funding source can be seen in the Australian film ‘What the future sounded like’ by Matthew Bate. Originally broadcast in the UK in 2006, the film is currently available on Youtube and will be shown in 2012 at the Musik-Film-Marathon in Berlin. See the website: <http://www.whatthefuturesoundedlike.com/>

standards an extremely primitive but revolutionary device. Although it lacked the capability to accommodate the direct sampling of sounds they used the computer to digitally automate the compositional process by driving a bank of filters and oscillators which would analyse the sound and then re-synthesise it. Cockerell used the principles of exponential voltage control, as detailed by Bob Moog in *Electronics World*, to build a bank of sixty-four variable tuning band pass filters, which by reducing the 'Q' of each filter to the point of resonance, converted them into a bank of sine wave oscillators. This dual purpose filter/oscillator was subsequently incorporated in the design of the VCS-3 and its derivatives.

The machine had special electronic switching apparatus to reduce the manipulation, copying and editing of tape. Using the combination of computer and filters it was possible to select (either randomly or sequentially) one of any number of up to thirty two infinitely variable pre-set tones, thirty two time intervals of .01 to 10 seconds, and thirty two levels of loudness. Thus any tone could be selected, randomly, at any time interval, at any loudness and not be interrelated with the other parameters. It was also possible to increase the probability of a particular choice being made, up to a ratio of 64:1 chance of occurrence. The resulting sounds were unpredictable, but within set parameters. This ability to control electrical equipment, using numbers generated by the computer, combined electronics and composition and was synthesis in its most basic form.

Unit Delta Plus held an electronic music festival on 10th September 1966 at the Watermill Theatre near Newbury, Berkshire. It was billed as the first concert of British electronic music. Perhaps it was, although corroborative references are hard to find as Zinovieff does not mention Unit Delta Plus in any of his writings. The programme for the 1966 concert contained works by Derbyshire, Zinovieff and Hodgson as well as light shows created by lecturers at Hornsey College of Art. Derbyshire's *Amor Dei* with words by Barry Bermange was first broadcast by the BBC on the Third Programme and was performed with the BBC's permission. In order to save on costs similarly Derbyshire's *Pot-pourri* was performed with BBC permission. The following year the group participated in the Million Volt Light and Sound Rave at London's Chalk Farm Roundhouse. The event took place over two nights, 28th

¹⁶⁸ A computer was far beyond the means of any other private studio at the time. After the first computer, which he named 'Sofka' (after his daughter) he bought a second PDP-8 with a larger memory – 8K and named it Leo (his son).

January and 4th February 1967, and included a performance of tape music by Unit Delta Plus, electronic works by the Beatles and Paul McCartney's *Carnival of Light*.

Little more is known of Unit Delta Plus save that they split in 1967 after 'a traumatic performance' at the Royal College of Art. The reason for the split and exactly why the performance was 'traumatic' has not been discovered despite extensive research. Following the split Zinovieff and Cockerell continued to work in the Putney studio and began tailoring it to Zinovieff's own specifications using much of the equipment from Unit Delta Plus. I can find no concrete information stating that it is the same equipment, as Zinovieff never mentions Unit Delta Plus, but as most of it was bought with his money it seems likely the equipment remained at Putney. A comparison of photographs gives a number of clues.

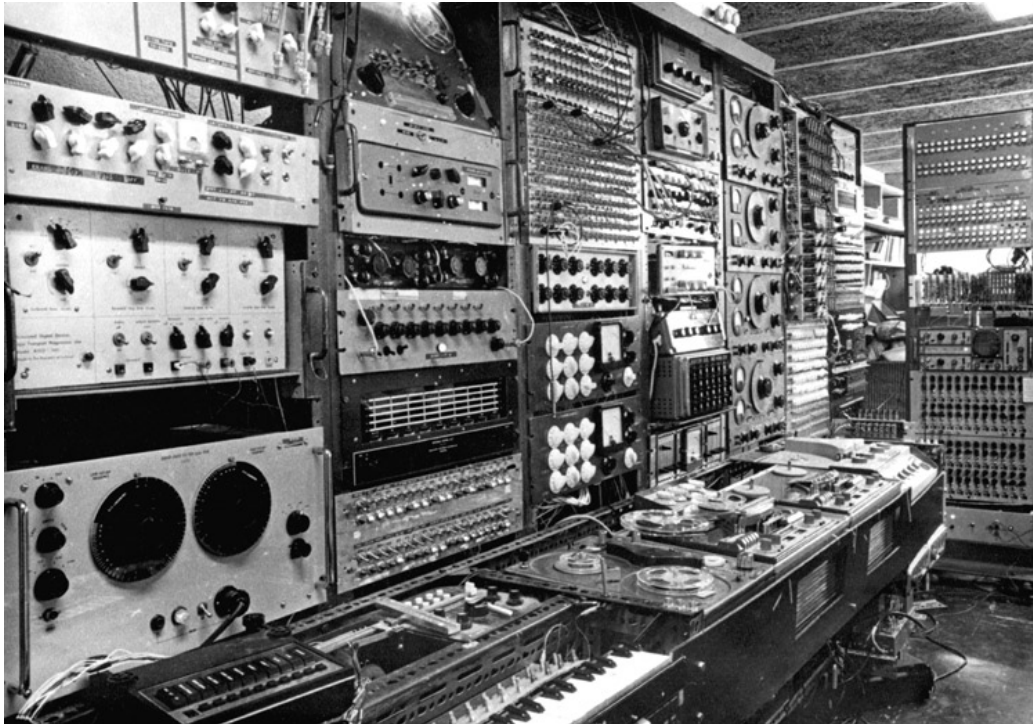


Fig. 9. The Unit Delta Plus Studio¹⁶⁹

¹⁶⁹ See the website: www.delia-derbyshire.org/unitdeltaplus.php



Fig. 10. Electronic Music Studios (London) Limited.¹⁷⁰

As can clearly be seen the same equipment was reused or modified for the later version of the studio that would turn into EMS. One can thus trace a line of continuity in terms of the evolution of Zinovieff's studio from the earlier Unit Delta Plus. The studio was indeed advanced for its time in terms of its integration of analogue and computer technologies, thus creating what was known at the time as a hybrid studio. Such resources could only be matched by the EMS studio in Stockholm and, further afield the GROOVE system developed by Max Mathews at Bell Telephone Laboratories, New Jersey. He 'regarded his studio as a cutting-edge research institute'¹⁷¹, and indeed was well placed so to do. This prolonged exposure to equipment facilitated the development of techniques and allowed inspiration for new devices. As mentioned in regard to the BBC Radiophonic Workshop, staff were rotated after a few months meaning they did not gain the familiarity with devices the staff at EMS were lucky to have. Since staff at the BBC were not allowed to remain at the workshop for long periods of time the attraction of such an advanced facility, albeit in the private sector, was significant.

Throughout the next year Cockerell and Zinovieff continued to build up their computer armoury. A concert of electronic music was to be held at the Queen Elizabeth Hall in London in 1968. For this concert David Cockerell built peripheral equipment, consisting of digitally

¹⁷⁰ See the website: www.ems-synthi.demon.co.uk/studiopz.gif

¹⁷¹ Pinch & Trocco 2002:283

controlled filters and oscillators for the computer and Zinovieff wrote *Partita for Computer*. The two composers were keen to show off their new computer-based equipment that they had constructed specially for the occasion. The computer took centre stage. Once set up, the programme started and the operators left the stage, leaving the computer to its own devices. This was probably the first time a computer had been used on stage as a live performance instrument in the UK.

Electronic Music Studios (London) Limited (EMS)

By 1968 the Putney studio had become expensive to maintain and Zinovieff's finances were slowly depleting, the group needed to produce something they could sell. Although never commercially minded, Zinovieff formed Electronic Music Studios (London) Ltd. in 1969, with Cary acting as a consultant.

The first piece of equipment was built in response to a request from the Australian composer Don Banks. Although commercial synthesisers were already available from American firms such as Moog and Buchla they were relatively expensive and did not offer the combination of features he was seeking in the form of a low cost and easily portable alternative. Accordingly Cockerell built the Voltage Controlled Studio Mark One which was about the size of a shoebox and cost less than £50 to construct. It contained various synthesiser modules, an oscillator and a filter, all housed inside the container with lots of knobs on the outside. This new compact idea led to the VCS-3 or 'Putney'¹⁷², which soon became a commercial rival to the American MOOG and Buchla synthesisers. The original marketing document states the aim of the device:

‘Our intention is to provide a complete small studio which can either be regarded as complete in itself, or used to form the basis of a more ambitious electronic music studio.’¹⁷³

¹⁷² The device was marketed as the VCS-3 in the UK and the Putney in the USA

¹⁷³ Zinovieff, 'Voltage Controlled Studio'



Fig. 11 The VCS-3¹⁷⁴

The VCS-3 was marketed mainly at schools¹⁷⁵, and for this to work it had to be affordable. The Moog and Buchla synthesisers were out of the range of most schools. The VCS-3 performed approximately the same functions as the Moog. The better known American synthesiser appeared on the market around the same time as the VCS-3 and was a direct commercial rival. The ring modulator and voltage controlled oscillator were designed by Cockerell but the filter was based on a design that Moog had published in *Electronics World*, creating immediate similarities between the two systems. The main difference was that Cockerell used diodes while Moog specified transistors. The reason for this came down to financial restrictions – a diode was tuppence and a transistor, twenty pence. The saving was vital at this stage.

The main difference between VCS-3 and synthesisers produced by other manufacturers was the pin matrix. Nearly all other synthesisers required the use of patch cords to connect the relevant modules. The pin matrix was developed as a patching system for early analogue computers. Hence the parts could be picked up cheaply in the many electronic part shops in London's Lisle Street. A number of composers who had occasion to work at EMS, came to

¹⁷⁴ See the website: www.ems-synthi.demon.co.uk/VCS-3.gif

¹⁷⁵ Pinch & Trocco 2002:284

regard the traditional use of patch cords and a patch bay to connect devices in a conventional recording studio as messy and time consuming, and accordingly chose to incorporate the pin matrix system for their own studios. Lumsdaine encountered these pin matrix boards in London during the late 1960s. Having been appointed Lecturer in Composition at Durham in October 1970 he immediately set about (with his PhD student Peter Manning) the construction of the initial Durham Studio, which consisted of two Revox A77 tape recorders, two VCS3s and a DK1 keyboard, two portable Uher mixer and first one (eventually four) of these interconnecting matrix pin boards. These were identical to the ones used for MUSYS.

The design of the VCS-3 was heavily dictated by the imperatives of keeping manufacturing costs as low as possible. Cockerell recalls that many components were dependant on what could be found in junk shops on Lisle Street. The joystick feature was taken from a remote control aeroplane and used to control two parameters with great success. This parallels the approach of composers at the time who were building their own equipment from that redundant elsewhere. The VCS-3 had three oscillators which produced a combination of sawtooth, sine and square wave outputs. It contained a built in amplifier, speakers and a panning feature as well as audio inputs for other devices. All of this was contained in a desk top box designed by Cary. Its user-friendly interface was the first of its kind, preceding the miniMoog by a number of years.

The VCS-3 was released in November 1969 and the BBC were one of the first to take delivery. Brian Hodgson suggested to the directors that instead of buying a Moog the BBC should support British engineering. For the purposes of the BBC the VCS-3 proved to be ideal. It produced a significant range of sounds from a highly compact and neatly configured box. Also, it was easy to connect one VCS-3 to another and the synthesiser could be electronically connected to a specially designed music keyboard launched in 1970. Originally Cockerell would hand solder all of the joints on the VCS-3, but soon he created circuit boards and the manufacture of these was farmed out to other companies. The early VCS-3 retailed for about £200, a good deal less than comparable Moog or Buchla machines.

The VCS-3 achieved commercial success not just in universities and schools (over 90% of VCS-3s were sold to these market sectors) but in popular music. Zinovieff had no interest in pop music so it fell to Robin Wood to deal with the series of progressive rock musicians who visited the studio. Pink Floyd regularly performed on stage with up to six VCS-3s at a time,

and all four members are credited with using EMS equipment for the composition of *Dark Side of the Moon* in 1973. Others who used EMS equipment include Stevie Wonder, Brian Eno, members of The Who, The Beatles, The Rolling Stones, Hawkwind and Deep Purple, helping the VCS-3 to achieve cult status.

As the VCS-3 had no keyboard the DK1¹⁷⁶ was modified for mass production as the DK2 touch. It was the first commercially available touch sensitive keyboard. It had a variety of tunings and even the ability to reverse the touch sensitivity so that, if keys were pressed harder, softer sounds were created. This three-octave, touch sensitive keyboard could be used to provide stepped control for up to two VCS-3 functions at any one time, for example the pitch of a selected oscillator and the frequency setting of an associated filter. It could also act as a trigger for an associated envelope shaper. It was not well received by some electronic musicians, but it was never intended as a keyboard synthesiser, but rather as a way of making money.

Although the VCS-3 was small and would sit quite comfortably on a table top, a portable version was desired and so the Synthi A or Portabella was created. By this time the VCS-3 retailed at around £330 and the Synthi A at only £198. An excellent advertising campaign was launched for the whole 'family' of what Tristram Cary dubbed 'Synthis' using the slogan 'Every. . . Needs a Synthi'. There were several of these including 'Every picnic needs a Synthi' and 'Every Nun needs a Synthi'.

¹⁷⁶ It was commonplace in EMS to christen devices. The DK1 was named the 'Cricklewood' perhaps because that is where David Cockerell lived, and Zinovieff had claimed the name 'Putney' for the VCS-3.

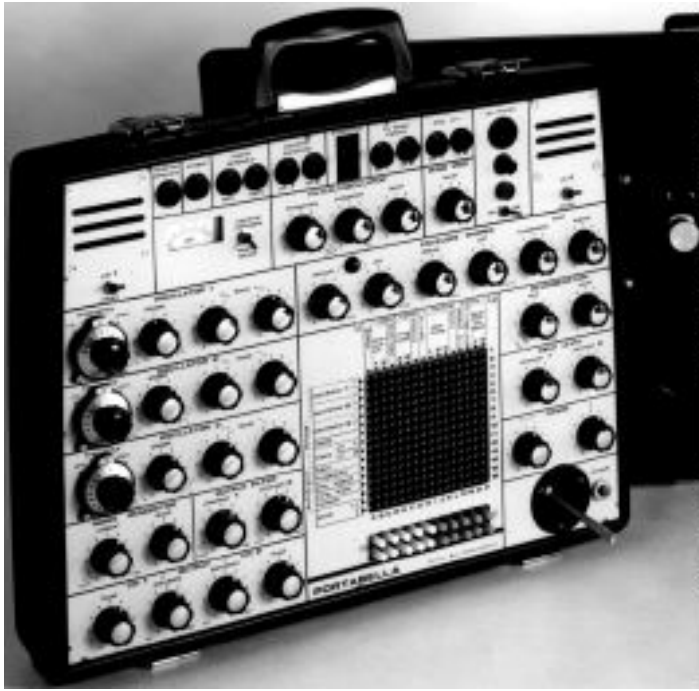


Fig. 12 The Synthi A or Portabella¹⁷⁷

In 1971 the Synthi 100 was launched, a large, sequencer-based synthesiser which took up the whole length of a wall in the studio. It was described as ‘the VCS-3 times ten’. It sold for £5500 and the BBC bought the first one, after the success of the VCS-3, and Cardiff University the second¹⁷⁸. The Synthi 100 was made to order and models were often given their own names. The Delaware and Digitana are two examples, the former belonging to the BBC and the latter to Cardiff University. Unfortunately the University ran out of space, and after a refurbishment, the Digitana spent some time on display at Wembley arena to great acclaim in the electronic music community. It was then sold to a private collector, none other than Richard James of Aphex Twin fame. It can now be heard, in its reconditioned state, on many of his commercial recordings. Other Synthi 100s were sold to WDR in Cologne, the University of East Anglia, Radio Belgrade and Mossfilm, Moscow.

¹⁷⁷ See the website: www.ems-synthi.demon.co.uk/emsprods.html#synthi100

¹⁷⁸ I was assured that the serial number was 002 on my visit to the studio in 2005.

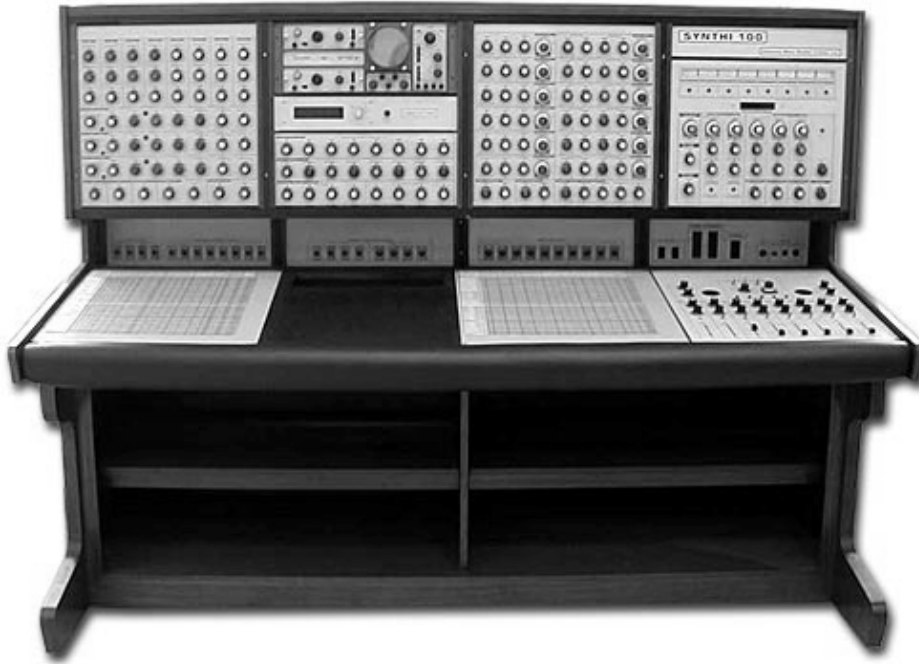


Fig. 13 The Synthi 100¹⁷⁹

The VCS-3 was designed to make money in order to fund Zinovieff's further experiments, which were continuing in the Putney studio. By 1970 his studio contained two PDP-8 computers connected together, with a 32k hard disc - to find two computers outside of an academic or military environment was rare. The studio also contained a digital oscillator bank, pressure sensitive keyboard (Squeeze Me), a general purpose knob with a panel to select control option (spinwheel) and numerous filters and oscillators. Zinovieff's idea was to control his analogue equipment with the computers, and by 1970 Peter Grogono had developed a programming language by means of which this could be achieved.

During the ten years that EMS was operational a huge variety of equipment was produced. Not all of this equipment went on to be marketed commercially. Around 10% was developed for sale, typically the DK2 keyboard for VCS-3; the Synthi A or Portabella and the Synthi 100.

MUSYS

MUSYS III is the name given to the programming language written for EMS by Peter Grogono. Grogono began working at EMS in March 1968, initially to cover for Zinovieff who was in hospital. While there he wrote a reverberation program for the PDP-8L (Leo) and

¹⁷⁹ See the website: www.vintagesynth.com/misc/synthi100.jpg

was offered an informal contract. He quit his job and began work on what was to become the MUSYS studio.

As EMS evolved the controls for the studio became unwieldy at around seven hundred different control options. Mark Dowson suggested that a computer be used as an elaborate sequencer and to perform arithmetic and logical functions. From this the MUSYS system evolved. By 1969 each new composition required a new programming language so Grogono suggested that a special purpose compiler should be designed which would make the old delivery and service routines for the composer transparent. The computers were sufficiently powerful to perform total synthesis of sounds, (that is, produce numbers at the rate of 10 – 20,000 per second, thus defining a waveform). However, only a limited repertory of waveforms could thus be generated, and the studio disc was too small to store audio sound files.

The MUSYS program was designed instead to control the oscillators, amplifiers and filters that made up the studio, tasks that are computationally far less demanding. In that there are analogue devices and that data passes both ways across the analogue digital interface, the system, as noted earlier, must be seen as using a hybrid architecture. At the lowest level of operation the computer acts for the most part as a sophisticated sequencer. If, however, ideas could be expressed mathematically then a computer program such as FOCAL, Fortran or Algol could be used to prepare lists of control data for use in MUSYS, and MUSYS itself could be used directly to solve mathematical equations providing they were not too demanding.

MUSYS thus essentially functioned as a sophisticated sequencer to record, store, vary and play back information that had been entered into it. Essentially it was a programmable scheduler, supported by (for its time) a sophisticated computer operated editing system, whereby data could be entered and modified either via a conventional alphanumeric teletypewriter or a specially constructed console consisting of a series of pushbuttons and data display lights¹⁸⁰. MUSYS is described by Zinovieff as a ‘Computer-controlled electronic music system’ and ‘its object is to make generally applicable, software and hardware system for the production of electronic music’¹⁸¹. David Cockerell designed and built most of the

¹⁸⁰ Manning 2004:212

¹⁸¹Zinovieff 1970b:Introduction

electronic equipment for little financial recompense and Grogono transformed the programming into a sophisticated language and wrote a good deal of the manual.

The intention for MUSYS was to use one computer to generate the data and the other to perform it, i.e. send the data to the various devices. The MUSYS design is based on the theory that electronic sounds can be created by the manipulation of a series of parameters, and that machines can be built to produce the sound output described by these. These parameters range from, at the time, relatively simple ones such as pitch, loudness, timbre and time, to effects such as glissando, acceleration and crescendo. Complex parameters described in the manual include, tension, surprise, catharsis and boredom. The MUSYS system was able to run six simultaneous busses which could create six-part harmony or could be used to control arbitrary devices. For example you could use three busses for three separate parts and the remaining three could be used for overall dynamics, filtering and reverberation.¹⁸² Any aspect of a composition could be manually altered at any stage, and a record of this alteration made permanent.

The brief for MUSYS as far as the Putney studio is concerned was:

- Complete hardware flexibility, and the easy adaptation of any new hardware into the system
- An easy comprehensive language for musicians to use
- Fast compilation of the data, and delivery of the data to the devices
- An interactive system where real time data and interference with the final sounds is possible

According to the manual MUSYS can be used as ‘a compositional aid’, ‘to synchronise waveforms’ and to ‘control otherwise conventional equipment’¹⁸³, although waveform synthesis was not commonly used. The reasons given for this are that waveforms cannot be generated and used in real time. By 1969 MUSYS III is listed as in use. It is unknown what happened to versions I and II but there are two possibilities. They were either trial versions of MUSYS which were abandoned or were the actual programming languages used in the studio

¹⁸² Grogono, Peter. *Questionnaire response*, 21st February 2007.

¹⁸³ Zinoveiff 1970:Introduction

up to 1969. There are, however, no references to either of these so these possible reasons remain speculative.

In the introduction to the manual MUSYS III is described as ‘capable of solving most of the structural, mathematical and logical problems encountered by musicians and also allows the minimum of thought to be given to the actual process control itself ... because of its macro structure, it is possible to evolve large musical and philosophical ideas with very little numerical data.’¹⁸⁴ Viewed with hindsight such claims are seriously open to doubt since even today few if any computer-based resources of the composition of electronic music come remotely close to achieving such aspirations. In any event MUSYS III was essentially a basic command oriented programming language that required extensive coding on the part of the composer. In June 1970 EMS ran a course, sponsored by the Arts Council, to allow a small group of British composers to learn how to use the system. David Lumsdaine participated on this course just a few months before he took up his post at Durham University. It is thanks to Lumsdaine that I have had access to a copy of the original MUSYS manual as he passed it to his successor at Durham, Peter Manning.

In 1972 an electric guitar based synth, the Hi-Fli was released, and it was the first failure for EMS. Later that year Cockerell left the company and moved to the USA to design guitar effects pedals. Later, in 1976 he spent time at IRCAM working with Boulez. By 1974 Zinovieff was losing interest. ‘He was computer-literate in an era when very few musicians were and, throughout the early '70s, his ideas remained way ahead of their time’¹⁸⁵. From here on EMS started to decline. A few more synthesisers were built and marketed but the end was in sight. ‘In 1976, following the failed launch of Zinovieff's 'International Voice Movement' telecommunications company, EMS left London and relocated its development team and music studio to The Priory in Great Milton, Oxfordshire. But by this time, the company was in terminal decline.’¹⁸⁶ In 1979 the company went into receivership and the studio broken up. The National Theatre agreed to store the EMS equipment but because of a leak it was eventually destroyed by water damage and disposed of. Zinovieff recalls that the last time he saw the studio it was in pieces, covered in water in the basement of the National Theatre¹⁸⁷.

¹⁸⁴ Zinovieff 1970b:90

¹⁸⁵ Reid 2000:2

¹⁸⁶ *ibid*

¹⁸⁷ Zinovieff 2010:1

EMS continues to exist today and is run by Robin Wood. He maintains an extensive website on the history and products of EMS and at the time of writing will still overhaul EMS equipment.

Closing reflections on the evolution of the studio in the UK

Electronic music in Britain was at a disadvantage from a very early stage. By the time that Max Mathews (USA) published his seminal book on computer music¹⁸⁸ in 1969, studio facilities in the UK were still lagging seriously behind those available in continental Europe and the USA. Developments at a national level were further hampered by the BBC who were not willing to understand the significance of the new music and employed a very strict policy regarding the use of their radio recording studios. The BBC studios could thus not be used by composers for the production of electronic works other than in the very rare circumstances of a BBC commission. In most countries where a national studio was present it was commonplace for the studio to be financed by and housed in the national broadcasting company. Significant opportunities for creative work in the UK were thus lost.

An entry in *Répertoire International des Musiques Electroacoustiques* lists a work as *Music from Mathematics: The Voice of the IBM 7090 computer* produced in the Bell Telephone Laboratories... 1960¹⁸⁹. This is concrete evidence of the growing divide between developments in the UK and USA. Although Zinovieff had been working with computers since the early 1960s it was not until the late 1970s that computer music was finally to become a practical reality in the UK.

What was clearly lacking in the UK at this time was a national studio where interested parties could discover, work with, research and compose electronic music. Many UK composers trained at national studios in other countries only to discover on their return to the UK that there was nowhere for them to work. Owning one's own studio or even a modest array of suitable equipment was a massive financial outlay, well beyond the means of most composers. Given these conditions the development of studios in universities during the 1970s was to prove especially important. Moreover it was the directors of these studios that were to prove especially influential in the subsequent lobbying of organisations such as the Arts Council for the funding to establish a national studio, and these important developments

¹⁸⁸ For further reading: Mathews 1969

¹⁸⁹ Le Groupe de Recherches Musicales de l'O.R.T.F. and The Independent Electronic Music Center, Inc. 1968:51

2. The Evolution of the Studio

will be studied in due course. The circumstances outlined above provide a cogent explanation of why electronic music in the UK developed at a significantly slower rate and in a different vein to other European countries. The only conceivable advantage was that this slow start may have allowed the UK studios to avoid the pitfalls and mistakes made by others. It also resulted in the conditions necessary to stimulate interest in the possibility of establishing a national studio.

Chapter 3: The Importance of a Community in the Development of Electronic Music

The concept of a community has many possible interpretations according to the context within which it operates. In the case of electronic music a strong sense of community developed between the various individuals who became associated with the early post-Second World War initiatives in Paris, Cologne, Milan, and elsewhere. Here the institutional context was highly influential, as was the prominence of the leading protagonists in each case, notably Schaeffer, Stockhausen, and Berio respectively. A strong sense of identity was established, supporting the notion that in each case creativity was underpinned by a distinct and unique aesthetic.

In the case of non-institutional groupings, for example the early work of John Cage and his associates furthering the cause of Music for Magnetic Tape in 1950s America, the sense of community if anything was even stronger. This is invariably fuelled by a common recognition that, without institutional funding participants need to work together in an especially proactive manner to create a common sense of identity and purpose in convincing others of the value of their work. Measured against these complementary perspectives developments in the UK in a community context provide a revealing and ultimately very important insight into the ways in which the medium of electronic music was championed and supported.

A community can manifest itself in a number of ways: firstly there is the physical community, where an actual meeting of people occurs, thus allowing individuals to raise issues and for those present to discuss them and seek common ground. Then there is the virtual community, where those of a similar interest are linked by means of correspondence, initially via the medium of writing and in recently times, online. Although the latter medium has greatly enhanced communications, and indeed led to initiatives such as collaborative internet performances of electroacoustic music the sense of identity here is most certainly with common ideas, rather than as in the case of the early European studios a particular physical environment offering unique conditions for creative work.

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The subsequent study of the various bids to establish a national studio throws an interesting light on these perspectives, as does the establishment of associations such as the Electroacoustic Music Association (EMAS), later to become the Sonic Arts Network, building upon the pioneering work of the British Society for Electronic Music (BSEM) and the support of the Society for the Promotion of New Music (SPNM). It is with these important developments in mind that special attention is focused in this chapter on the characteristics of the community and its importance in shaping the development of electronic music in the UK.

Above all a community has great power to foster a sharing of ideas. This was especially important in the early days of electronic music, and indeed it was the preponderance of so many pioneers working in complete isolation that highlights the consequences of the lack of a major stimulus such as an institutionally-funded studio that allows technologists and creative artists to meet and share ideas and experiences.

For reasons that will now be self-evident, an important key to the development of electronic music was the establishment of associations of like-minded individuals, and charting the course of these provides a considerable insight in to how electronic music became established in the UK. The first 'drawing together of ideas' occurred at the BBC in the 1950s, later, in the 1960s there were attempts to catalogue electronic music in the form of *Répertoire International des Musiques Electroacoustiques*, and by the end of the decade studios began to appear in universities across the UK. Also in the late 1960s societies championing electronic music were founded and it can thus be argued that a community for electronic music had truly come into being. This chapter sets out to detail the various communities and show how they were instrumental in shaping the development of electronic music and most particularly in stimulating the sequence of initiatives to found a national studio.

The BBC Radiophonic Workshop

There was undoubtedly a community of interested parties at the BBC Radiophonic Workshop. Despite the fact that the Radiophonic Workshop did not have a remit to support activities other than those specific to the BBC, forcing composers such Daphne Oram to work alone at night, it did facilitate a sharing of ideas among those interested in electronic music. As mentioned earlier, the BBCs policy was not to allow anyone to work at the Radiophonic Workshop for more than a few months at a time. This was both positive and negative for the

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development of a community, on the positive side it allowed many people to become part of the community and perhaps stay in touch and carry on with electronic music activities after leaving the Workshop. On the negative side, it meant that no single composer had any time to develop ideas while at the Workshop, a problem exacerbated by the heavy workload. It may also be noted that, as a national venture, the press attention and publicity surrounding the opening of the Radiophonic Workshop gave electronic music hitherto unheard of attention, and this was to prove useful to others.

Documentary evidence provided by Répertoire International des Musiques Expérimentales

The catalogue was the first attempt to draw together a list of compositions produced worldwide. No previous attempt had been made to gauge the scope of electronic music in this manner, and the results displayed were to prove especially revealing. It was clear that even by 1961, when the first edition was compiled, that electronic music was beginning to thrive worldwide. However in the UK, developments were still at a very elementary stage. The 1961 discography lists no compositions produced and no studios established in the UK. This is somewhat surprising since by this stage the Radiophonic Workshop was well established and, as previously noted, a few works had been composed there. That said the list is essentially a discography so it is perfectly possible that it is correct in that it would appear there were no recordings commercially available of British electronic music at that time. A handful of German, American, French, Dutch and two Japanese discs were listed as available in 1961, though how available these were for purchase by interested individuals is unknown. By the time of the second edition of the catalogue compiled in 1967 the listings of discs ran to fifty pages, and the associated listings of studio and works composed now included several UK entries. However, somewhat revealingly, Davies subsequently noted that ‘Britain was [then] the fourth most prolific producer worldwide of music in the medium, but unlike elsewhere, nearly all of this was background music.’¹⁹⁰

Electronic music in the academic community

Until the mid-1960s electronic music was not deemed worthy of academic support in the UK. Most Universities were still teaching pastiche composition and little more, and even more mainstream ‘contemporary’ music was rarely studied. However the first seeds of interest in

¹⁹⁰ Davies 2003:1

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post-Second World War music including the emerging genre of electronic music began to spread across the academic community during the early part of the decade fuelled to no small extent by the establishment of the Durham Contemporary Music Festival in 1963.

The Festival had the specific intention of bringing together composers and interested members of both the academic and the non-academic communities to discuss recent developments in contemporary music, the UK equivalent of Darmstadt. This forum for the discussion of recent developments undoubtedly helped bring together a number of those interested in electronic music and therefore influenced the development of the first studios. Electronic composers and personnel were present at the festival from the outset, the Director of the festival, John Wilks, also studied at the Milan studio during the mid-1960s and this personal interest in electronic music stimulated further interest in the possibilities of the medium. During the three years of the festival (1963, 1965 and 1967) internationally renowned composers such as Pousseur and Berio were to attend and the concerts included performances of electronic music. Indeed it was the Durham Contemporary Music Festival which paved the way for the much larger and now well established Huddersfield Contemporary Music Festival, which was to follow in the next decade. As a postscript to the Durham Festival, a pioneering performance of Karlheinz Stockhausen's *Kontakte* took place in 1971 using residual funds from the Festival, the piano part being played by Roger Smalley and the percussion part by Tristram Fry.

The Durham Contemporary Music Festival was forward thinking in that it sought to bring together not just composers, or would-be composers, but all those interested in contemporary music. This is particularly important for electronic music as those who practiced it were from a variety of disciplines, composers, musicians, technicians and a small but enthusiastic group of individuals, often with no formal training in music, who found ways and means of gaining access to such facilities. At universities this often included students and staff from other departments such as physics and electronics. This aspect will be discussed in more detail in reference to developments at Durham University.

Although it was to be a pioneering group of universities that finally established the first institutionally-funded studios in an educational context it is important not to overlook some initiatives that were taken in a quasi-educational context by pioneering individuals such as Hugh Davies who sought to attract the support of further education colleges in an extra-mural context, for the most part unsuccessfully beyond the funding of occasional workshops and

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study days. Initially there were no formal courses at this time, more a group of enthusiastic amateurs sharing ideas, and the persons in charge for the most part had no formal training in the medium. The only possibility would have been to study abroad. Some of these early pioneers, for example Hugh Davies, had done just that. When he was approached to set up the Goldsmiths College studio in 1967 he had just returned from two years working as an assistant to Stockhausen. Davies states that ‘in my own evening classes I was frequently aware that in some areas I was only a couple of weeks more advanced than some of my students’¹⁹¹. Another pioneer to make contributions in this context was Daphne Oram whose provenance is detailed elsewhere.

According to Davies, ‘During 1968 six electronic music studios were set up at universities and music schools in England. This is all the more remarkable in a period of financial restrictions, and considering the fact that the only previous officially sponsored studio was the BBC Radiophonic Workshop established in 1958. The new studios are University of London Goldsmiths College (Hugh Davies); Royal College of Music (Tristram Cary); Royal Academy of Music; Manchester University (David Piper); York University (Richard Orton); Cambridge University; King’s College Cambridge (Roger Smalley).’¹⁹² The statement is from a letter by Davies to the editors of the American Publication *Electronic Music Review*, Ren and Yael. Virtually the same statement is made by Davies in a programme for a concert by the British Society for Electronic Music in 1969. Only the Royal Academy studio is omitted from the list. The Academy studio is mentioned in the above letter but with the comment ‘yesterday I was asked to set up the studio at the Royal Academy’¹⁹³ which begs the question how the studio could be included in his original list if in truth it had yet to be established. It was also to transpire that the studio at Manchester consisted of no more than a small synthesizer purchased for Piper’s work on a PhD thesis, and on his departure was simply deposited in an attic and forgotten about for several years. Along with this letter in the Hugh Davies Archive is a handwritten list of studios and dates, reproduced below, in which the studios are divided into two columns, the first listing studios in London, the second studios elsewhere in the country. Clearly from the dates given this record was revised in the mid-1970s with a number of additions and deletions. The listing is as follows:

¹⁹¹ Davies 2001:53

¹⁹² Davies 1968b

¹⁹³ *ibid*

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1958 BBC
1966 EMS
1967 ULGC
1968 RCM
1971 Morley
1974 (?) Westminster
1971 City [Lit]

1968 York
1967 (Manchester)
1970 Durham
1971 Cardiff
1974 Glasgow
1974 Norwich

List of Studios reproduced from Hugh Davies Archive.¹⁹⁴

The reasons for this division into two groups are unclear; a simple explanation is purely geographical, those based in London and those elsewhere. It is possible, however, that the first list identifies those studios with which Davies was directly acquainted. The list is nonetheless useful. The absence of the Cambridge studio is explained by the 1969 programme note which reads ‘Roger Smalley has been able to assemble a small studio at King’s College, Cambridge’¹⁹⁵. Roger Smalley and Tim Souster were Composers in Residence at King’s, thus holding short term contracts. Their equipment, consisting of two tape recorders and a VCS-3 was primarily used for concert performance and dismantled at the end of their fellowships. The reasons for omitting the Royal Academy studio from the second list are unclear. One can only speculate perhaps because the proposed studio was never built by Davies, or was simply another synthesiser venture of a transitional nature.

By the early 1970 studios of a more permanent nature had thus been established in a number of academic institutions, notably Goldsmiths College (Hugh Davies), York University (Richard Orton), Cardiff University, (Keith Winter), and Durham University (David

¹⁹⁴ Davies *List of studios*

¹⁹⁵ Davies 1968b:1

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Lumsdaine). Others were soon to follow. Aside from the BBC and EMS other initiatives at this time were few and far between, and generally only of a temporary nature. A notable exception was Spectro Arts Workshop, a multimedia not for profit company established in Newcastle in 1972 with funding from Northern Arts and the Arts Council. Spectro established a public access electronic music studio which continued to operate until the demise of the company in 1992.

Studios were classified in *Répertoire International des Musiques Electroacoustiques* according to whether they were permanent official (PO), Permanent Private (PP), improvised official (io) or improvised private (ip) giving a useful indication of the nature of the setup. In an explanatory section at the beginning of the catalogue it states that 'improvised' equipment is normally used for other purposes (such as in a radio station or recording studio), and it is collected together into a studio just for the realisation of a particular composition: if a studio consists of only the barest minimum of equipment (such as one microphone and one tape recorder), it has been designated as improvised.'¹⁹⁶

Répertoire International des Musiques Electroacoustiques lists every studio known to Davies at the time of compilation. It has to be appreciated, however, that some entries only have a speculative status. For example, included in this list are 'planned studios' at Adwick - High School; Linthorpe - Middlesbrough College of Art; London - Hugh Davies. In an annotated copy Davies crossed through the Middlesbrough studio, indicating that it never became operational, and nothing can be found of the Adwick Studio. In terms of permanent studios listed in *Répertoire International des Musiques Electroacoustiques* the list reflects the likely census date of late 1967. It includes Gerhard's studio in Cambridge, Cary's studios in London and Diss, the Oramics Studio, Manchester University Studio, Unit Delta Plus and the various early incarnations of the BBC Radiophonic Workshop. Interestingly it does not include the York University Studio, although it most certainly was under construction by this date. Also listed are permanent private studios by Ernest Berk, Desmond Leslie and Desmond Briscoe. Ernest Berk was the director of The Modern Ballet Group and most of his work was for this company. His studio was operational in 1955 and some thirty or so compositions are listed to 1966. Desmond Leslie was a writer. His studio was operational from 1957 and

¹⁹⁶ Le Groupe de Recherches Musicales de l'O.R.T.F. and The Independent Electronic Music Center, Inc. 1968: xiii

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Davies states with the entry 'no information received, many short pieces before 1961, not intended for any specific purpose'¹⁹⁷.

In 1966 Leslie moved to a castle in Ireland and it is likely he did not continue with his electronic music activities as the castle had no electricity. In later annotations by Davies, much of Leslie's music is listed as theatre music, mainly for Shakespeare plays. Desmond Briscoe's associations with the BBC Radiophonic Workshop are well documented though there is little information on his own studio, established in 1959, a year after the workshop. Around fifteen pieces were created there until 1966, mainly for film. Of those listed as 'improvised', the activities at the Oxford University Electronic Music Studio and in Edinburgh, by the Oxford Theatre Group are solely by Davies, in 1963 only. Of the remainder a further four electronic music production facilities are identified at professional recording studios, these are, Stagesound (1965); F C Judd (Sound Recording Ltd) (1960); John Boyden (Recordings) (1963); and intriguingly The Beatles & Parlophone Records (1966). The latter entry serves as a timely reminder that electronic music was by this time becoming increasingly significant in the world of pop music, albeit for the most part in terms of live performance.

The earlier reference to the contributions of further education colleges omits one initiative that is in a special context all of its own, dating back to the previous decade. Morley College, London at that time was exclusively an adult education college with no full time students. Most classes took place in the evenings or on Saturdays using an array of part-time tutors. In 1959 Morley College became the first academic institution in the UK to hold classes in electronic music, with Daphne Oram as tutor. As there was no studio and Morley College owned no equipment, it was only through the generosity of Oram that students had practical experience. She invited them to weekend courses at her studio in Kent to study the nature of electronic music, and some went on to compose works there. Thus the 1959 Morley college venture cannot be classed as a studio. In 1964 Oram became too busy to carry on, and the classes were discontinued. In 1966 Michael Graubert became a tutor and conductor at Morley College, and in 1969 he became Director of Music, a post he held until 1991. Building on his previous career as a development engineer at EMI before studying to be a composer he re-introduced classes in electronic music.

¹⁹⁷ Davies, annotations in Service de la recherche de le R.T.F. 1961

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Manchester University (1967)

The studio in Manchester was the first university studio to be established, just ahead of York.

In a letter to Davies, dated 30th October 1968, David Piper (Studio Director) states:

‘Plans for the establishment of this studio were first put into operation by the head of the department, Prof. Hans Redlich, in late 1965, together with myself and technical help from Mr A W Curtis, the Manager of the University Television Studio. As you will no doubt appreciate, acquiring funds for such a project was a problem but we were fortunate in getting hold of some money which enabled us to purchase one or two basic pieces of equipment including a stereo tape recorder – a Vortexion CBL 6 (to be used in conjunction with an already existing mono-recorder and microphone) -, three sine/square wide-range oscillators, a high and low pass filter, a white noise generator, and a mixer. I myself constructed a patch-panel arrangement to facilitate the use of this equipment, and, up to a point the studio was operational by the middle of 1967.’¹⁹⁸

This evidence suggests that the studio in Manchester was more than simply a Moog synthesiser, certainly in its initial phase. The purchase of the latter, however, was to focus attention on this resource, possibly to the exclusion of other possibilities. Piper states that it was delivered during October 1968 and that it was his idea to have it following his visit to the Moog factory in Trumansburg. Piper states ‘It seemed to me that a studio such as ours – which needed eventually to be able to offer all the facilities of the classical studio but which did not have unlimited financial means at its disposal – such a system as the Moog Synthesiser offered an ideal solution.’¹⁹⁹ However, according to Davies, the presence of the Moog ‘did not lead to any significant pedagogic results’²⁰⁰ at Manchester. In 1968 there were still no classes in electronic music, Piper merely stating that he hoped to interest some students on an informal basis. By March 1970 Piper had staged a couple of concerts involving his own electronic music but the initiative was clearly suffering from the lack of any other creative practitioners of electronic music to work with.

As noted earlier, when David Piper completed his PhD the Moog synthesiser and studio fell into disuse. The studio was eventually revived but the precise date is unclear. Certainly the first major developments here may have been as late as 1992 when John Casken was

¹⁹⁸ Piper 1968:Letter

¹⁹⁹ *ibid*

²⁰⁰ Davies 2001:53

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appointed Professor of Music; in his own words he ‘totally refurbished the electronic studio and introduced a new course in electronic music’²⁰¹. In 2003 the studio was amalgamated with the Royal Northern College of Music and David Berezan was appointed by Casken to design, install and run the studio and design courses.

King’s College, University of London

King’s College is included here not because it had a studio, but because teaching of electronic music was taking place. Thurston Dart, head of department at King’s, had wished to set up a studio at Cambridge during his time there. He stated in a letter to Hugh Davies dated 26th September 1967, ‘the question of an electronic music studio, which has been dear to my heart for many years, and was among the first things I tried to prepare for at Cambridge when I became professor there’²⁰². When he moved to King’s he still wished to set up a studio but goes on to say, however, that a studio will not be created during the next year: ‘For the next twelve months. . . there is no hope of my being able to move ahead on electronic music. We lecture about it; we discuss its useful and useless aspects; we try to stimulate our students to think about its problems for themselves; we play a good deal of it on disc. Beyond that, nothing.’²⁰³ Unfortunately this initiative did not materialise. Dart later suggests that Davies should contact Goldsmiths College, ‘where I believe they are setting up a small studio of some kind’²⁰⁴. This as matters turned out, was a fortuitous and productive suggestion.

Goldsmiths College (1967, later to become part of the University of London)

Goldsmiths College was the second studio to offer classes on the composition of electronic music²⁰⁵. In January 1968 evening classes on electronic music began in the Adult Education department. From the outset they attracted a wide variety of people, those with a musical background, those with a technical background and those who were simply curious. The first equipment was ordered for the studio in 1967 and kept in a physics laboratory (where it had to be dismantled and replaced in cupboards two days a week when the lab was in use) until 1968 when it was re-housed in its own premises on the perimeter of Goldsmiths College. The studio was set up by Stanley Glasser (Head of Music in the Adult Studies dept) and the first

²⁰¹ Casken 2007:Letter

²⁰² Dart 1967:Letter

²⁰³ *ibid*

²⁰⁴ *ibid*

²⁰⁵ Documentation on the Morley studio is extremely limited; in the case of Goldsmiths information is more readily available thanks to the records of Hugh Davies.

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evening classes taught by Hugh Davies. The Adult Studies Department at Goldsmiths College was almost duped into providing the studio. Glasser and Davies embarked on a plan of subterfuge, which was not uncommon for studios at the time, Davies states:

‘First an evening class was agreed on, followed by the insistence of the importance of practical work for which ‘of course’ equipment would be needed , which in turn would ‘obviously’ require a room in which to be permanently installed!’²⁰⁶

The initial equipment included three Revox tape recorders, a stereo mixer, amplifier and loudspeakers, a primitive arrangement that was supplemented a few weeks later by a sine/square wave generator built from a kit by two students from the evening class. The original evening class included Don Banks, Anthony Gilbert and David Lumsdaine²⁰⁷.

When Davies planned the studio he allowed for both live electronic performance and composition but as the studio grew in popularity there was need for some form of central control. A central patchboard was installed and items could no longer be removed for external use.²⁰⁸ The studio appeared on a BBC programme about modern music and photos were used in publications on the same subject. However, despite its fame and popularity, the studio continued to suffer financially and did not have any full-time members of staff. Davies, the director, frequently wrote to the University registering his displeasure at the working conditions and overdue payments. His dismay at the lack of proper teaching time for the students is also apparent and touching. As a man who cared deeply about furthering the interest of electronic music, it must have been difficult to work under such constraints.

This situation contrasts sharply with the conditions secured by the other studios that were to follow. York, for example, appointed a technical assistant in 1970, and in 1973 Durham, for example, appointed both a full time research officer and a technical assistant to support Lumsdaine. Even by 1978 when Goldsmiths had become a fully-fledged university and the music department had finally secured adequate funding, there was little evidence of substantial investment in the electronic music studio. For this outcome Davies suspects,

²⁰⁶ Davies 1976:29

²⁰⁷ *ibid*

²⁰⁸ It was commonplace to keep all equipment in a portable state as there was a great deal of sharing at the time. Often electronic music enthusiasts would take their equipment and meet up with other enthusiasts, pool the resources and put on a live electronic music concert.

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probably correctly, that ‘the considerable number of people who have been associated with the studio is a reflection that all work there is paid by the hour, and that better paid or more permanent jobs have attracted several people away from Goldsmiths.’²⁰⁹

The studio also maintained links with other institutions in London. From 1971 classes were given to students from the Guildhall School of Music and Drama; occasionally students from King’s College London were taught and from further afield, students from local schools, musicians from all over the country and the rest of the world, and frequent student groups from the USA²¹⁰.

Davies states ‘there is little to be said about the installation that is in anyway unusual’²¹¹, in so far that the word installation can be taken to refer to equipment. There were many similarities with the design of the University of Durham studio, and at least in part this was the result of Lumsdaine’s initial contact with Davies at evening classes. A possibly significant difference was the emphasis on teaching rather than research and development. Again Davies states, ‘The main emphasis has always been on the teaching aspect of the studio, and much of the weekly schedule is taken up in this way’²¹². It is not surprising that few creditable works were produced by Goldsmiths students as there simply was neither the time (due to the teaching schedule) nor the specific teaching (due to the lack of teaching staff for financial reasons). It seems that a large number of people took a little experience from the Goldsmiths studio but few made any sizable advances from time spent there. At postgraduate level the situation improved slightly. A couple of postgraduate compositions are listed by Davies and some staff works, many of which were completed with extra equipment brought in by individuals on a loan basis. The vast majority, over two thirds, of works produced at Goldsmiths were by visiting composers and evening class students using the studio during time paid for by SPNM. In 1971 Goldsmiths hosted the SPNM Composers’ Weekend and George Newson was responsible for the studio work. In 1976 Davies was still the Director, George Brown a lecturer and Richard Guy a technician. Composers who realised works in the studio included Don Banks (1969), Richard Bernas, Lawrence Casserly, Martin Gellhorn, Stanley Glasser and Anna Lockwood.

²⁰⁹ Davies 1976:29

²¹⁰ It is interesting that student groups from the USA should be interested in the Goldsmiths College studio as the USA generally had a much better provision for the study of electronic music.

²¹¹ Davies 1976:30

²¹² *ibid*

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York University (1968)

The Music Department at York was founded by Wilfrid Mellers in 1965, it was to be a new kind of music department staffed in the first instance predominantly, although not exclusively, by composers. Mellers was particularly keen to attract younger members of staff, and these included Richard Orton who came directly from Cambridge to York in 1968, with a specific brief to develop an electronic music studio. As early as December 1967, David Blake championed the proposal to establish a studio at York to members of the SPNM Electronics Sub-Committee (Blake's intentions are discussed further in the following chapter). York was a new university with purpose-built facilities, the first equipment for the studio arrived in 1968, even before the music department was fully established in the Lyons Concert Hall building. As the new building came into use, the initial equipment, a Revox tape recorder and an Uher mixer, were used on a makeshift basis. The studio occupied three rooms, the largest being the main studio and the two smaller, a workshop and an editing room which could be used as a second studio and housed a small library of tapes, books and records. In 1970 the studio received a University establishment grant which allowed a more permanent studio to be built and a good deal more equipment purchased. Orton states:

‘The university deserves credit for supporting what must have seemed a remote pioneering venture at that time, though happily many other universities have since followed suit.’²¹³

The 1970 studio was designed by Michael Jeans-Jakobsson and Richard Orton. It was adapted and developed by the studio technician, Jim Webster, from 1970-73. The 1970 studio was centred around a 12-in, 4-out console mixer, custom built by Calder Recordings of Hebden Bridge. Regarding a studio philosophy, Orton states:

‘The basic philosophy of the studio from the outset was to provide access to sounds from whatever source for the use of composers. As it has turned out, there has been a considerable emphasis on high quality recording equipment, including a Nagra IV-S portable tape recorder and Dolby noise-reduction units, perhaps to the detriment of synthesising and processing equipment, which still remains rather meagre: a few

²¹³ Orton 1975:33

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items of Moog equipment, two VCS-3 synthesisers with ancillaries and an assortment of filters.’²¹⁴

He goes on to state that the studio took the decision to concentrate on achieving the highest standard in recording technology and to all but abandon the synthesiser side of things, primarily for financial reasons. He mentions the desire for a large ARP unit and the soaring costs of synthesiser equipment from American manufacturers. Clearly Orton, as so many others, had to make do with what was available and stated: ‘whatever the equipment, more important is the use to which it is put’²¹⁵.

York was one of the first studios to teach electronic music. Intensive four week courses ran from 1969, York thus becoming the first studio outside London to offer such a training. The course was, rather unusually, available to all members of the department. Normally only postgraduates had electronic music available to them. Orton states that the course consists of:

‘theoretical and practical instruction in electronic sound and the use and uses of available equipment, listening seminars with music taken from the studio library and a creative project drawn from the student’s own suggestions.’²¹⁶

Trevor Wishart began using the York studio in 1969 shortly after it opened. There he composed and realised, *Machine* (1971), *Journey into Space* (1972) and the seminal *Red Bird* (1977), some of his most important early work. In the mid-1970s John Casken was invited by Orton to compose his first electronic piece *Quatedrale* in the studio. Casken went on to work at Birmingham, Huddersfield, Durham and Manchester and had a great deal of influence over the studios at each. Another respected composer, Denis Smalley, a native of New Zealand, arrived from the Groupe de Recherches Musicales in 1972 and continued to compose tape works. Smalley went on to establish the studio at the University of East Anglia in 1975, before subsequently moving to City University in 1994.

The success of York at this early stage in attracting a number of composers who were subsequently to make significant contributions to the development of electronic music

²¹⁴ Orton 1975:33

²¹⁵ *ibid*

²¹⁶ *ibid*

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highlights a key aspect of the importance of studio-based communities in terms of the interaction and sharing of ideas. The other electronic music studios had yet to achieve their full potential in this regard, and thus the influence of York in this context was considerable at this time. The list of individuals listed by Orton in 1975 is especially interesting since it includes not only other composers who were to prove particularly significant in this regard, notably Jonty Harrison who subsequently established the studio at Birmingham University but also various individuals who were to make their primary contributions in other related areas, for example Keith Potter who was to write extensively about the role of electronic music in contemporary music, and Tom Endrich, who was to make a material contribution to the Composers Desktop Project.

Royal College of Music (1968)

The situation at the Royal College of Music at this time can best be summed up by quoting from a letter from Cary to Davies dated 17th October 1968:

‘The RCM is operating and teaching this term. I am going to continue as director, but I can’t give all the time I would wish, and I am trying to persuade the college to pay for a technician. . . at present no one is allowed to use the equipment unless I or Clive Webster (the BBC engineer who has done the fitting) are present, but I hope by the end of this term to have sorted out a few students who can be trusted not to break things. . . I am not aiming at a large class, because I want every individual to do everything, so I have only senior composition students, and the first class is nine strong. . . The studio, although we have some good machines, is at present able to do very little complex work, because it is by no means finished – we have for example no filters, envelope generators or keying devices, and no automation at all. But these things will come and we have at least three good professional machines (Philips) and one variable speed playback machine. The thing is that the studio is intended also for straight recording, so emphasis was placed on good tape recorders. Eventually there will be closed circuit TV and video recording as well.’²¹⁷

²¹⁷ Cary 1968

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*Durham University (1970)*²¹⁸

David Lumsdaine arrived at Durham with clear ideas about what was becoming generically known as electroacoustic rather than electronic music, at least in the UK and Europe. As noted earlier he had attended evening classes at Goldsmiths College, and these were influential in shaping his ideas. Just before taking up his post he also attended the MUSYS course at EMS, which further fuelled his enthusiasm. He claims to have written the first piece which used a VCS-3, entitled *Nursery Rhymes*, in 1969 using the very first prototype machine which he states was ‘much better than the rest’²¹⁹.

In 1970 Peter Manning began postgraduate study with Lumsdaine, investigating the development of electronic and computer music. Lumsdaine and Manning purchased a VCS-3 synthesiser for the department to add to the only other item of equipment available at this time, an old valve Revox tape recorder donated by Lumsdaine himself. Lumsdaine acknowledged that electronic composers of the 1960s were quick to act on their many ideas. Studios would appear with modern and revolutionary sets ups that would frequently fade into obscurity as their limitations became apparent²²⁰, for example wire brush operated oscillators were installed at EMS Stockholm and quickly abandoned. As most studios were fixed systems there was no quick and easy solution to modernising them, once money had been spent on a particular system or piece of equipment the studio was effectively stuck with it as little money would be available for a replacement.

This thought in the back of their minds, Lumsdaine and Manning were mindful of the pitfalls of ill advised equipment. They set to work to create a flexible system and the ‘packing case philosophy’ was born. The studio was adaptable and thus could always be reordered for the next piece. It was composition-driven and thus a flexible facility materialised and was at first geared towards the creation of Lumsdaine’s *Caliban Impromptu*. This flexible nature was useful in another way, as the electronic composers based at universities would often pool equipment in order to put on large scale live electronic concerts. The Electronic Music Universities Co-Operative²²¹ facilitated the sharing of equipment and put on several concerts a year. This would not have been possible if equipment had been tied down.

²¹⁸ Manning 1976:14

²¹⁹ Lumsdaine 2005:Transcript

²²⁰ *ibid*

²²¹ *ibid*

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In 1970 Lumsdaine and Manning secured the use of a former flat in the basement of the Durham University music department, housed next to the Cathedral on Palace Green²²², and a collection of old exam desks on which to place the equipment. The studio was made up of three rooms, a large room containing the equipment, and two smaller rooms comprising the stock room and a rather cramped workshop, leading on to a corridor containing the tape library and a collection of literature on the subject. By 1976, when Manning wrote his article in *Contact Magazine*, the studio was linked to two recording rooms via balanced landlines and closed circuit television.

By 1971 the equipment included two VCS-3s and a keyboard, two Revox B77s, the first of which had previously been used to record concerts in the department, three Revox A77s, a stereo Uher recorder and, as mixers were very expensive, two portable Uher mixers for which Lumsdaine devised a method for connecting them together. As in other financially challenged studios at the time, those involved became very good at persuading unsuspecting Physics and Engineering students to build things for the studio. This is how the first oscillators were created. Lumsdaine bought some old industrial parts and asked the students in Applied Physics assemble something he could use to make sounds. One student in particular took a close interest in the studio, working unpaid for almost two years. This was Peter Eastty, who went on to become Zinovieff's chief design engineer for the Synthi 100 computer control system before moving to IRCAM to work on the di Giugno digital synthesiser.

Lumsdaine's *Caliban Impromptu* was a prototype for the working practices and methods for future compositions created in the Durham studio. The team would gather at night. It consisted of Lumsdaine, who had created a number of single oscillator sounds which needed to be mixed together, his first student, Peter Manning, who would always 'man the faders', and Peter Eastty, who would help to start and stop the many tape recorders. This is an example of the 'master and apprentice' situation present in so many studios at the time. In 1973 Manning was appointed Research Officer, alongside the first permanent studio technician, John Emmett, in due course replaced by Ron Berry. During the composition of *Caliban Impromptu* a store cupboard was used as a reverb chamber. Later John Emmett

²²² The presence of the Cathedral, in particular its bells, was to provide much compositional annoyance in subsequent years, and to this day!

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would design the first digital reverb unit for the studio. *Caliban Impromptu* was performed at the Cheltenham Festival in 1972.

By 1971 the studio was finally up and running and Lumsdaine had decided on the preferred design for the patch bay. Time spent in EMS on the MUSYS course had introduced him to the pin matrix type of connection and he preferred it to the more common patch bay. The second-hand matrix boards originally used for analogue computers were identical to those used in Zinovieff's studio, sourced from a second-hand electronics shop in London. The matrix was pillaged from an old analogue computer and the physics workshop enlisted to help create the printed circuit boards.²²³ The next process was soldering the components into place. All those involved with the studio would spend their spare time each day in the studio soldering, notably Manning, Emmett and Lumsdaine. By 1972 the matrix patchbay system was complete, and its installation gave the studio more stability. The 'packing case' era was all but over and individual pieces could no longer be easily reorganised or removed for performances.

In 1971 Lumsdaine and Manning visited EMS Stockholm and observed automated controls for stopping and starting tape recorders. Upon their return to Durham they began work on such controls. Their work was greatly aided by John Emmett, who on the departure of Peter Eastty had also started working in the studio on an informal basis prior to his appointment as technician in 1973. These remote controls made the composition of Lumsdaine's *Aria for John Edward Eyre* much quicker. *Aria* was a BBC commission for Soprano and double bass with chamber ensemble and live electronics. It was performed by Jane Manning and Barry Guy in 1973. In 1973 the University created two posts, one academic (research) which was secured by Peter Manning, and the second, that of a technician. John Emmett won this role and he was to serve the department until 1977 when he left to work for Thames Television.

The music department at Durham held concerts on Tuesday afternoons and postgraduate composers could have works performed, these mainly involved multitracking and filtering. The university concert series, Musicon, also joined in supporting performances of Varese's *Poème Electronique* and Stockhausen's *Kurzwellen* and *Kontakte* performed by Peter Manning. Lumsdaine returned from a research trip to Australia in 1974 and intended to

²²³ Lumsdaine 2005:Transcript

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complete *Big Meeting*, a work he began a number of years earlier, by recording the brass bands at the Durham Miners Gala. Apart from finding some of his tapes had been tampered with, Lumsdaine still did not have the piece of equipment he required to complete the work. Help was to arrive in 1977 in the form of Ron Berry, the new studio technician. Durham University was unusually generous to the Music department in providing the funding for two members of staff to be associated with the department, one technical and one academic. They also gave generously for the purchase and maintenance of equipment. Despite this the staff at Durham always thought carefully about their purchases and favoured in-house building to off the shelf purchases.

By 1974 undergraduate as well as postgraduate students were allowed to work in the studio. Many undergraduates from Durham went on to work for institutions such as the BBC. By 1976 the studio was a 'major teaching, research and development project'²²⁴. Emphasis was always given to the purchase or acquisition of high quality recording equipment as the staff at Durham, as at York, felt any studio without such a resource was at a serious disadvantage.

When Emmett arrived at the studio the portable Uher mixers formed the central hub of the studio. On his arrival he set about designing a mixer to replace these, which was completed by Ron Berry after his departure in 1977. Emmett also designed new devices specifically for the Revox tape recorders and by 1976 the studio was equipped with six remotely-controlled Revox tape recorders, a four channel Teac tape recorder and a set of eight Dolby noise-reduction units. Two of the Revoxes had their own speed change devices, added in-house. The Revox and Dolby set up remained almost unaltered until 2006. As mentioned, the staff at Durham preferred to create their own equipment and this was in no small way down to the skills of the series of technicians who worked there. By 1976 they created third-octave filter banks; four multi-function amplitude processors (companders) and a pair of digital delay lines, the starting point for research into digital audio devices.

One of Ron Berry's first tasks as technician was to complete this mixer, pending his design of the Mk 2 Durham mixer, completed in the mid-1980s. Berry continued to develop the studio. He designed his own range of equipment, partly in response to the continuing demands of *Big*

²²⁴ Manning 1976:14

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Meeting. In 1978 *Big Meeting* was completed on the day of the Miner's Gala, the annual event on which it was based.

In 1978 Berry completed his installation of the 24-track mixer, of his own design, the 'RB Mk. I'. At the same time the pin matrix system was removed and replaced by a conventional patch bay as, by then, the pins wore out easily and the mixer was prone to misbehaving. On one memorable occasion recounted by Manning and Lumsdaine, a cup of coffee was accidentally spilled into the matrix and the equipment slowly turned off as the components filled with liquid, turning on again as it began to dry out. The new mixer was of a more conventional design, subsequently replaced by the 'RB Mk. II' which was in constant use for teaching and composition until July 2007, when it was finally replaced. Indeed a great deal of the Durham studio in use today was designed by Berry, who remains part of the studio staff.

Although the full impact of pioneering efforts to establish facilities for computer music in the UK were not to impact for another decade, Durham, along with the studio at Cardiff (see below), was especially proactive in lobbying for access to suitable resources during the 1970s. In 1973 Manning was granted access to an IBM 1130 computer recently installed in the Psychology Department and started writing elementary synthesis programmes. Durham's link to the IBM 370/165 mainframe computer at Newcastle University subsequently led to the installation of Barry Vercoe's software synthesis program MUSIC360 in 1974. Problems with access to and conversion of the resulting sound files, however, severely constrained its use, and attention turned in 1976 to the possibility of running MUSIC11 on a newly installed PDP-11/34 in the Durham computer services department. Although this proved more viable access was of necessity very limited given the demands of other users. By this point York had become involved in similar initiatives and for a short period of time York and Durham entered a race to become the first UK university studio to be equipped with self-contained facilities for computer synthesis. In 1980, just three months before Lumsdaine's departure, Durham was awarded a grant of £20,000 and purchased a PDP-11/23 minicomputer. Using custom-designed analogue-to-digital and digital-to-analogue converters designed and built by Manning and Berry, MUSIC11 was up and running by December 1980, just months before York achieved an equivalent outcome. In 1981 a third PDP-11/23 MUSIC11 system had been installed at Nottingham, followed by a fourth at Edinburgh.

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David Lumsdaine left Durham in 1980 and took up a post at King's College London, becoming a leading figure in the SPNM. Now he works as a composer based between York and Australia. In 1980 Peter Manning was appointed as director of the studio and in 1981 John Casken was appointed as lecturer in composition. Casken left in 1992 to take up a post at Manchester University, and Berry was promoted to experimental officer in 1997. Of the original staff, Peter Manning is still the Director of the Durham studio, has written many useful books and articles on the subject and is a leading figure in electronic music today.

Morley College, London (1971)

Michael Graubart's appointment as Director of Music in 1969 facilitated an opportunity to establish a permanent studio at Morley College which was finally realised in 1971. The first classes were held in September of that year. From the outset, the emphasis had been on teaching the theoretical and practical fundamentals. Hugh Davies advised Graubart on equipment and his influence can be seen in the nature of the studio. The equipment consisted of two Revox G36 and two Revox A77 tape machines²²⁵ (one with variable speed and self-synchronisation), one VCS-3 synthesiser, a small stereo mixer, an amplifier, two large Tannoy speakers, headphones, two microphones and an oscilloscope. Unfortunately, much as was the case at Goldsmiths College for a number of years, the teaching space was not exclusively used for electronic music. At Morley College a solution was found by storing equipment on two large trolleys, which had to be wheeled in and out of a small store adjoining the room in which the classes were held. Some of the equipment could be operated from the trolleys but it was still a cumbersome process. Even when the college expanded into a new building in 1973 there was no room exclusively for electronic music. Cleverly, the equipment was installed on a large bench and shelves around the sides of the room, and lockable shutters were installed to protect it.

Even in its new home there was no central patching system. It was felt that 'a real understanding of the equipment could be best fostered by ensuring that students had to think out the matching and interconnecting problems themselves'²²⁶. Hence each item of major equipment was fitted with strips of quarter inch jack sockets on the front, enabling students to use whatever equipment they required (in situ or elsewhere) connecting it up by means of jack leads. This arrangement combined convenience with flexibility and allowed a number of

²²⁵ Graubart 1977:16

²²⁶ *ibid*

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students to work simultaneously. Graubart stated that ‘It seems to us that the criteria for a class-teaching studio and for a studio intended to be used by one composer at a time are, in fact, very different.’²²⁷ This observation was perceptive and important, highlighting the very different requirements of a studio that is entirely personal to an individual and one that is intended for use by a group of composers. It is impossible for a studio to be ideal for both outcomes and highlights the need for compromise in nearly all teaching studio situations. There was a need to develop a facility on a more compositional basis, one which was not dependent on teaching for income. This was to manifest itself as the various bids for a national studio which are detailed further in the following chapter.

Morley College also had a strong emphasis on live performance and the studio equipment was also used regularly by a live performance group. Graubart had a strong interest in tape music, both as an art in itself and for teaching purposes; hence Morley College was heavily biased to musique concrète and, later, synthesisers and tape music. Teaching at the studio comprised an evening class, teaching primarily sound, hearing and the theoretical aspects of the use of equipment but including some analysis of electronic compositions, and a Saturday class where the students could use the studio for their compositional work, rotas being arranged when necessary to ensure the most efficient use of time and equipment. The staff consisted of the Director and Tutor, Michael Graubart, who also taught the theory class, and various visiting lecturers including Harrison Birtwistle, Tristram Cary, Lawrence Casserly, Hugh Davies, Lily Greenham, Stanley Haynes, Roger Smalley and Peter Zinovieff.

Albeit in a very different way to York in terms of its postgraduate community, the association of so many practitioners with a single institution created a community of an equally important kind. Although by the very nature of the institution contact between these individuals was more one of unplanned contacts when two or more people were on the premises at any one time this environment facilitated opportunities for key people to discuss issues of common interest, further underpinning what was eventually to become a sense of common purpose in seeking a national studio for electronic music.

²²⁷ Graubart 1977:16

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University College, Cardiff (1971)

The studio in Cardiff differs from others at the time because it was situated in the physics department rather than the music department. As Keith Winter states in his article in *Contact Magazine*, this was ‘bound to affect the nature of any electronic music studio’²²⁸. From the outset there was a heavy emphasis on computer music and there was ‘a more scientific approach to the use of equipment, an approach which has been noticeably absent in Britain until recently’²²⁹.

As early as 1969 the software synthesis program MUSIC IVB was running on the college mainframe computer, but slow speed conversion facilities led to its eventual abandonment. Attention then turned to a small PDP-8 computer which, although not capable of hosting synthesis programs such as MUSICIVB, was very adept at providing a computer control environment, much in the manner of Zinovieff’s MUSYS system, and also could be used for specific synthesis tasks.

In 1971 a grant from the Leverhulme trust enabled the building of the studio and by 1975 it was capable of four-channel operation. It was designed to be operated by one person, with remote controls to all devices and an 18 channel mixer. The studio was built around a Synthi 100 purchased from EMS. The Synthi 100 had been modified a little, but no radical changes were made. For example, the filter and oscillator amplitudes could be directly voltage-controlled by the composer to make amplitude and frequency modulation spectra simple to control, and the sequencer had another button to provide single clock pulses, useful for inserting predetermined event timings into the memory.

Cardiff also had another studio, created for live performance, equipment centring around a digital organ and an eight channel mixer. The organ generated each frequency from a single voltage-controlled oscillator and an envelope pulse either on each chord or each new note depending on the setting. Being voltage controlled, the whole keyboard output could be frequency modulated to produce complex timbres and textures. There was also a range of special devices designed for specific events, including voltage controls, operated by feet,

²²⁸ Winter 1975:31

²²⁹ *ibid*

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hands, light and other interfaces and a range of microphones including minute contact microphones for instrumental use²³⁰.

By 1975 the Cardiff studio had a strong emphasis on developing digital hardware, perhaps because of its association with the Physics department. Winter states:

‘The future looks bright for digital hardware, and already it is possible to build fast microprocessor systems for the real-time control of electronic sound in various coded forms.’²³¹

Winter also felt that ‘The special environment of the Cardiff studios will continue to contain a combination of music, physics and psychoacoustics so necessary to a composer of electronic music. . . after the large computer programmes of the 60s this flexible ‘small’ technology will inevitably change the shape of electronic music studios in the future.’²³²

The link with psychoacoustics is not found elsewhere at the time and the predictions about digital computer music were to prove correct.

In 1975 Cardiff ran an undergraduate degree in Physics and Music, and a postgraduate diploma or MA in Electronic Sound. Keith Winter was the Director of the studio and Mike Greenhough a postdoctoral research assistant.

West Square, London (1971)

The Studio at West Square, London, was set up in September 1971 by the composer Barry Anderson. As a composer interested in electronic music, Anderson was increasingly frustrated by the lack of facilities and when appointed to a full time post at the South Bank Institute he set up the studio at West Square. West Square, near Elephant and Castle, was a specialist Adult Education Centre attached to the South Bank Institute, which fell within the Inner London Education Authority. Previously Anderson had worked at Goldsmiths College and the City Literary Institute, teaching piano. It is likely he came across the Goldsmiths College studio and its design may well have influenced that of West Square. Initially the

²³⁰ Winter 1975:31

²³¹ ibid

²³² ibid

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studio was no more than a borrowed EMS Synthesiser-AKG synthesiser, a microphone and a couple of tape recorders²³³.

The studio had two main foci, the teaching of electronic music, and the performance of live electronic music. This approach, geared toward teaching and performance rather than individual composition, meant that the studio was able to offer facilities to a relatively large number of people. And this is a key consideration in a teaching environment where funding for equipment, staff and courses is directly dependent on numbers of students able to take the class. Hence, by opening up the studio to a large number of students, funding was secured. Not that the opportunities for individual composition and research were not available. On the contrary, students were encouraged to use the studio when no classes were taking place for their own or group project work.

As at Durham University the studio was housed in a series of rooms which had been designed in the first instance for other uses. The West Square studio was in an old, late Victorian building with narrow corridors and winding stairs. Considerable ingenuity has gone into adapting for working use that part of it which has been assigned as a studio. Two rooms, each capable of holding up to fifteen people in reasonable comfort for lectures and somewhat fewer for practical use, were set up for teaching and working. A largish open foyer became the technical workshop, and another much larger room was used for group rehearsals and recordings. West Square suffered in the same way as Goldsmiths and Cardiff in that some of the rooms were used for teaching other classes. However during the vacation the whole set of rooms became available for studio use.

The West Square studio developed a strong link with the electronic music studio at the City Literary Institute, sharing facilities and equipment. Contact began in 1973 when West Square provided studio time for a group of City Lit. students until their own studio was ready. From 1973 to 1976 an increasing number of composers produced works at West Square and the studio was becoming overstretched. In 1974 John Dodd joined the studio as the first full-time technician and the studio was able to develop. The maintenance and repair of equipment, which had been a growing problem up until then, could be carried out in the studio and improvements in equipment could be made. At this point the idea of a central patching

²³³ Montague 1988:13

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system was considered but abandoned in favour of retaining the mobility of the studio. Under this system, pieces of equipment could be removed and used for concert performances, which were important to West Square.

One of the main developments by Dodd was the construction of a multiple and variable tape-delay table, principally for performing Stockhausen's *Solo* for melody instrument with feedback. As Anderson states:

‘After two years of struggling with the thorny problems of extended tape transport (up to forty feet) and some quite disastrous early performances of *Solo*, this apparatus now functions acceptably well: in its way, it is a unique device for concert work. A mark II version in aluminium, again using Revox stereo replay heads but with improved preamps based on ICs, has been designed, and we plan to start building this in the autumn.’²³⁴

The West Square Electronic Music Ensemble was set up in 1975 as a result of the studio's emphasis on live performance and subsequent success in the field. This group comprised musicians and technicians with a common interest in working together to develop the skills and experience essential for the performance of the growing number of works for live electronics. Working with leading performers, emphasis was on the realisation of works which explore and extend new instrumental and vocal resources, acoustically and electronically. Their first concert was given at St. John's Smith Square in 1975 and was well received.

The West Square Electronic Music Association was formed in August 1975, aiming to encourage new composition and offering the means for realisation and performance. The Association sought to bring composers, performers and engineers together to work in an integrated yet flexible milieu. The Association was assisted by the Greater London Arts Association and the Arts Council enabling it to commission a number of new works and promote concerts at St. John's Smith Square and the Round House.

²³⁴ Anderson 1977:24

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University of Surrey, Guildford (1971)

The studio at the University of Surrey had an entirely different approach to others in the UK since in the first instance its primary objectives had little to do with electroacoustic composition. Surrey University Music Department's recording studio was first and foremost a training ground for student Tonmeisters. A Tonmeister is a German term meaning a person trained equally in the theory and practice of music and in the technical aspects of recording and recording production. The Tonmeister concept first took root in 1946 in Germany, where a Tonmeister Institute was formed at the Hochschule für Musik at Detmold. Since 1946, training for Tonmeisters has been established in Berlin, Dusseldorf, Stockholm and Warsaw. Though the basic philosophy is similar in these institutions, at Surrey, where the course began taking students in 1971, the style and weighting of training between musical and scientific teaching varied a good deal.

The University of Surrey was built in the 1960s as a technological university. From the outset Professor Reginald Smith Brindle, the Head of Department, held a strong regard for the role of mass communication in present-day musical affairs. The Music Department ran two courses, one combining academic studies with a degree of specialisation in one or more practical disciplines (instrumental performance, conducting, composition), and a second for Tonmeisters. The Tonmeister course ran in collaboration with the Physics Department, and included additional training in mathematics, electronics and electroacoustics and sound recording techniques. Students from both courses worked with electronic equipment and the studio possessed a portable recording studio. The performance students would assist the Tonmeisters by being recorded and would in turn have a record of their performance.

The Tonmeister course took four years and the third year was a professional placement. The Senior Lecturer in Recording Techniques, John Borwick had final approval over all placements, which were taken in various sectors of the recording and broadcasting industry in Britain and abroad. The industrial year gave students an opportunity to practice basic techniques in a professional environment and was, as far as I can tell, unique among university courses at the time. The Tonmeister course was essentially academic, and Robin Maconie, writing in 1977, felt 'that the academic side is growing in significance as music comes more and more to rely on technical judgement for its intended effect'²³⁵.

²³⁵ Maconie 1977:24

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The University of Surrey sought to bring professionalism to studio design and operation and claimed to have the only ‘appropriately thorough course structure in the use and maintenance of electronic equipment on which the quality of musical output substantially depends’²³⁶.

They directed experimental work towards refinements of stereo recording rather than research in any other areas. Studio time was limited and it was not possible for students to spend time in the studio getting to know the machines. This is certainly different from other universities at the time. The Music Department studio and control room were situated in the basement and ground floor of the University Great Hall. Performances in the Great Hall were recorded via six tie-lines direct to the control room and monitored by closed circuit television.

When Robin Maconie joined the Music Department in 1975 he immediately placed an emphasis on enhancing student awareness of the historical and aesthetic significance of recording media in the development of Twentieth Century music. Maconie was an expert on Stockhausen and felt that as the studio had such good facilities for recording they should also be used for composing. The studio’s long term objective was to develop as a composing facility, which seems a little surprising as it seemed to actively discourage creative activity. The department’s holdings of student tape portfolios, including a proportion of original compositions, are considerable, but much of this material is of limited intent and interest. Most student work was at a basic level and was in most instances superseded by subsequent production work done after University whilst in employment. Unlike other departments, Surrey preferred not to be drawn into competition about the number of works produced or visiting composers entertained, regarding the field of electronic, concrète and computer music as one in which much essential groundwork had still to be done, both artistically and technically.

University of East Anglia (1973)

The Electronic and Recording Studio at the University of East Anglia came into being in 1973 when the music part of the School of Fine Art and Music moved to new, purpose-built premises. Funding for the studio came mainly from the generous Nuffield Foundation and consultancy over equipment was the responsibility of Tristram Cary who sought the advice of EMS London Limited. Tryggvi Tryggvason, fresh from work at Decca, began work as the

²³⁶ Maconie 1977:24

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sound engineer during the summer of 1973. His first twelve months were spent correcting anomalies, continuing the purchase and installation of equipment, and setting up the M. Mus. sound recording course. He was responsible for the day to day administration, and teaching related to sound recording.

The studio at the University of East Anglia suffered some unfortunate turns of events on its path to fruition. Compositional activities began to take shape in October 1974 when Ian Bonighton was appointed to lecture on the subject but were short lived, as events took a tragic turn. In May 1975, Bonighton's accidental death halted the development of composition. As, in line more generally with universities' financial restrictions at the time, his vacant post was automatically frozen. Until October 1975, when Denis Smalley was granted a one year fellowship, no teaching or composition took place. Smalley's appointment was to cover essential teaching and composition development and he became a permanent member of staff a year later when the lecturer's post was unfrozen. A second blow at this difficult time was the resignation of the studio technician only a month after Bonighton's death, leaving the studio with no permanent staff. This post was also frozen and a replacement could not be employed until the Autumn term 1976 when Michael Lewis, formerly of Grundig, joined the team.

The studio at the University of East Anglia comprised the sound engineer's office, technician's workshop and the studio itself, a large rectangular room capable of dealing with classes of up to twenty people. The studio functioned well for both composing and as a control room for professional sound recording. The three studio rooms are at first floor level, adjacent to the balcony of the concert room, which is designed as a large, orchestra-sized recording studio in addition to its other roles for concerts and teaching. The concert room had acoustically variable surfaces and was linked to the recording studio by twenty microphone lines and closed-circuit television.

The equipment comprised a Hewlett Packard System 2100 computer, an EMS Synthi 100, a VCS-3 synthesiser and several Studer, Teac and Revox tape recorders. The System 2100 computer, a gift from the international insurance brokers, Faber, Willis and Dumas, was installed in April 1976. By the following year the studio staff had worked out how to use the computer and were able to develop an elementary mixed digital synthesis system. The System 2100 was a relatively obscure computer, primarily designed for scientific data

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acquisition and control applications. Although it lacked the computational capacity of a PDP-11 computer it was more versatile than the PDP-8. However, with no prior use of such an architecture for music applications, all the software had to be written from scratch. By 1977 sufficient progress had been made to underpin Smalley's intention to develop a 'three generation studio, a confluence of the classical studio with its still very much indispensable techniques, the analogue synthesiser and a mixed digital synthesis system.'²³⁷ The studio also opted to purchase a portable mixer. 'The Midas mixer was purchased for outside recordings but along with the Lockwood Major and Tannoy speakers provides a flexible, interesting and powerful diffusion system for electronic music concerts.'²³⁸ The presentation of electronic music concerts was an important part of UEAs philosophy, and Denis Smalley felt that 'without it a composition studio can easily become inward-turning'²³⁹. The equipment from UEA was used in the Norwich and Norfolk Triennial festival in October 1976 and in the following month for a series of concerts of works for the Arts Council's Contemporary Music Network.

Courses offered at the University of East Anglia included both under and postgraduate study. All students in composition were required to complete a studio apprenticeship whether or not they intended to compose electronic music. Out of term the studio was made available to outside composers. Smalley stated in 1977:

'so far, the studio seems to have been particularly attractive to French composers, partly because of my contacts with them, partly because of our equipment, and also because of the surfeit of trained composers compared with the lack of open studios in France'²⁴⁰.

Indeed the Groupe de Recherches Musicales and IRCAM had notorious closed door policies. Denis Smalley made the following statement in *Contact Magazine* in 1977:

'Composers and commentators have recently been talking about what they call "the crisis in electronic music". Changing technical possibilities and ideas have not been paralleled by changing musical concepts. The result has been a confusion between

²³⁷ Smalley 1977:14

²³⁸ *ibid*

²³⁹ *ibid*

²⁴⁰ Smalley 1977:15

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means and ends, reaction and progress, and in the extreme, a situation where potentially progressive tools are used to create backward-looking products. Now that our basic equipment, mainly of very high quality, is installed with permanent personnel to work with it (a technician is perhaps more important than the equipment itself), we like other studios are entering a period of reassessment.’²⁴¹

Denis Smalley moved to City University in 1994 and retired in 2009.

University of Glasgow (1975)

In approximately 1972 Glasgow University appointed a lecturer in electronic music but they did not have a studio until 1975. In the interim period the music department received substantial grants from the Court of the University and the Scottish Arts Council for equipment and buildings. Exact dates are unknown; however, Stephen Arnold mentions in a 1978 article in *Contact Magazine* that ‘it took five years from the decision by the music department of Glasgow University to appoint a lecturer with special responsibility for electronic music to the opening of a working studio in purpose-built premises’²⁴².

Emmerson stated in 1975:

‘Some of the most advanced equipment is to be found at the Glasgow University studio which should open later this summer, with 16 channel tape recorder and mixing facilities and the large Synthi100. This situation is unique in that an outside concern (the Scottish Arts Council) is taking an active and continuous interest, and the project is seen as a regional studio.’²⁴³

The Glasgow studio was part of a complex of rooms including a concert hall seating approximately 300, green room and technician’s workshop. The concert hall and the green room could be used as recording studios with the main studio functioning as a control room, and the technician’s workshop could be used as a small studio independent of the main studio. In 1978 Arnold states that:

²⁴¹ Smalley 1977:15

²⁴² Arnold 1978:20

²⁴³ Emmerson 1975:26

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‘The studio still required a permanent communications system between the concert hall, green room and studio, something that most other studios had by that time. Other items of equipment felt to be lacking were a portable mixer for live electronic music and for the performance of tape music, higher-quality two- and four-track tape machines, and a wider range of microphones.²⁴⁴

Arnold also desired to further develop digital controls, and create a digital synthesis system. As with Goldsmiths College, in order to justify the studio, it was necessary to provide students with direct experience of electronic music and recording techniques. Electronic music was integrated into the BMus course at Glasgow and was compulsory for 3rd year students, with their work assessed for their final grade. Unusually and perhaps uniquely, students were also required to sit a three-hour degree examination covering the History, Theory and Practice of Electronic Music.

The Glasgow studio had links with the Department of Electronics and Electrical Engineering. Parallels can be drawn with the Durham University studio which also had links with the electronics students, but in a much more informal way. Several final year electronics students spent their term-long practical project making equipment to enhance the studio. In 1977 students built a complex, voltage controllable, variable speed control for tape machines and a comprehensive remote control for the Ampex 16-track tape machine.

The Glasgow studio was based around two EMS systems, the Synthi 100 and its ill-fated extension the Computer Synthi²⁴⁵. In 1978 there were only three EMS Computer Synthi machines in existence, at Glasgow, Paris and Oxford. The Computer Synthi contained a DEC PDP-8A processor with 4K core, 24 analogue-to-digital converters, 24 digital-to-analogue converters, a crystal clock, 16 sliders, 64 push buttons, a display and a dual digital cassette system. It could produce a single layer sequence of up to about 40 minutes. Arnold states that:

‘at the moment the Computer Synthi is best viewed, in terms of its potential musical function, as a vastly extended EMS sequencer, but with greatly improved editing and

²⁴⁴ Arnold 1978:21

²⁴⁵ Peter Eastty was contracted by EMS to develop the interface for the Computer Synthi, however he departed for IRCAM before the design was complete. As a consequence it never achieved a viable commercial status.

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the possibility of inputting data directly from the push buttons (not just getting it from the Synthi 100).²⁴⁶

The link with EMS is interesting as in 1978 Graham Hinton resigned as technician at the Glasgow studio to take up a post at EMS. Staff at Glasgow, most likely Hinton, made modifications to the Synthi 100 including replacing the frequency controls with locking ten-turn potentiometers which allowed accurate setting of frequencies; restructuring the inputs and outputs to give better signal-to-noise ratios; increasing the panning possibilities; improving the reverberating circuitry; adding sensitivity controls to the envelope triggering and a patching system linking the audio and control matrix boards allowing any signal to function as a control voltage.

The studio was used only by students during term. Out of term, however, and particularly during the summer vacation, composers were able to book studio time. Composers working in Scotland could apply to the Scottish Arts Council for bursaries to cover the costs involved. By 1978 Glasgow was considering running courses for small groups of composers in order that they become familiar with electronic music techniques and the Glasgow studio in particular. Compositional output of the Glasgow studio at this time was modest, about fifteen works, mostly by students, were completed by 1978. Composers Lyell Cresswell, Edward Maguire and Stephen Arnold also created some works, most involving pre-recorded tape plus live performer(s).

Royal Academy of Music

Found in the Hugh Davies archive is a shopping list of equipment headed as 'RAM studio'. It states that '£250 to start with still won't get us a Revox!?!'²⁴⁷, usefully highlighting Davies frustration with the amount of money available to set up the studio. Davies lists the equipment he can buy with the small budget and a list of questions shows that this document was prepared in the very early stages of planning for the Royal Academy Studio. Questions include, 'who directs? . . . any installation fee – week's work. . . function, who uses it and for what types of EM (live, taped), how much teaching'²⁴⁸. As noted earlier Davies played no further role in development of the Royal Academy of Music studio. Information on this

²⁴⁶ Arnold 1978:20

²⁴⁷ Davies *RAM Studio*

²⁴⁸ *ibid*

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studio has not been forthcoming and nothing further is known save the following presented on the Royal Academy of Music Facebook page and Wikipedia. The RAM acquired its first full equipped electronic studio in 1976 as part of a major development resulting from the acquisition of new adjacent space, which included also and opera theatre built with funds from Sir Jack Lyons (who also had funded the Sir Jack Lyons concert hall at York in the late 1960s).

City University (1975)

Malcolm Troop studied for his PhD at York under Wilfrid Mellers and was the first head (later Professor) of Music at City University. The department and music degree course were established in 1975. The philosophy was the same as York. Everything was new. From the beginning there were courses in ethnomusicology, electronic music, and in music and technology, for which Troop should be credited. The first PhD studentship (funded by the Worshipful Company of Musicians) was given to Simon Emmerson, who was interviewed for the post by Peter Manning from Durham alongside Troop. Emmerson actually predates the department, arriving in 1974, as a research student in the centre for Arts and Related Studies.

The studio at City was influenced by Emmerson's experience working as an invited composer at the Durham studio. Emmerson spent time at the Durham studio in both 1975 and 1976, during which time he created a piece for the live performance group Intermodulation. He returned to City and in 1977, guided by his experiences at Durham and with the help of Peter Manning, set up the studio. Its design was similar to the Durham studio and contained the same Revox controls, similar desk and monitoring, and similar patch to VCS-3. The creation of the studio signalled the start of developments which were soon to secure its status as a leading centre for electroacoustic music. During the academic year 1979-80 Jonty Harrison worked as a visiting lecturer. Computer music at City developed further with the appointment of a second Worshipful Company of Musicians Research Student, Kevin Jones, 1976, subsequently a research fellow. At about this time Stanley Haynes, a research fellow, installed MUSIC V on the mainframe computer.

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University of Birmingham (1978)

Little is known of the early days of the studio in Birmingham and despite efforts over several years I have not been able to find any more information. Jonty Harrison came to Birmingham in 1980 and took charge of the Electronic Music Studio. Under his guidance the studio developed into the world leading facility it is today. Live performance was an increasingly important factor in electroacoustic music, one of the most successful and well known performance systems was created at the University of Birmingham. Birmingham Electro-Acoustic Sound Theatre (BEAST) was formed in 1982 by Jonty Harrison as a platform to showcase electroacoustic music and the music produced at Birmingham's Electronic Music Studios was performed using this set up.

Closing remarks on university studios

By the end of the 1970s electroacoustic music studios had been established in a significant number of UK institutions and the pioneering era was drawing to a close. In an academic context the situation thus appeared very promising. In a national context, however, the UK still lacked a flagship facility to match what was available in continental Europe, and there was now a critical mass of electroacoustic composers to press forward with an agenda to achieve such an outcome. It is these developments which form the central theme of the next chapter.

As the title of this chapter suggests a key consideration in charting the birth and early development of these studios is the importance of their associated communities, not least in creating fruitful environments for discourse and discovery. Whereas it has been shown that the lack of such a community, most notably in the case of the Manchester studio, can seriously undermine such initiatives, it is also clear that small groupings of perhaps just two or three people can produce useful synergies for the development and exchange of creative ideas. Thus the lack of much larger communities at this time in the UK comparable to those working elsewhere (for example the GRM in France), while perhaps militating for a more distributed pattern of activities rather than a common focus, did not prove a material disadvantage, for the following reasons.

The university studios discussed above are all representative of the burgeoning community that was beginning to grow around electronic music. Without the centrally organised

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community that existed in some European countries, composers in the UK were at what seemed like a disadvantage as they were left unsupported and lagging behind other countries. In fact, what transpires is that this was not a disadvantage, rather an advantage. As composers had to create their own communities they were free from the prescriptive doctrines of a centrally organised community. Communities for electronic music in the UK were essentially a support network allowing a mutual sharing of ideas and generally campaigning for the development of the medium. In the early years there was a need for the sharing of ideas on a basic technical level in order that equipment could be built or sourced. The communities which developed at universities were physical communities but equally important were the virtual communities which developed around the societies and mailing lists devoted to electronic music. For lone composers and technicians the sense of community gained by joining a society or subscribing to a magazine was of paramount importance. As technology developed many more communities developed online and access to these has become increasingly easier.

Communities exist on several levels and perhaps could be viewed as concentric circles. A small community develops around a new university studio and the sharing of ideas help the studio to develop. Composers and technicians at the studio are members of different larger communities. The composer may subscribe to a journal and the technician may discuss equipment with a technician from another studio. They hear of ideas and developments in the medium and use some, but not all of them, in their studio. The studio thus has several outside influences but is able to pursue its own philosophy. The smaller communities are strong enough for individual ideas to have the support they need to develop without being swamped by the ideas of the larger community. The smaller community can take what it requires from the larger community and not be smothered. This meant that although development was slow to start in the UK, eventually many studios were created with differing ideologies.

There was a heavy reliance on commercial equipment, with a strong trend towards equipment produced in the UK, particularly that of EMS, but also the creation of specific equipment in-house. The sharing of ideas amongst those building equipment was paramount. Magazines such as *Wireless World* were vital in the creation of equipment for early studios. Manning states in 1979: 'It is interesting to observe that many studios in Britain, particularly those

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providing technical staff, have developed ancillary equipment of their own. This trend seems to be on the increase and is encouraging²⁴⁹.

Without communities, in whatever sense, there would have been no drive to create a national studio; this discussion will form the core of the following chapter.

²⁴⁹ Manning 1979:9

Chapter 4: The National Studio Initiatives

The perceived need for a national studio for electronic music in the UK began to materialise during the early 1960s when it became clear that the BBC Radiophonic Workshop, opened in 1958, would not be made available for composers other than those specifically contracted to produce programmes commissioned by the BBC. Although it has to be recognised that access to the studios funded by the equivalent broadcasting institutions on the continent was by invitation only, the complete absence of support for such composers in the UK became a source of increasing frustration. This intransigence was a powerful stimulus for those motivated to seek ways and means of establishing a national studio which would, in contrast, be accessible to the wider community.

The history of the various initiatives to establish such a studio thus provides a revealing perspective on the evolution of electronic music in the country from the early 1960s to the late 1990s, when after a succession of failures it finally became clear that the development of technology had reached the stage where the case for such a resource was rapidly diminishing. A major stimulus for such initiatives was the progressive establishment of university studios, starting in the late 1960s. The growing number of composers associated with these developments stimulated a number of initiatives to establish collaborative associations, in particular to pool equipment for performances, and the resulting interactions between these key individuals provided a natural forum to discuss the possibilities of establishing a national studio.

The early university studios, while undoubtedly pioneering, were for the most part seriously under-funded. In the late 1960s and early 1970s little money was available in the form of institutional grants for the purchase of equipment, given that expenditure on technical resources in music departments, apart from for instruments, was in almost all cases without precedent. With the possible exception of York University, which as a new university had a purpose-designed music department, studio accommodation had to be procured from whatever space could be found. The Durham University studio, for example, housed in a former basement flat next to the Cathedral, lacked sound-proofing and had only a limited space to house all the associated resources. Equipment during the early days was generally very basic, and many of the early university studio directors supplemented the limited

resources with items which were privately purchased. Since most studios amounted to little more than individual items of equipment loosely wired together the various components could be easily moved and re-configured. It was indeed as a result of this flexibility and portability that it became possible to pool equipment from different studios in one place for a large concert of live electronic music. The one notable exception to this rule was in the case of the select group of studios who managed to secure the funding for a Synthi100. This was certainly not portable but this, if anything, reinforced the case for establishing independent repositories of equipment which could be taken out on location both for outreach work and also, most importantly, the promotion of electroacoustic music through public performance.

As these studios developed and matured, there was an increasing emphasis on hard-wired installations in order to ensure the reliable routing of signals. This trend towards more permanent facilities provided a further incentive for establishing a separate pool of portable equipment, ideally that could be shared. As will become clear in due course, this concept of sharing resources for concert performance was to become a priority for a number of groups established to further electroacoustic music, notably the Electronic Music Universities Co-Operative established in the early 1970s and Electroacoustic Music Association (EMAS), set up in 1979, later becoming Sonic Arts. Issues such as this soon became embedded as part of a much bigger agenda concerning the desirability and functional nature of a national studio. Unpacking the protracted and, at times, quite complex sequence of events is no easy task, but the resulting perspective reveals useful and arguably important information on the development of electroacoustic music in the UK.

The path to a national studio

As early as April 1966 Tristram Cary wrote on the need for a national studio. An article entitled *Electronic music: A call for action* was published in the *Musical Times*. Cary outlines two solutions to the problem of a national studio:

‘One would be a first class studio attached to a university, so that access could be had to really expensive devices like computers where necessary, and where special circuitry could be developed by the electronics department of the same university. . . . The Second solution is more ambitious but could be very exciting. It would consist of a National Institution to study and develop all low frequency phenomena whether electrical or physical or both. It would bring together a great deal of diversified work

now being done by government and industrial laboratories. It would include ultrasonics, acoustics of buildings, musical instrument design, microphones, loudspeakers and all kinds of transducers, including echo-sounders and the like, all sub-sonic, audio and supersonic electronic devices and recording techniques, electronic and normal music (as a physical study), noise reduction, vibration analysis of structures, sonic boom etc. etc.’²⁵⁰

Cary’s statement shows great insight at an early stage. By the following year the university studio at Goldsmiths College had been established, and as already noted others were soon to follow. Although these shared a number of features in common, for example the provision of microphones, a mixer, tape recorders and monitoring loudspeakers, the choice of equipment for synthesis and signal processing varied markedly from studio to studio. Whereas the development of commercial equipment, notably voltage-controlled synthesisers, provided an element of shared experiences the retention of classic devices such as oscillators and filters obtained from a variety of sources and even in some instances (such as at Durham) the production of custom-designed facilities ensured a significant degree of individuality from one studio to another. With the notable exception of Peter Zinovieff’s private EMS initiative it was indeed to be the case that the only possibility of accessing any computer equipment at that time would be via a university.

The second part of Cary’s statement was to provide as important catalyst for the more ambitious quest for a national studio, starting with an initiative established by the Society for the Promotion of New Music (SPNM).

SPNM electronics sub-committee

On 16th August 1967 John Woolf, Honorary Secretary of the SPNM, wrote to Hugh Davies, reporting that ‘at last week’s committee meeting it was decided to form a sub-committee to look into the possibilities and problems of electronic music in relation to the society’²⁵¹.

Davies was asked to sit on the committee alongside Don Banks and David Blake. The meeting was set for 25th September 1967. This reference to electronic music highlights the generally negative view of electronic music in the UK at this early stage. It is often referred

²⁵⁰ Cary 1966a:313

²⁵¹ Woolf 1967:Letter

to as a problem in contemporary documentation (the attitude of the BBC has already been discussed) and hardly ever in any positive way.

At the meeting the sub-committee first compiled a list of known electronic studio projects which at that time included studios at University of Manchester; Goldsmiths College; Sheffield University; University of York; University College, Wales; London University; Guildhall; University of Surrey; BBC Radiophonic Workshop; and the Royal College of Music. Some of the projects listed, however, were to prove aspirations rather than realities.

Of these only Manchester and Goldsmiths were listed as ‘studio functional’ which rings true, when we consider the information presented in previous chapters. Studios proposed at University College, Cardiff and Surrey were set up in the following years, although the Surrey studio was to become primarily a studio for training broadcasters. The Royal College of Music studio has no annotations in this compilation but Davies will have been aware of it from his correspondence with Tristram Cary which led in turn to his involvement with Goldsmiths. Of the remainder, the Sheffield University studio is listed with a note saying ‘question this, it is not music dept., but believe that there is a studio’²⁵², The inference here is that the initiative might have come from someone perhaps in another department, for example engineering or computer science, but no evidence has come to light to resolve this issue. It is interesting to note here that the Cardiff initiative was indeed attached to the physics department, completely unsupported at this time by anyone in the music department. The reference to London University which also has a question mark is undoubtedly King’s College and the interest of Thurston Dart discussed in the previous chapter. The final studio is that at Guildhall listed as ‘studio proposed, but at least a year before anything starts’²⁵³. The only reference to electronic music at Guildhall is that, from 1971, students were taught at Goldsmiths.

The BBC Radiophonic Workshop was operational by this stage and reference is made to ‘an approach made by Peter Dickinson – follow up’²⁵⁴. It would seem from this that the subcommittee members were still hopeful that the BBC might be persuaded to change its policy on access. Sadly this was not to be, as has already been noted.

²⁵² Banks & Davies 1967:1

²⁵³ *ibid*

²⁵⁴ *ibid*

Following this meeting, Davies and Banks laid out their plans for an open access studio. Interestingly, they were far from certain at this stage if such a studio should be planned at all. They stated that ‘Should it prove necessary for the SPNM to start its own studio, this could be commenced in a modest way’²⁵⁵. The notes from their discussion show the following basic requirements:

1 room (preferably with room for expansion)

Equipment – estimated cost £1000 consisting of:

2 Revox Tape Recorders

Tape Deck (for editing) and possibly a Reflectograph with variable speed?

Filters

Sine/Square Wave Generator

Microphones

Services of a part time technician (say 2/3 evenings per week)²⁵⁶

At the time such an initiative would have created a useful if somewhat modest studio independent from any educational institution. However, it would not have begun to compare with the facilities soon to be available even in the early university studios and was no match at all for what was to materialise in Zinovieff’s studio. Also at this meeting Davies and Banks attempted to define the requirements for studying electronic music, comparing the time needed with that for studying a musical instrument, and suggested that the absolute minimum studio time for each student should be two hours, twice a week. They also suggested that a course might involve working with a technician and watching a more advanced student at work. After this introduction the participants would have two hours a day, over two weeks, to work with the equipment.

It seems reasonable to propose that, this meeting was the moment when the earliest plans for a national studio in the UK were mooted, although it has to be recognised that the initial aims were very modest. Although it not possible to prove conclusively that this is the case, the lack of evidence to the contrary suggests strongly that these were the first serious musings. Despite the abovementioned attempt to persuade otherwise, the BBC Radiophonic Workshop

²⁵⁵ Banks & Davies 1967:1

²⁵⁶ *ibid*

was not a contender for a national studio as it had been operational by this time for nearly a decade and yet the BBC had shown no signs of a desire to turn the workshop into a national facility. In fact they had actively discouraged any compositional activity. Indeed Daphne Oram resigned from the BBC within less than a year after its establishment. She was to observe on a number of occasions how obstructive the BBC had been during the period leading up to the establishment of the Workshop to her personal ambitions to compose, so much so that tapes, painstakingly made in the middle of the night, often disappeared from the studios. Peter Zinovieff's EMS studio however, was well established by this stage, well in advance of the BBC technically and on a par with activities on the continent, if a little behind the intended schedule. By the end of the 1960s it was also pioneering computer technology.

The next meeting of the SPNM Electronics Subcommittee was held on 5th December 1967. This time Davies and Banks were joined by David Blake and George Newson. Their discussions covered the relative merits of the American Moog and Buchla synthesisers culminating in Davies and Newson recommending the purchase of a Moog. David Blake sought reassurance that it would not necessarily be assumed that the proposed studio had to be located in London. He was at the time in the process of setting up the York studio and this provides an early example of the tensions that were subsequently to arise in this regard. In response the committee agreed to assess all of the available studios in the UK at that point recording in the minutes that:

‘The SPNM should contact not only those university departments who had already evinced interest in such a scheme, but should send a questionnaire to those other departments and organisations who either (a) had already considered planning a studio, or (b) would be encouraged (in the light of an SPNM contact) to consider such a venture.’²⁵⁷

Clear statements of intent such as this, endorsed by comments raised in interviews with those active at the time, suggest there was a clear intention at this time to house the national studio at one of these existing venues if they were found to be appropriate.

²⁵⁷ Banks & Davies 1967:1

The minutes go on to state that George Newson had recently returned from working in America and found it frustrating that there was ‘absolutely nowhere’²⁵⁸ he could work in his own country. He explained that in America he was able to work for up to twelve hours a day for several weeks at a time. The committee concluded that this would not be possible in the UK in the short term. They decided to focus on two aspects of studio creation, to establish a major studio project and to create small projects for training the younger composer. They stated that the amount of studio time available would depend on negotiations between the composer and the SPNM.

Following this observation the first signs of a potential rift can be detected. In response Blake champions York again:

‘He thought generally that there should be further cooperation between York and the SPNM, and why not have the composers’ seminars at the university?’²⁵⁹

He also stated that York was in an advantageous position as it had the cooperation of the Physics, Maths, Computer and Music departments. Banks then stated that University College, Wales was in a similar position to York and that they were about to install a digital to analogue converter. At this point Blake left the meeting. No reasons are given for his sudden departure, but this abrupt conclusion of a potentially very important discussion suggests that even at this early stage divergent views were likely to prove problematic. The issue of a London based studio was to arise again in later national studio bids, and material tensions were to arise in the context of those stakeholders who were active at some distance from the capital. It is thus somewhat ironic that the last three major bids, starting with the South Bank initiative in the mid-1980s, progressed from London, to Birmingham, and finally to Yorkshire.

Finally the committee prepared a questionnaire and a list of addresses to send it to. It stated that ‘from summer of 1968 [the SPNM] will be in a position to support projects in this field’²⁶⁰. Funding would be available for a major project and a series of smaller projects. A

²⁵⁸ Banks & Davies 1967:1

²⁵⁹ *ibid*

²⁶⁰ *ibid*

list of requirements was given for the major project which included that the studio was prepared to give two days a week of studio time to the SPNM.

By March of 1968 the SPNM was in a position to promote a concert of electronic music at the London Planetarium on 22nd of that month. It was supported by the Arts Council of Great Britain and the joint promoter was the Park Lane Group. It included 5, 6, 7 by Ernest Berk, January Tensions by Peter Zinovieff, Galactic Interfaces by Hugh Davies and Dream Music by Brian Dennis. A further concert was planned for 17th May to include works by Richard Orton, Brian Ferneyhough and Tim Souster.

On 3rd May 1968, there was a special meeting of the Executive Committee of the SPNM to ‘hear views and information on electronic music needs in the United Kingdom’²⁶¹. In attendance were Don Banks (Chairman); Francis Chagrin; William Montagu-Pollock; Nicholas Stacey; Tim Souster; Keith Winter (representing the Arts Council) and John Woolf of the SPNM, along with invited guests Desmond Briscoe (representing the BBC Radiophonic Workshop); Tristram Cary; George Newson and Peter Zinovieff. Apologies received from Susan Bradshaw; David Blake; Peter Dickinson and Hans Keller. Interestingly Hugh Davies was not invited to attend.

The meeting was intended to solicit information which was readily given, first regarding studio space for composers to work in:

‘Mr. Cary said it was difficult to know where to begin as basically it could be said that everything is lacking in this country regarding electronic music. This became clear when one learnt that Sweden had spent £500,000²⁶² on the Stockholm studio and were preparing to build 800 £1,000 studios²⁶³. . . Mr. Newson said that the real need was for a studio where the professional composer could work. He felt that students were partially catered for with the activities at Goldsmiths College, and the proposed studio at the Royal College of Music and the Guildhall School of Music. With regard to an engineer, he said that this must be someone who is able to think musically and not just technically. . . Mr. Chagrin said that one possibility seemed to be a very

²⁶¹ Banks 1968a:Letter

²⁶² Approximately £5million today

²⁶³ These studios were never built

substantial studio costing a great deal of money, and the other was for a smaller studio or studios. Mr. Cary thought that a smaller studio could be produced for about £5,000 plus £500 a year. One of the problems was the constant development of new equipment.’²⁶⁴

Then followed the first recorded instance where Peter Zinovieff offered his studio to the Nation:

‘Mr. Zinovieff said he was willing to offer his studio, which contained about £20,000 worth of equipment including a computer, as the basis for a large studio. . . He thought it was necessary to think on really big lines. . . A possible approach was for us to begin with Mr. Zinovieff’s studio, to which we could add some money. Support from National organizations could then be used to build this into a studio of the size which was evidently required. He thought it was quite impossible for the SPNM to do this alone but the Society should be the driving force enabling the achievement to be made. . . Mr. Woolf asked Mr. Zinovieff if he would still be willing to give his studio if it became impossible to develop the project on the lines which Mr. Chagrin had outlined. Mr. Zinovieff said yes, though he wanted his studio to be a starting point.’²⁶⁵

This instance in May 1968 indicates that Zinovieff may have already felt that his studio ideas were beyond his own capability, certainly in context of longer-term sustainability. This offer even predates the formation of EMS as a commercial venture and sales of the VCS-3 to fund his compositional activities. As was to happen again, it would appear that Zinovieff only wanted his studio to be involved if it was to become the national studio.

Finally, the meeting touched on the composer/technician relationship which had materially affected the development of electronic music since its inception. The difficulty in crediting technicians and composers for pieces has already been discussed in an earlier context and it is interesting to note that it was raised in this particular discussion forum:

‘Mr. Newson said that the composer faced the problem of having to have an engineer to deal with the purely technical side. Mr. Chagrin suggested the possibility of arranging for time to be available in various existing studios; composers could then go

²⁶⁴ Banks 1968a:Letter

²⁶⁵ Banks 1968a:Letter

at such times and an engineer could be provided to work with them. Mr. Briscoe said that each studio varied considerably and it was necessary for the engineer to have a detailed knowledge of the equipment. Mr. Cary was in favour of composers making themselves familiar with the technical problems and to be able to actually build up equipment.’²⁶⁶

What these minutes really show is a lack of specific goal and knowledge of what to buy, as well as highlighting differences in opinion which would prove difficult during later attempts to build a national studio. The SPNM required specialist knowledge of what to buy and it seems that Davies was the person to give that. A series of correspondence between Banks and Davies shows this. Davies gives accurate information including prices that none of the others seemed capable of giving. It is clear, for example that Banks knew little of the technical requirements of electronic music. In a letter to Davies dated 10th July 1968 he states:

‘I am a little surprised to see that Stockhausen has asked for two stereo tape recorders instead of a four track one’²⁶⁷

Banks assumes that a four track recorder is simply better than two stereo recorders and that must be what Stockhausen would want. However he had neglected to think of the practical processes involved in composing a piece when considering this and Davies replies thus:

‘Stockhausen’s two stereo tape recorders instead of a four track one is only because of the particular piece he wants to have done. If he wanted a four track machine he’d have asked for it.’²⁶⁸

This highlights the significant lack of knowledge at this time among many of the supposed experts in the field of electronic music. To give him his due, Banks did contact Milton Babbitt at the Columbia Princeton Electronic Music Center seeking further information on the kind of studio which should be built in the UK. Babbitt stated that:

²⁶⁶ Banks 1968a:Letter

²⁶⁷ Banks 1968b:Letter

²⁶⁸ Davies 1968a:Letter

‘if what you want is a good “classical” studio, the Moog equipment is very well made, but I cannot vouch for how it will travel. . . obviously the central expense of a studio is still the tape machines and, over here, by the time you have bought the minimal three two-track machines you have already spent £3000 and if you add the very useful four-track machine, you have spent another £2000.’²⁶⁹

Such expenditure was way beyond any of the previously discussed budgets of a national studio for electronic music, and this dislocation from the reality of the situation is further reinforced by Babbitt’s further comment that:

‘I can only continue to feel that you all should go in the direction of computer production of sound.’²⁷⁰

This mismatch between reality and aspiration was to surface in an even more spectacular fashion in 1969 when Zinovieff wrote a letter to *The Times* in which he once again offered his studio to the nation if someone was prepared to store it and pay for its upkeep, with a suggested purchase price of £40,000²⁷¹.

In truth this net worth estimate accurately reflected the value of Zinovieff’s MUSYS system, at this time, incorporating not one but two PDP-8 computers. It would seem, however, that he was soon to realise that the recovery of his personal investment in this venture was not going to be realised, and that he would probably have to settle for a much lower sum should such a sale be a remotely viable proposition. In the MUSYS manual produced for the Arts Council-funded induction course in June 1970, the following appears:

‘Believing that MUSYS has a general application to any electronic music studio with a relatively small budget and ambitious ideas, we offer the system – that is the hardware details and the software programs – to anyone who wants them. . . We have also offered this studio complete as it is to any organisation able to take it on with the sole provision that a suitable place is found for it and a research program is initiated

²⁶⁹ Babbitt 1968:Letter

²⁷⁰ Banks 1968:Letter

²⁷¹ Zinovieff 1970a:Letter

that would justify the effort and expenditure made so far on it. We hope that the BSEM will be able to find means to take advantage of this offer.²⁷²

British Society for Electronic Music (BSEM)

The reference to the British Society for Electronic Music (BSEM) requires further explanation. The formation of this society was to herald the next major development in the campaign for a national studio for electronic music. Comprised of most of the members of the SPNM Electronics Sub Committee it can be assumed that British Society for Electronic Music grew out of that committee, and this split from the SPNM was at least in part the result of a growing sense of frustration that progress was not being made. Although the SPNM was to support the British Society for Electronic Music financially for the first year of its existence, it subsequently became an entirely independent organisation.

On 14th February 1969 the inaugural meeting of the British Society for Electronic Music was held in London. From the minutes²⁷³ one can observe a number of important figures involved with the society from the outset:

Chairman: Peter Maxwell Davies

Hon. Secretary: Peter Zinovieff*

Hon. Treasurer: James Murdoch

Committee members: Don Banks*, Tristram Cary* and Hugh Davies*.

Also present at the meeting: Ralph Abraham; Derek Carew; Lawrence Casserley*; C. R. Cobbett (EMI); Trevor Denham; Malcolm Fox; Luke Gardner; Leslie Glaze; Anne Hasted; John Hempenstall; Simon Jaffes; Keith Winter (Arts Council-nominated representative); John Woolf (SPNM).

Of those present, those with an asterisk (*) are known to have already made a significant contribution to the development of electronic music in the UK by this stage. The absence of Blake and Newson from the SPNM committee may indicate further disquiet from those in the regions to the prospect of the resources for a nation studio being concentrated in London. Whereas the SPNM made genuine efforts to promote its activities around the UK, for example always holding its annual summer school in a different location, of which London

²⁷² Zinovieff 1970b:Letter

²⁷³ Winter 1969:Letter

was simply one of many. Those pioneering the British Society for Electronic Music appeared to be furthering a rather different agenda. This indeed was to be confirmed at this inaugural meeting. Following some discussion on finance, the ‘Principal Object of the Society’ was outlined thus:

‘It was unanimously agreed that the principal object should be the founding of a major electronic music studio in London with the intention of providing composers with the opportunities that are available in the leading electronic centres in Europe and America. The secondary objects of the society would be the provision of information, liaison with international and national organisations, and the promotion of performances. The studio would be a totally independent national centre.’²⁷⁴

News of the intentions was spread through the Arts Council mailing lists courtesy of Keith Winter.

Also at this meeting the British Society for Electronic Music laid out their plans to buy equipment before the end of 1969, but also stipulated that they should be on a firm financial footing before purchase commenced. The subscription was set at 10 shillings (50 pence) per year. They agreed that the probable cost of the envisaged centre was likely to involve a capital sum of approximately £200,000. That said, ‘It was thought that eventually the studio would be an extremely sophisticated, advanced, modern studio of the next decade, existing primarily for experimental purposes. The aim should be to have at least ten working areas with highly efficient workshops’²⁷⁵, which would make it a national centre on a par with those in other countries. The Society actively sought the opinions of other national studios and it was suggested at this meeting that ‘an approach should be made to the major electronic studios of the world for their specifications; also that each member of the society should immediately draw up a list of their own detailed ideas.’²⁷⁶

The British Society for Electronic Music was formally launched at the Royal Festival Hall on 20th June 1969 and a concert followed ten days later. On 4th July an article appeared in *The Times* entitled *Why we need a national electronic studio*. Written by Stanley Sadie it brought

²⁷⁴ Winter 1969:Letter

²⁷⁵ *ibid*

²⁷⁶ *ibid*

the British Society for Electronic Music further into the public eye with the immortal words ‘electronic music, at its best, is real music; or it can be, given the chance.’²⁷⁷

As noted, members of British Society for Electronic Music were asked at the initial meeting to put forward their ideas for the national centre, and the author has been able to locate documentary evidence of the thoughts of both Zinovieff and Cary in this context, courtesy of the Hugh Davies Archive and also supplementary information provided by Robin Wood of EMS. Zinovieff’s thoughts centre around a computer based studio which ‘doesn’t get out of date’²⁷⁸ but which would prove almost impossible to achieve as computer architecture rapidly became obsolete in the early days. Cary’s thoughts are more feasible if perhaps a little grand, including not only studio facilities but a lecture hall, concert hall and an accommodation block. As will become clear the proposed studio never materialised.

The difference of opinion regarding the viability of a computer-based studio, thus taking up Zinovieff’s offer, rather than a purely analogue one, may well have prompted Zinovieff to write to the committee on 10th September 1969:

‘I know that there is a general feeling among you that I ought to resign as secretary of our society. I would very much rather not unless you insist. Instead let me assure you that over the next few months you will find no cause of complaint whatsoever about me.’²⁷⁹

It is unknown what happened next but it would seem clear from a letter he sent to The Times dated 26th June 1970 using the title, Hon. Secretary, it can be assumed he retained his role, certainly up to this point. In it he once again brought the issue of a national studio to the public attention, stating:

‘Almost every other nation has accepted that it is necessary to spend a considerable amount of money on those arts which require technological aids – for instance, electronic music’²⁸⁰.

²⁷⁷ Sadie 1969:Letter

²⁷⁸ Zinovieff 1969a:Letter

²⁷⁹ Zinovieff 1969b:Letter

²⁸⁰ Zinovieff 1970a:Letter

He then continued with a very public plea to the nation for someone to come forward to pay for the upkeep of the studio, bemoaning the fact that despite the formation of BSEM, no progress had yet been made in this context. His decision no longer to seek recompense for his expenditure designing the studio was explicitly reinforced in yet another plea to house the EMS studio, made by Cary in the *Hi-Fi News* in 1971:

‘What we want is a national studio, and if it is to allow a number of composers to study and work it will have to be good and it will need equipment and expertise of the highest class. Swedish radio has spent something like 300,000 UK pounds on its new e.m. studio in Stockholm. This is the kind of sum we too need. We have the best brains in e.m. in the world, but we need (a) a place, and (b) plenty of first-class hardware to put in it. Peter Zinovieff has offered to give, yes give, his 40,000 UK pounds computer studio to the nation. All he requires is that the studio should be suitably housed and maintained, which would need about the same sum again and an annual amount to run it.’²⁸¹

By this point Zinovieff’s financial situation had deteriorated to the point that he could no longer both pursue new ideas and also maintain the existing studio, and the circumstances that were to lead to its eventual fate are charted below.

The Arts Council New Activities Committee

The Arts Council New Activities Committee was formed in the autumn of 1968 and at a meeting on 28th May 1969 the committee stated that their purpose was to ‘continue investigation into the extent of new activities in the arts, and the need for Arts Council support to them’²⁸². For the year 1969-70 they had a budget of £15,000. Hugh Davies was asked to sit on the committee, presumably as a representative for electronic music as each member was from a different area of ‘new activities’. The report shows that little was known of electronic music activity and the only group who had received any support was Gentle Fire, a live electronic performance group of which Davies and Richard Orton were part.

The aims of this committee were to prove somewhat contentious and in December 1968 a protest group called the Friends of the Arts Council Operative (FACOP) was formed to ‘look

²⁸¹ Cary 1971:42-49

²⁸² Astor 1970:1

into the New Activities Committee, the relation of the Arts Council to the living arts, and the question of patronage'²⁸³. Working documents pertaining to this have been identified in the Hugh Davies Archive. During April 1969 FACOP arranged for groups and individuals to send in their funding applications to arrive at the New Activities Committee on the same day. In total over two hundred applications were received and over £250,000 asked for. By the end of April FACOP had succeeded in invading a New Activities Committee meeting, forcibly putting forward their case for an 'open committee with a radically new structure'²⁸⁴. In May 1969 FACOP published their case and strategy in their newsletter *Circuit*:

'The way in which this committee has been appointed, its method of enquiry and the degree of knowledge of its membership seem to be typical of the way in which the Arts Council fails to meet the real needs of the people it's supposed to be encouraging.'²⁸⁵

In the same document the Friends of the Arts Council Operative described themselves and their activities thus:

'[uniting] groups and individuals involved in all aspects of artistic activity came into being initially through the existence of a large number of separate (but soon to be related) grievances against the State's monolithic arts patronage machine, and more specifically through the setting up of a committee of enquiry into new activities'²⁸⁶

On 28th May 1969 Michael Astor presented FACOP's case to the Arts Council but this was refused as 'unworkable and unacceptable'²⁸⁷. FACOP then organised a conference on 8th June 1969 and invited 'all artists in all fields'²⁸⁸, David Beida wrote to Davies asking him to attend and spread the word. Their main point was that a mere £15000 was allocated to the so-called 'new activities' and applications for funding had already surpassed this many times over. They sought to lobby the Arts Council for a different type of support for the Arts, in the form of an Artists Panel made up of those actually working in 'new activities'. Their main objection was that the New Activities policy did not encourage 'living artists' which had

²⁸³ Tilson 1969:1

²⁸⁴ *ibid*

²⁸⁵ Beida 1969a:1

²⁸⁶ *ibid*

²⁸⁷ Beida 1969b:1

²⁸⁸ *ibid*

been the intention stated in the 1965 Government White Paper²⁸⁹ on the Arts. Five years later none of the objectives of the white paper had been accomplished and the New Activities Committee was stood down, to be replaced after a convenient pause by art-form specific subcommittees, including the New Music Sub-Committee.

This inertia was to have its casualties. In October 1969 the Drury Lane Arts Lab folded through lack of funds, nothing whatsoever having been received from the Arts Council. The Arts Lab was a multipurpose space for all types of Art including experimental theatre, art, sculpture and contemporary music. Davies amongst others had joined the Arts Lab Ensemble specifically to perform contemporary music. Jim Haynes, director of the Arts Lab, wrote in his closing newsletter, dated 28th October 1969, 'The kitchens of the Royal Opera House are given some £37000 per annum by the Arts Council. The Arts Lab received no support from the Arts Council. I have been asked to join the Arts Council. I am £8000 in debt.'²⁹⁰ Many of those who used the Arts Lab were involved with FACOP who continued to lobby the Arts Council throughout 1969. Their lobby infuriated the Chair, Michael Astor who eventually offered them £50 from his own pocket to start the Artists Panel because he felt it would 'bring together and identify the extremists, nihilists, those who are given to raving in public and one or two more serious political activists'²⁹¹. Jim Haynes did not join the Arts Council, instead he moved to Paris.

The Calouste Gulbenkian Foundation

The Arts Council may not have been particularly supportive of electronic music at this point but the Calouste Gulbenkian Foundation most certainly was, undoubtedly encouraged by the outcomes of their earlier funding of Daphne Oram to develop her Oramics studio. As early as 1971 they publically expressed an interest in supporting electronic composers and called a meeting to be held on 22nd September, inviting more than thirty such people. These included Don Banks; Desmond Briscoe; Tristram Cary; Delia Derbyshire; Jonathan Harvey; David Lumsdaine; Daphne Oram; Richard Orton; Tim Souster; Keith Winter and Peter Zinovieff.

²⁸⁹ A White Paper signifies a clear intention on the part of a Government to pass a new law. It is an authoritative report or guide that helps solve a problem. White papers are used to educate readers and help inform decisions, and may be consultative as to the details of a new legislation.

²⁹⁰ Haynes 1969:Letter

²⁹¹ Willat 1968:1

The documentation from the meeting shows that an entirely open discussion was held and all parties were able to put forward their thoughts. This document usefully provides a perspective of opinions in 1971. Notably Briscoe outlined the nature of the BBC Radiophonic Workshop and stated unequivocally that it was not concerned with the performance of electronic music, also that there was a longstanding debate about whether or not composers should be allowed to work in the studio²⁹².

This document also confirms the Arts Council position on electronic music at this time. John Cruft, who had recently moved to the Arts Council from the SPNM, stated ‘generally the council was willing to help with performances but not with the provision of equipment.’²⁹³ Many present stated that there was a need for places where composers could work and that the growth of electronic music in the UK was behind that of other countries. Some had experienced working in Oram or Zinovieff’s studios and felt that all should have access to such facilities. Once again Zinovieff offered EMS to the nation, but as it subsequently transpired yet again to no avail. There was also the issue of a lack of a suitable performance space; Souster reported that the Queen Elizabeth Hall and the Purcell Room on the South Bank, although relatively new, were not adequate for the performance of electronic music. Various composers stated that touring a portable rig for performance was a good option but noted that those already available were heavily oversubscribed and rapidly deteriorating.

The issue of computers was also raised. Jonathan Harvey reported that the UK was frustratingly behind the USA in their adoption of computer technology, with only Newcastle, (in truth Durham, through shared access to the Newcastle machine), Cambridge and London Universities having access to computers. It was felt by all present that a national studio would be beneficial but that it should not cover exclusively one genre of electronic music. There should be provision for computer music, tape composition, spatial projects and a forward thinking view to ensure that the facility did not become out of date quickly.

The feedback from this meeting seemed positive. Having most notably assisted Oram a decade earlier hopes of further funding from the Foundation in this regard were naturally high. Unfortunately such assistance was not to materialise.

²⁹² Banks et al 1971:1

²⁹³ Banks et al 1971:2

Electronic Music Universities Co-Operative

Notwithstanding the failure of these initiatives, in the early 1970s discussions took place between, amongst others, Winter, Lumsdaine and Orton over the possibility of a national studio for electronic music to be based at the South Bank Institute. These discussions were not simply about how or where a studio should be created, but whether or not one should exist at all.

The group of composers discussing this matter defined themselves as the Electronic Music Universities Co-Operative²⁹⁴, the aim of which was to facilitate the sharing of expertise and knowledge on the composition of electronic music. They were the same musicians who would pool their equipment on a number of occasions to create large scale concerts of live electronic music. Further discussions about a national studio grew out of that initial arrangement. Their national studio bid is different to previous ones as it did not call for a single studio. The group proposed an arrangement whereby composers, whether they were attached to a university or not, could use a university studio for composition when these were not in use for teaching. So, in effect, composers would have a choice of studios to work in, each providing a unique set of characteristics for creative exploitation. As mentioned above, it was commonplace for a studio setup to be based on the ideas of an individual composer. It seems that many composers liked this flexible attitude, a view confirmed by Lumsdaine in an interview²⁹⁵. They could thus have an opportunity to identify the nature of the studio they wanted to work in. However, it transpired that many of the possible institutions were less than willing to allow such ready access by external individuals and, despite good intentions and some preliminary exchanges, these aspirations were never to be realised in the manner intended.

The reasons why the Co-Operative was not in favour of a single national studio are interesting, and indeed the substance of similar perspectives that were to emerge in later contexts. The problems they foresaw were largely based on the track record of European national studios, in particular their reluctance to provide access to composers other than a preferred few. In Lumsdaine's view, for example, the subsequent development of IRCAM was to confirm such a view. This institution, set up in 1977 by Pierre Boulez on the receipt of

²⁹⁴ This was an informal group of composers, referred to as Electronic Music Universities Co-Operative by David Lumsdaine.

²⁹⁵ Lumsdaine 2005:Transcript

a huge governmental grant, was to be seen by many commentators as essentially a monument to himself and his ideas on composition²⁹⁶. In a number of respects their fears were to prove well founded. The diversion of funding into Pierre Boulez's IRCAM may have affected the funding of other state-run ventures in France, not least those associated with other important groups of composers and researchers such as the Groupe de Recherches Musicales. The Co-Operative felt that self-interest and a certain amount of competitive rivalry undermined former initiatives for a national studio in the UK, and for this reason they firmly rejected cultivating any future plans for a national studio. This group, however, also soon lost momentum and the constituent activities retreated once again for the most part to the confines of individual studios.

Into the 1970s, a new generation of composers

In the 1970s there was a generational change. The early pioneers mentioned above were progressively joined by a new generation of electronic music personnel, adding critical mass to the growing lobby of advocates for the medium. These included Simon Emmerson, Jonty Harrison, Denis Smalley, Peter Manning, and Trevor Wishart.

Live electronic music

The development of university electronic studios fostered not only studio composition but also works for live electronic ensembles. In one or two instances, notably Cambridge, live performance was the primary objective. Here an important live electronic music ensemble, Intermodulation, was set up by Roger Smalley, a fellow at King's College, and Tim Souster. Souster was to become a fellow a few years later, succeeding Smalley to the same fellowship. When Simon Emmerson went to study in Cambridge in 1968 he immediately became acquainted with Roger Smalley and Souster and attended Intermodulation concerts (from its foundation in 1969). The ensemble was a key element in the development of electronic music in the UK, modelled on Stockhausen's improvisation ensemble with live electronics. It bought some of the earliest VCS-3 synthesisers and continued to perform until 1975. Similarities can be drawn with Gentle Fire, the live performance group set up in 1968 by Hugh Davies and Richard Orton.

²⁹⁶ Lumsdaine 2005:Transcript

Those involved in Gentle Fire and Intermodulation felt that they were at the forefront of development of British electronic music, and their enthusiasm for live electronic music led to intensive lobbying for financial support in the context of concert promotions. Here, as will be seen shortly, the influence especially of Souster on the Arts Council was to reap some important dividends. Influence from abroad could also be clearly seen in these live performance ensembles. Souster was Stockhausen's assistant in Cologne in 1971 and thus Intermodulation was heavily influenced by the German school. Intermodulation was also influenced by the American school, and could thus be called Germano-American. It included in its programmes some works by John Cage, but never embraced the French tradition. Denis Smalley²⁹⁷ came to York from New Zealand (via Paris) to study for his PhD with Orton, bringing with him a preference for the French aesthetic, having previously studied with Messiaen and Schaeffer in Paris in 1971-2. Emmerson credits Denis Smalley as 'very definitely the pioneer of bringing the French aesthetic to the forefront'²⁹⁸. Although he wasn't strictly the first, his arrival at York heralded the beginning of 'a kind of Trojan horse of the French tradition'²⁹⁹. In York Orton and Wishart created a more British aesthetic focussing on experimentalism, improvisation and sound transformation. Following in Denis Smalley's footsteps but soon to achieve a comparable status was Jonty Harrison who completed a PhD at York in 1980 and subscribed very much to the same aesthetic.

In other countries such a situation might have led to an ideological war at that time, and the ingredients were in place for rival factions to develop, going independently to the Arts Council to seek funding at the expense of their competitors. Fortunately this did not happen. Emmerson describes the situation in Britain as a 'cross referencing of ideological blocks'³⁰⁰.

'It was a glorious mess of ideological baggage which did not coalesce into warring factions as it has done in France and Germany.'³⁰¹

The notable lack of ideological infighting was to reap important benefits, not least in terms of the opportunities for genuine dialogue and crossover of repertoire. Emmerson recalls Souster

²⁹⁷ No relation to Roger Smalley

²⁹⁸ Emmerson 2008: Transcript

²⁹⁹ *ibid*

³⁰⁰ *ibid*

³⁰¹ *ibid*

saying to him ‘I’ve just heard this work by Denis Smalley and I think it’s amazing’³⁰². Emmerson went on to say ‘We have a weird model which is neither one thing nor another. Although we have a European-style funding system we have American style centres within Universities. It has to be said this happened in universities which already supported contemporary music and moved into electronic music’³⁰³

The Contemporary Music Network (CMN)

The Contemporary Music Network was to prove very important to the performers of live electronic music. At this time EMAS did not exist and the BSEM had become dormant. By 1972-3 Annette Moreau, a Durham graduate, had established the Contemporary Music Network at the Arts Council and electronic music was being included. Such opportunities to perform were helpful both artistically and financially since many of the electronic ensembles were struggling to make ends meet. The Contemporary Music Network thus provided a timely and useful opportunity for a coming together and a point of reference for a sharing of ideas amongst these second generation pioneers of British electronic music. However, despite this support many of these groups did not survive to the end of the decade. Jonathan Harvey, writing in 1983 states that: ‘Live groups such as Gentle Fire or Intermodulation died away ten years ago without creating a breakthrough.’³⁰⁴

Electroacoustic Music Association of Great Britain (EMAS)

It was becoming clear during the early 1970s that the university studios would hold the most significant key to future developments in electronic music in the UK, and thus pressure mounted for suitable institutional funding, based in the first instance on teaching requirements but in due course also those of research.

Around this time Emmerson was asked to write an article entitled *Electronic Studios in Britain for Music and Musicians*. Published in 1975, it sought to ‘examine present day facilities in this country and compare them with those abroad’³⁰⁵. It compared the studios at Durham, York, Glasgow and EMS and highlighted their inadequacy as compared with those found in other countries. As the emphasis at the university studios was on the teaching of the

³⁰² Emmerson 2008:Transcript

³⁰³ *ibid*

³⁰⁴ Harvey 1983:2

³⁰⁵ Emmerson 1975:24

techniques associated with the composition of electronic music and not the commercial creation of electronic pieces they were essentially different to the BBC and EMS. Emmerson states:

‘The emphasis is on teaching, and therefore in most of these studios – quite correctly – the equipment is suitable only for introductory and rudimentary work and inadequate for more advanced composition.’³⁰⁶

As a core feature of this article, Emmerson states that a network of regional studios may be the way forward for the UK. Indeed the only studio in the UK to have an outside benefactor at that time was that at Glasgow University which received direct funding from the Scottish Arts Council. 25% of the basic equipment costs were paid by Scottish Arts Council who also agreed to provide bursaries for composers resident in Scotland. Emmerson suggests that studios already established would make candidates for other regional studios, Glasgow for Scotland and Cardiff for Wales but that there was a gap in the provision in England. Studios in Durham and York could serve the North and Southampton serve the South but as yet there were no studios in between of sufficient calibre to act as regional facilities. He stated that ‘it is hoped that the idea of an English national studio for London will be revived and pursued as soon as possible.’³⁰⁷ He got his wish and in 1977 the Arts Council Music Panel asked Emmerson to write a brief report on the state of electroacoustic music facilities in the United Kingdom. This was intended to bring forward some ideas about what should happen in the UK to bring the situation up to speed with other European countries, i.e. the formation of a national studio. In his report Emmerson mentions the funding situation and states that ‘spreading funds fairly may result in inadequate facilities at each of many centres, rather than concentrating on a few regional establishments’³⁰⁸. He also stated that although the UK was behind other countries in the establishment of a centre, it could benefit from mistakes made by others. Following Emmerson’s report the Arts Council agreed to fund some meetings to set up a committee to look into electronic music.

The initial meeting, sponsored by the Arts Council, was held at York University from 31st March to 3rd April 1978. Emmerson’s findings were presented to representatives from

³⁰⁶ Emmerson 1975:25

³⁰⁷ Emmerson 1975:26

³⁰⁸ Emmerson 1977:1

Durham, York, Glasgow, Cardiff, City University, East Anglia and EMS, among others. The aim of the weekend was to discuss, among other things, the formation of an Electronic Music Studios Association. Other discussions included the design of a centre for electroacoustic music in London, plans for a performance network and tape exchange, and a catalogue of works in association with the British Music Information Centre. During the weekend the participants also discussed the cost and availability of studio time and the problems associated with presenting electroacoustic music to the public. One of the most interesting subjects discussed was the formation of a studio association and the 'examination of the (defunct) British Society for Electronic Music and whether a Studio Association would run parallel to this and the election of a working party to launch the association'³⁰⁹.

This working party was made up of Anderson, Davies, Emmerson, Denis Smalley and Robin Maconie. At a meeting on 3rd May 1978 they planned a draft constitution for the British Electro-Acoustic Music Association based on an Arts Council model as the Arts Council indicated that they would support the association. Emmerson felt that at this time the Arts Council was at last taking electronic music seriously. A foundation meeting was set for 29th January 1979 at the invitation of the Arts Council.

Arts Council representatives Annette Moreau and John Cruft were present at the foundation meeting, chaired by Emmerson with Robin Maconie as acting Secretary. Those present included Davies, Harvey, Manning, Orton, Denis Smalley and Wishart. Matters discussed included a catalogue of works which would be co-ordinated by Davies based on his *Répertoire International des Musiques Electroacoustiques* publication and the provision of a Tape Music Network. The Network would allow for the playback of music at ten centres around the UK, a list of technical requirements for these was given and some suggestions of venues which were predominately University studios. The formation of the society was discussed next and Emmerson proposed the name The British Electro-Acoustic Music Association. The motion was seconded by Barry Anderson and the minutes state that it was 'carried by acclamation'³¹⁰. At its following meeting on 11th July 1979 the committee minuted their intentions to apply to the Arts Council, the Gulbenkian Foundation and SPNM for financial aid.

³⁰⁹ Emmerson April 1978

³¹⁰ Anderson & Emmerson 1978:1

At this point there was confusion about the acronym for the society, BEMA had already been taken by the British Electrical and Allied Manufacturing Association; and Emmerson recalls receiving a telephone call from lawyers following airtime on Radio 4's Today programme. The name was accordingly changed to the Electro-Acoustic Music Association of Great Britain or EMAS. In the minutes of a meeting on 28th September it is stated that 'two possible acronyms 'EMA' and 'EMAS' were left with Barry Anderson for further legal advice and checking of the Company names register'³¹¹.

At this point it is pertinent to explain why the title uses the name 'electroacoustic' rather than 'electronic' music; this can be explained in the following commentary by Jonty Harrison and Denis Smalley:

'It is now widely accepted that the ideological divisions between Parisian musique concrète and elektronische Musik as practiced in Cologne have been absorbed into the more generalised world (and word) of electroacoustic music. In fact, there are many reasons to dispute this assumption, even today, and it was certainly not the case back in the early 1970's when, for most British composers, the dominant personality in electroacoustic music was Stockhausen and the compositional approach to the studio was that of Cologne.'³¹²

During this early period the core aims of EMAS were to establish an equipment pool which could be hired from the society, to assemble a collection of information for a catalogue of works, to facilitate a sharing of ideas between studios, to train composers in the skills of electroacoustic music and to educate the public through organisation of playbacks of electroacoustic music through regional networks. The final item in an ambitious list of intentions submitted specifically to the Gulbenkian Foundation in the first instance was to establish a National Centre for Electro-Acoustic Music. It was intended to house an auditorium specially equipped to handle electroacoustic works as well as a library, office and other facilities. 'Such a centre would become the administrative headquarters of EMAS and house the equipment pool'³¹³. Noted with this is that this particular application for funds was

³¹¹ Anderson & Emmerson 1978:1

³¹² Harrison 1989:528

³¹³ EMAS 1978:1

not concerned with the monies to establish such a centre but for the funds to set up the day to day running of the other items.³¹⁴

As stated above, the Inaugural General Meeting of EMAS was held on 29th January 1979. The minutes state that initial attempts to gain charitable status had failed but plans for the playbacks of music via the Network was progressing well. The Arts Council had by this time agreed in principle to provide funds for a pool of equipment and the SPNM had provided a petty cash grant. A newsletter had also been established with the first issue distributed in January 1979.

By June 1979 things were progressing further and the committee had tested different speakers in preparation for buying equipment for the EMAS pool. At a meeting on 14th June the committee reported that Anderson and Emmerson had visited Zinovieff's studio and observed the state of affairs. To quote the minutes, 'confidential details of the studios imminent collapse were discussed'³¹⁵.

The demise of BSEM and EMS (London) Ltd.

There are similarities between EMAS and the BSEM; the two societies had the same basic intentions, to develop electronic music in the UK. When EMAS was formed the BSEM, strictly speaking, still existed, but had lain dormant for a number of years. Emmerson referred to EMAS as the 'new generation' with Hugh Davies who was 'marvellous at transcending all generational things'³¹⁶ as the link between the two. Zinovieff was still active in BSEM and did not either accept or reject EMAS, but felt that the society he had set up had been ignored. Zinovieff's views on a national studio were now out of date as well as his computerised studio, revolutionary during the early 1970s, was rapidly becoming an antique.

Notwithstanding this, Zinovieff continued to offer it to the nation and on 7th June 1979 Emmerson and Anderson went to visit his relocated studio in Oxfordshire. To quote Emmerson 'we had a terrible dilemma because we knew at that time that the computers were out of date'³¹⁷. Their embarrassment as visitors was that it could not form the basis of a national studio; it was becoming an antique. The EMAS Committee launched a rescue meeting with Anderson and Emmerson to contact the Arts Council and Gulbenkian

³¹⁴ EMAS 1978:1

³¹⁵ Emmerson 1979:1

³¹⁶ Emmerson 1978:1

³¹⁷ Emmerson 2008:Transcript

Foundation, and Davies and Anderson to contact the Inner London Educational Authority. At the EMAS committee meeting dated 4th July 1979 it was mooted to contact institutions who were currently setting up studios to see if they would be able to take Zinovieff's studio. Those proposed were Huddersfield and Nottingham. Emmerson and Anderson felt that Zinovieff's pitch for a national studio was wrong and did not pursue it further, a decision which angered Zinovieff. Later, around 1984, the studio was given to the National Theatre through Zinovieff's contact with Harrison Birtwistle. 'Mildly to our horror he went and gave it to the National Theatre in the 1980s and as far as I know it was never put together again'³¹⁸.

Alternative plans for a national studio proposal were well underway by this point and details were published in the April 1979 Newsletter. By the July newsletter there were details of possible buildings and sites which had been investigated in London, including the possible conversion of a factory building in a run-down area which might attract financial incentives from the Greater London Council. In recognition of the growing interest in the possibilities of digital technology EMAS sponsored a conference in Edinburgh in April 1980 entitled 'Computer Music in Britain' at which reports and papers were given by among others, Lawrence Casserley, Mike Greenhough, Manning and Souster. In the same month EMAS sponsored the 'Towards a Theatre of Sound' event directed by Barry Anderson at St. Johns Smith Square. This was seen as an important step in the right direction for the establishment of a national studio, and as a collaboration between SPNM and EMAS it attracted press attention. The BBC made two programmes from the concert for subsequent broadcast on the weekly Radio 3 programme, 'Music in our Time'. St. Johns Smith Square was not an ideal location for electroacoustic music as it has a long reverberation time, but this high profile event achieved its objectives. The desire for a national studio was suitably heightened and a meeting of all members, now numbering some 130, was held on 27th June to discuss the campaign.³¹⁹ By October 1980 EMAS were in a position to make a new formal bid for a national studio for electronic music in the UK.

EMAS bid for a national studio (1980)

At a committee meeting on 21st August 1980 members of EMAS consolidated their plans for a national studio. This time it would be called a national centre to reflect the scale of the plans. Their intention was to apply again to the Arts Council, the Gulbenkian Foundation, and

³¹⁸ Emmerson 2008:Transcript

³¹⁹ Maconie 1980:6

also the Performing Rights Society for funding using a 'growth pattern' approach. They would start with the basics, one studio, an office and store, and expand in due course to include dedicated performance and rehearsal spaces and also catering facilities. By October 1980 the proposals had been drawn up and submitted to the respective institutions for consideration. The outcomes, certainly in terms of the bigger picture were disappointing. Crucially the Arts Council felt it was unable to assist with any building costs. Nor could it provide any funding for administrative and technical costs. However it was prepared to provide funding for the equipment pool. Between 1980 and 1983 this was stored at West Square electronic music studio and informally managed by Barry Anderson.

Undeterred, EMAS continued to lobby the Arts Council for assistance with administrative costs and the salary of a technician to oversee the equipment pool. In October 1980, for example, it applied unsuccessfully for £17,250 to pay for an Administrator, part time technician and part time secretary for one year. They reapplied for the same officers in January 1981, this time asking for £19,650 but this bid was also unsuccessful. During 1982-83 the Arts Council halted their revenue grant programme meaning that EMAS did not receive any funding that year. In a confidential document from Emmerson to other members of the committee, dated 15th January 1982 he lays plans for a plea to the Arts Council. He states that the equipment pool cannot be used to its full potential without administrative support and storage facilities; that Britain is missing out on the International exchange of information because it does not have the ability to engage in the world wide electronic music scene; and finally that 'plans for a Centre for Performance and Research in Electroacoustic Music would be even further postponed'³²⁰.

In response the Arts Council commissioned Jonathan Harvey to write a report on EMAS, which he completed in 1983. This stated that to date the association had received grants totalling £29,000 which had been spent on the equipment pool. In the four years since the purchase of the first equipment the pool had developed sufficiently so that by 1983 up to three simultaneous hires could occur. Harvey observed that many concerts of electronic music could not have happened without the EMAS equipment pool. Another noted success is the EMAS newsletter, designed and then edited by Trevor Wishart, which had begun to disseminate the work of activities in the UK more widely and also attract interest from

³²⁰ Emmerson 1982

abroad. Other successful ventures included technicians' meetings, which allowed studio staff to learn from each other's mistakes and 'receive each other's inspiration in a fast-developing technology'³²¹.

Reference was also made to collaboration with SPNM and the Institute of Acoustics leading to participation in conferences and festivals. Harvey also mentions the ingenious division of EMAS into three parts, a trust, which allowed charitable status, a trading company, and a club. Despite all of these successes still no funding had been received for administrative or technical support and the pool was still housed 'parasitically' at West Square. The major aim of EMAS, the establishment of a national centre, was still an outstanding issue. Harvey states that the plans laid out in 1980 were still the basis for a working document as 'more precise definition has not been entered upon, presumably because no-one has seen any prospect of raising the money yet.'³²² Interestingly the report mentions that EMAS is not concerned with sound generators³²³ which highlights the fact that this equipment pool was for playback purposes only and not for composition of new works.

Harvey also states that EMAS should consider building a digital studio, should they of course be granted funding. As for housing the proposed studio several collaborative ideas were put forward including housing such a studio at the Almeida Theatre, National Sound Archive, or British Music Information Centre. Collaborative ideas for a new building in association with the SPNM were also suggested. Also suggested was a joint research project with the BBC into electroacoustic music in Britain. Harvey's report called for a meeting between all possible collaborators of EMAS and:

'The purpose of the meeting would be to impress on those present the disgraceful lack of any major open studio in Britain, and describe the benefits which a studio and performance centre could bring, both aesthetically and as a form of research – the example of IRCAM can of course by now be held up as a serious and successful contributor in both fields. If enough concerns pooled some resources into a national centre, its magnitude and status would be greatly increased.'³²⁴

³²¹ Harvey 1983:6

³²² Harvey 1983:7

³²³ Harvey 1983:5

³²⁴ Harvey 1983:15

At the very end of the report Harvey reminds the reader that:

‘If EMAS seems to need rather more than its fair share of Arts Council money for one enterprise, one must remember that it is the only one of its type, as opposed to many orchestras, many ensembles, opera companies, dance companies and theatre companies all receiving subsidy. It is unique in Britain; there are not many EMASs but only one.’³²⁵

Through 1984 EMAS continued its concert series and work on assembling a catalogue of electronic compositions.

Composers Resource Facility

As before, the desire for a national centre was not universal and many of those outside of London were keen that any such venture should not be located in the capital. On 25th October 1984 Trevor Wishart and Andrew Bentley presented an entirely different approach to a national centre. Their plan was not to have a single studio but to develop a Composers Resource Facility which would focus on the development of hardware and software for the composition of electronic music. This would be facilitated through regional user groups and the new possibilities of communication offered by cassette post and modem links. Regional centres would be established by studio subscription to the project and allowing the collaboration of on and off campus composers. All studios would use the same software and hardware which would allow for an easy transfer of information between facilities and allow composers to work in more than one studio. New programmes would be developed by professional software and hardware engineers employed by the Composers Resource Facility, which in turn would be funded by studio and individual subscription to the project.

EMAS struggles for survival (1984)

In late December 1984 EMAS held a two day conference to discuss their future plans. These discussions included what was by then regarded as the obsolete 1978 model for a national centre and also the question of whether a national centre or regional facility was desirable. The outcome, reflecting the divided views of those present, was that both objectives should be pursued. On the 8th February 1985 EMAS agreed to adopt the Wishart and Bentley model

³²⁵ Harvey 1983:16

for a Composers Resource Facility. Later in 1985 EMAS also agreed to expand the equipment pool by creating a northern pool in Stockton, Teesside, which materialised and was maintained for a number of years. Another positive outcome, in the latter part of 1984, was the securing of Arts Council funding to pay for an Administrator.

By July 1985 there were also concerns over EMAS' financial situation and it was minuted that 'The drive for a major centre would not be pursued at the expense of shorter term questions of fundraising for EMAS's survival'³²⁶. By October 1985 it was agreed simply that 'the drive for a centre should continue on an informal basis'³²⁷. These decisions, however, did not herald the end of EMAS, and it was subsequently to co-ordinate yet another bid for a national centre. In the meantime an important change had occurred at the Arts Council, leading to the provision of direct support for composers and performers working with the medium.

Arts Council Bursaries for Electroacoustic Music 1985/86

In April 1985 the Arts Council launched their Bursaries for electroacoustic music 1985/86. Advertisements were taken in the *EMAS Newsletter*, *Electronics & Music Maker*, *Classical Music* and *The Guardian*. Bursaries were available for two areas of work; that of preparation for a specific project, for example a composition, and for development and exploration, thus encouraging research into new techniques and processes. The panel consisted of Davies, Simon Bainbridge, Hodgson, Harvey and Denis Smalley. Documents located in the Hugh Davies Archive show that £12,500 was available in total for which seventy-seven applications were received. Among those who applied were several EMAS committee members and other prominent electroacoustic composers, including Andrew Bentley; Michael Clarke; Stephen Montague; Richard Orton; Tim Souster; Trevor Wishart and the Interface group.

The South Bank, London Sinfonietta and Nicholas Snowman

Simon Emmerson recalled in 2008: 'Nigel Osborne who was not a central figure in EMAS but was active in contemporary music said "there will be big changes coming up when Nick Snowman comes to the South Bank".'³²⁸ Nicholas Snowman, coming from IRCAM, already had links with the London Sinfonietta as its co-founder (with David Atherton) in 1968, and

³²⁶ Smalley 1985a

³²⁷ Smalley 1985b

³²⁸ Emmerson 2008:Transcript

had also subsequently commissioned a number of live electronic pieces. Roger Smalley had composed *Pulses* for the Sinfonietta in 1969 and Simon Emmerson recalls the concert. He notes that the London Sinfonietta were not given enough credit for their performance of such new music, he recalls ‘they had used electronics but, like any British ensemble, they were typically wary of electronics; they didn’t know how it worked; they were desperate to get an EMAS-like organisation to help them. There were composers who said, “look you must use more electronics” and then the Sinfonietta sometimes did’³²⁹.

When EMAS heard that Snowman was coming to the South Bank they immediately sought his collaboration. From the outset he indicated that he wanted a national studio at the South Bank³³⁰. He invited individual members of the EMAS committee whom he thought might be sympathetic to his cause, rather than inviting EMAS as an organisation. His intent was most likely to bypass the internal disputes in EMAS regarding the geographic placement of the national studio. EMAS, always a democratic organisation, was keen to rectify this direction of travel and lobbied for members of the committee with regional interests to join the South Bank venture, an initiative that was only partially successful. Thus the South Bank Initiative was born, the first formal meeting being held in February 1986. It quickly became clear that this initiative could not be led by EMAS. Its role had to be a contributing one, given that the South Bank expected to be the primary stakeholder, not least in terms of providing the associated infrastructure. A steering committee was formed consisting of Sir Fred Warner (Chairman); Brian Hodgson; Nigel Osborne; Barry Anderson; Carol Butler (EMAS Administrator); Simon Emmerson; Stephen Montague; Denis Smalley; Michael Vyner (London Sinfonietta); Nicholas Snowman; Ian Horsbrugh and Jonathan Harvey, representing the Arts Council. The initiative was launched on 8th October 1986 and received front page coverage in the second issue of *The Independent*. By 1988 a brochure had been created to promote the initiative and in the section titled ‘The Background’, the following statement is found:

‘The creation of a national studio for electronic music at the South Bank will provide a facility in Britain for work with music and technology at the highest level. It will stimulate artistic activity in a number of fields. It will also serve as a centre for national coordination of work in the medium, for liaison with the electroacoustic

³²⁹ Emmerson 2008:Transcript

³³⁰ *ibid*

industry, and for the development of urgently needed materials for education in the broadest sense.’³³¹

The studio was intended to be part of the South Bank Centre, where there was already a hub of musical and theatrical activity at the National Theatre, the National Film Theatre and the Hayward Gallery.

‘The site will be divided into a series of workspaces, including a large central production studio, six flexible workstations each to include computer terminals and a variety of synthesis and recording installations, a computer and servicing area, and the associated necessary office space.’³³²

The Studio was to have three types of resources; those designed for computer synthesis, commercially produced synthesisers and advanced sound recording facilities. It was to act as a national hub for studios already present in the UK and help promote British electroacoustic music internationally. It was envisaged that the studios would be connected electronically within the near future. An ambitious project of education and outreach was planned to address the expectations of a growing number of electronic music enthusiasts. The national studio was also to create its own computer software and programming language in order to standardise such activities in the UK, much in the way that Wishart and Bentley had already proposed. Links with the London Sinfonietta via Snowman were to be expanded and close collaboration between the studio and the ensemble would allow for high quality performance.

Three quotations taken from *The Independent* on 8th October 1986 were used to back up the need for a national studio. The first concerns Isaiah Berlin who later donated money to the cause from the profit of a tribute concert. In 1986 Berlin saw Harrison Birtwistle’s *Mask of Orpheus*, for which Barry Anderson had created the electronic parts and was deeply impressed. He stated after the concert:

‘I’m a musical ignoramus, but I can tell you how deeply moved I, and others, were by *Mask of Orpheus*. Electronic music exists and cannot be ignored. There must always be people who support revolution in the arts, even if we don’t fully understand them.

³³¹ Hodgson et al 1986: The Background

³³² *ibid*

If we fail to, we risk philistinism and stagnation. So forward with the new expression.’³³³

Next was Harrison Birtwistle himself, who stated:

‘In my generation the techniques [of electronic music] were still being invented. You decided whether you wanted to experiment or not. Now, it’s part of the language of music and should be available to everyone, not stuck in an elitist ghetto.’³³⁴

And finally, Alfred Brendel stated:

‘Now Britain has a chance to become an international centre for new music. As a performer I am not threatened – the music I play will continue. But even in my repertoire, I ask: “What’s new here?” Many composers today look backwards, there’s been a loss of nerve. Electronics offer new sounds. If I were a composer, I’d use them.’³³⁵

In 1987 Barry Anderson unexpectedly died, which took away a significant element of the driving force behind the bid, and by 1989 enthusiasm was fading. There had been no less than twenty-five committee meetings and no tangible results. Despite sustained fundraising efforts EMAS had only managed to secure £8000 from the Gulbenkian Foundation, £3000 from the Paul Hamlyn Foundation and a Mac personal computer from A F Computing Ltd.³³⁶ The bid was officially abandoned in 1989 but Snowman never completely gave up on it. The stock market crash of Black Wednesday³³⁷ was partially to blame.

The Composers Desktop Project (1986)

The Composers Desktop Project (CDP) was set up as a resource to help composers use affordable computer technology. During the early 1980s Andrew Bentley, Archer Endrich, Richard Orton and Trevor Wishart, with vital support from Martin Atkins (who developed the soundfiling system for the CDP) and David Malham (who built the first hardware

³³³ Maddocks 1986:1

³³⁴ *ibid*

³³⁵ Maddocks 1986:1

³³⁶ Coopers & Lybrand Deloitte 1991a: Management and Funding 6a, b, and c.

³³⁷ The Stock Market Crash known as ‘Black Wednesday’ occurred on 16th September 1992.

interface) began exploring the possibilities of the earliest microcomputers for compositional ends. The group knew that software already existed for mainframe computers and 'inspirations came to a head when the Atari computer was brought out with a MIDI interface and a cartridge port with a very fast burst rate (intended for games applications)'.³³⁸ All of those involved purchased the same computer and began work on a common programme. By August 1986 they had carried out a feasibility study and had managed to run CSOUND on the Atari computer. David Malham had also built a high quality sound interface, paid for by Trevor Wishart as no official funding was available. During 1986 Trevor Wishart spent time at IRCAM and developed the first four of his spectral manipulation programs and later in that year the Composers Desktop Project was established as a formal organisation. First versions of the 'CDP System' were delivered in June 1987 and in 1988 the Gulbenkian Foundation awarded a grant of £17,000 to develop the system further.

The Composers Desktop Project was designed to be an affordable, standardised programme for composers offering as many tools as possible on a desktop computer:

'Our aim is to provide new computer tools for sound design, in which the emphasis is on a detailed and flexible access to the inner features of sounds. In doing this, we mainly adopt the composer's viewpoint. We seek to create a cooperative and mutually supportive environment in which practising composers can help each other, both in designing software tools and in using them effectively. We believe in and depend on the crucial importance of the composer's ability to hear music not only before it is written, but even before the means to produce it are available.'³³⁹

With the demise of the Atari computer in 1992 it became necessary for the Composers Desktop Project to find an alternative computing platform to host what by then was an extensive repertory of software for composers. By this point consolidation of the industry had narrowed the choice to just two platforms, the Apple Macintosh and the PC and it was decided, for economic reasons to adopt the latter. The PC version of the Composers Desktop Project is still available today and it is also now possible to purchase a version for the Apple Macintosh. Trevor Wishart, Richard Dobson and others continues to support and develop the software, with Archer Endrich still administering the project, and a basic software package currently costs just £30.

³³⁸ See the website: www.composersdesktop.com/about.html

³³⁹ See the website: <http://www.composersdesktop.com/about.html>

The Sonic Arts Network – the 1990s

In 1989, on its 10th anniversary, EMAS changed its name to the Sonic Arts Network. The Sonic Arts Network was an amalgamation of the national studio initiative on the South Bank, EMAS, EMAS Ltd and the EMAS Trust. Indirectly linked to the change of name was the fact that the titles ‘electronic’ and ‘electroacoustic’ were falling out of fashion, and Trevor Wishart’s book was gaining popularity. The Sonic Arts Network was born with a small legacy from Isaiah Berlin which allowed the bid for a national studio to continue although dispirited by the events of 1989. Snowman admitted that the prospects for establishing a national centre on the South Bank were fading and he agreed to transfer the residual money from the fund to the Sonic Arts Network on the understanding that they would continue to seek ways and means of continuing the initiative. This was to lead directly to another national centre bid, this time away from London. The notable change of emphasis from a London-based locus to one that was truly inclusive in geographical terms is reflected in the following description that appears in the subsequent 1991 national centre bid:

‘The Sonic Arts Network is the national association of composers, performers, teachers and others interested in the application of technology to the composition and performance of music.’³⁴⁰

National Centre for Electronic Music 1991 (NCEM)

The City of Birmingham was chosen as the location for the bid as it ‘has a considerable track record in establishing national and international facilities and in developing the arts – the City of Birmingham Symphony Orchestra, The Birmingham Royal Ballet and. . . Symphony Hall all bear testimony’³⁴¹ and thus it seemed the logical place for a national centre. The group making the bid consisted of Birmingham City Council; The Arts Council; West Midlands Arts; Birmingham Conservatoire; The University of Birmingham Department of Music; The City of Birmingham Symphony Orchestra; the Birmingham Contemporary Music Group and the Sonic Arts Network. In January 1991, in partnership with the Arts Council, they commissioned Coopers & Lybrand Deloitte to prepare a feasibility study for the proposed National Centre for Electronic Music. The Steering group consisted of Anthony Sargeant (previously Nicholas Snowman’s no.2 at The South Bank Centre); Trevor Wishart (for the Sonic Arts Network); Jonty Harrison (University of Birmingham) and Peter Manning, who

³⁴⁰ Coopers & Lybrand Deloitte 1991b:16

³⁴¹ Coopers & Lybrand Deloitte 1991b: foreword

was appointed by the Arts Council as its representative and coordinator of the resulting feasibility study.

The bid had a number of similarities with that previously submitted by EMAS in connection with the South Bank. However, this bid was formulated at a much higher level, reflecting the interests of a much larger group of stakeholders. The objectives were also far more realistic, an important consideration that was reflected in the development plan:

‘Going for too big a bang immediately can prove fatal, as the proposed national studio at the South Bank found. Large scale funding to support the full range of activities is more likely to be attracted once the Centre is operational.’³⁴²

The multi-phase plan proposed starting with a studio for composers, an educational unit, a software research group, a performance network, a full time director, administrative support, and a suitable rehearsal and performance space. This was seen as the very minimum set of requirements to establish the National Centre for Electronic Music, however even as just the initial phase the overall costs were considerable once the requirements of equipment purchase and maintenance, employing a minimum staff of six, and renting around 4000 square feet of space were taken into consideration. The second phase was to develop a number of workstations for composers, an educational studio accommodating 30, and a research department. For phase two, staffing would increase from six to nine and space to 6000 square feet. The third phase included more composers’ studios, meeting space with catering, a library and a dedicated rehearsal and performance space. For this staffing was to increase to 13 and space to 8000 square feet. The project was estimated to cost between £100,000 and £250,000 for the initial phase alone.

The bid compares the lack of a national facility in the UK at the time with those available abroad, notably in France, Sweden and the USA and also details the current provisions in the UK. In terms of charting the history of the medium in the country the statistics are interesting. In 1991 there were 54 institutions offering courses on electronic music in the UK. The commercial sector had also advanced by this stage, with 116 recording studios and 99 manufacturers³⁴³.

³⁴² Coopers & Lybrand Deloitte 1991b:5

³⁴³ This is the figure given in the APRS Directory

One of the main differences of the NCEM bid compared to previous bids was the desire to change the institutional structure of the organisation.

‘One of the fundamental objectives of the NCEM is to network and collaborate with existing institutions. The establishment of an organisational structure which promotes such joint working is thus paramount. A new, freestanding charitable company limited by guarantee which has a fixed number of board members from key organisations is recommended as the most appropriate structure. The board might include representatives from the following organisations and sectors: Sonic Arts Network, West Midlands Arts, Birmingham City Council, The University of Birmingham, Birmingham Conservatoire, CBSO, Media, Business with the Arts Council of Great Britain retaining the right to attend.’³⁴⁴

While this structure reflected the interests of all the contributing stakeholders it would have meant substantial changes for the Sonic Arts Network. ‘The Sonic Arts Network has played a central role in the promotion of electronic music to date. The National Centre for Electronic Music will in many ways incorporate this role and thus the future of Sonic Arts Network will require careful appraisal, both in terms of its involvement in the NCEM and its residual role.’³⁴⁵ This statement clearly threatens the future of Sonic Arts Network. The report states that:

‘Sonic Arts Network has indicated that it sees all of its functions being transferred to NCEM, including its membership organisation which will remain a lobbying force and be the source of representatives from Sonic Arts Network on the Board of the NCEM.’³⁴⁶

Although thus signalling the end of the Sonic Arts Network the proposal was designed to ensure that the spirit of the Sonic Arts Network and its predecessors would remain in the new organisation. In a similar vein it was intended that the Composers Desktop Project would work with the National Centre for Electronic Music but would not be wholly subsumed by it.

³⁴⁴ Coopers & Lybrand Deloitte 1991b:29

³⁴⁵ *ibid*

³⁴⁶ *ibid*

The location of the National Centre for Electronic Music was discussed extensively and potential collaborations with the City of Birmingham Symphony Orchestra and also Birmingham University investigated further. Funding was sought from a number of sources; Birmingham City Council; the Arts Council; West Midlands Regional Arts Board; the European Community and assorted trusts and manufacturers. The resulting feasibility study concluded that the funding climate was favourable but progress would need to be made quickly in order to be assured of support. It noted that:

‘The grant paid to the Sonic Arts Network by the Arts Council (£21,000 in 1989) is the largest single contribution towards electroacoustic music.’³⁴⁷

However, the majority of this grant was spent on the feasibility study and the subsequent report to the Arts Council. There was significant ill-feeling amongst those involved that the money spent on such a study could have been better spent on actual resources, and when it became clear that the potential stakeholders would have to provide a significant element of the capital and recurrent funding the initiative collapsed. A final bid was to come in the form of a dual centre bid between York University and Kirklees Borough Council.

Yorkshire/Huddersfield dual centre bid

The final bid for a national studio or centre for electronic music in the UK was presented by a consortium made up of the Sonic Arts Network, Kirklees Local Authority and York University. Each potential stakeholder had different aims and objectives for the proposed centre but the committee worked hard to weld together these ideas as a coherent vision. However, in the long term, the resulting tensions were to contribute materially to the ultimate failure of the bid. The Sonic Arts Network wanted a national centre along the same lines as previously proposed for Birmingham, with a performance space as well as studios. The Kirklees Local Authority, which represented Huddersfield, wanted to create a cultural quarter in the town, which was at the time classed as a deprived area and was thus eligible for National Lottery funding. York University had been trying to develop a new building and facilities for electronic music through the late 1980s and early 1990s and had particular interests in pursuing a research agenda. Rather than compete it was decided to join together and present a bid to the Arts Council for Lottery money for a national studio with two

³⁴⁷ Coopers & Lybrand Deloitte 1991a: Management and Funding 4c

physical bases, one in Huddersfield and one in York. York would be the research base and Huddersfield the public outreach. Both would have facilities where composers could work. It should be noted at this point that it was the local authority, and not Huddersfield University, which was involved with this bid.

During the mid-1990s the Arts Council funding system operated on a three stage bid process. An initial proposal had to be made, and if that was successful a grant was awarded to draw up a feasibility study with a business plan, which in the case of building-based projects would also included a survey of potential sites. If this study was approved the applicants could finally proceed to a formal bid for funding.

The initial funding application was successful and the feasibility study initiated. For this Sonic Arts approached Ken Baird, who resigned as Arts Council Music Officer in December 1993, and asked him to chair the steering committee. A report was commissioned from a firm of management consultants, Coopers & Lybrand Deloitte, focusing in particular on the relative merits of a dual site centre, or whether operations should instead be focused on a single site. Unfortunately developments in the university sector were to have a material bearing on the outcome. In 1992 a number of leading polytechnics, including Huddersfield, acquired full university status, with a consequential empowerment to pursue initiatives in research as well as teaching. Given the standing and reputation of the Music Department these new circumstances stimulated interest in pursuing research objectives very similar to those proposed by the University of York. In 1996 the music department achieved a very creditable score in the national peer review of university research excellence (known as the RAE) and this success encouraged it to bid for a share of the proposed research facilities previously proposed exclusively for York. Since it was still the intention to locate the performance space in Huddersfield such an alteration to the original plan would have seriously disadvantaged York's interests. In the event, this splitting of activities did not meet with approval at either institution and both the potential stakeholders felt they should have equal share of the resources. Also during this feasibility study Yorkshire Arts were brought into the bid, and they had their own demands to place on the table, in particular an emphasis on public access to the resources. It was also the case that their support for the project was at best lukewarm, and although the feasibility study was approved this lack of enthusiasm was to have a detrimental impact on the resulting bid to the National Lottery. This was considered in 1998 with an unsuccessful outcome. At this point the consortium disbanded. In common

with the Birmingham bid, it could be said that the money spent on management consultants might have been better spent on actual studio facilities.

Overview of national studio bids

Although none of the national studio bids were to succeed, in bringing together so many members of the electroacoustic community in pursuit of shared objectives they were to act as an important catalyst for more achievable objectives. Crucially they encouraged communication between individuals and institutions and generally raised public awareness in the possibilities of the medium. In terms of tangible benefits the incentive to collaborate on the pooling of performance equipment was to increase the opportunities for successfully staging major events. Hindsight provides instructive lessons for those currently seeking to propose major initiatives in contexts such as this in both political and practical terms. One consideration that was not fully appreciated at the time was the implications of the underlying advances in computer technology in terms of the progressive empowerment of the individual and the diminishing importance of a national institution in terms of access to suitable resources, with the possible exception of interests specifically focused on research. One recurring factor that was overlooked in this context was the fact that the proposed resources would all have become out of date very quickly, and none of the plans paid sufficient attention to the need to develop and renew resources on an ongoing basis. By no means all aspects of this necessary renewal could have been delivered by the proposed research programmes and these in any event were of limited interest to potential stakeholders not connected to the university sector.

By the time of the final bid the desire to establish a national studio had abated. Studio facilities in universities were increasingly state of the art and performance installations such as BEAST, based at Birmingham, by this time were well established. More recent consultative initiatives have indicated, however, that there is still a pressing need for performance spaces geared specifically to meet the requirements of electronic music. More recently developed performance spaces such as Kings Place in London and the Northern Rock Hall in The Sage Gateshead are multipurpose spaces and thus do not completely fit the bill for the performance of electronic music.

The dawn of the new century was thus to signal major changes in the future development of the medium in the UK and these lie beyond the scope of the thesis. It is hoped, however, that this account provides a useful insight into the very special circumstances that were to influence developments in this country prior to this watershed and thus inform a better understanding of this important area of its creative heritage.

Conclusion

The purpose of this thesis has been a critical appraisal of the key developments that fostered the development of electronic music in the UK, from its early beginnings just after the Second World War to the turn of the century. The central focus has been the working practices of the pioneers and their contributions to collective efforts to establish a national studio. This conclusion reflects on the findings of this critique.

An underlying objective has been to fill in the significant gaps that exist in the literature and in so doing be in a position to evaluate the available knowledge and understanding of these developments and throw new light on the issues arising. With the passage of time the ability of researchers to engage directly with these developments, not least in terms of engaging directly with those who were instrumental in bringing them about, becomes increasingly difficult, and the need to document and evaluate these contributions is now a matter of considerable urgency. My work draws together many strands of history, some of which are well known, others the product of new discoveries. It has been important to identify and evaluate in some depth information relating to both categories and not simply accept what has in many respects become the received wisdom in terms of the evolution of the medium in the UK. It is only by fully embracing both aspects that it becomes possible to piece together an accurate and suitably insightful history of electronic music in the UK.

An important further consideration has been the role of people other than those who have been at the forefront of creative developments in this regard. Whilst it is true that a number of these have also made significant contributions to the development of the facilities necessary to achieve their compositional objectives, there are others who have made equal if not indeed in some instances more significant contributions to the development of the medium, both directly in terms of fostering new technologies and indirectly in terms of fostering public interest in the possibilities of electronic music and also influencing those in a position to fund such aspirations.

In seeking to chart the developments that gave rise to the succession of bids to establish a national studio it has also been important to consider the circumstances that led to the establishment of the BBC Radiophonic Workshop, not least to understand better the reasons

why the BBC was not prepared to follow the lead set by sister broadcasting institutions in Continental Western Europe and establish a studio that was prepared to give a priority to new work and not, in effect, outlaw all use of the resources that did not meet the specific requirements of the BBC.

In seeking to establish a clear and suitably definitive account of the circumstances that led to the bids for a national studio a number of important issues came strongly into focus. Firstly support for such a collective venture was by no means universal, and secondly, and in part an explanation for this one of the major areas of contention was the issue of geographical location. Whereas the arguments for locating such a studio in the capital were undoubtedly persuasive, these overlooked a very material consideration concerning the geographical distribution on the existing, mostly college and university studios which by no means reflected a locus centred on London. Thus the case for the Birmingham bid was that much more compelling, and yet this too was to flounder as the result of a failure to attract sufficient local support.

The issue of whether to establish a national facility at all was essentially unique to the UK. Indeed it was without parallel, inspired to a significant extent by the failure of the BBC to contribute to the initiative. Ironically, in some respects the lack of such support might have proved to be a material advantage had the aspirations of those lobbying for a national studio born the desired fruit. Above all, what set developments in the UK apart from almost every other country was a collective desire amongst a critical mass of advocates to develop resources for all to derive benefit, and not just an elite group of composers fortunate enough to receive an invitation to work in a leading studio for electronic music.

Viewed with hindsight it is now clear that the arguments for such a facility were already being undermined by changing circumstances in the wider world almost from the outset. One long-forgotten factor that might otherwise have made such a bid more urgent was the uncertainty caused in 1984 by a decision of the University Grants Committee, somewhat alarmed by the rapid expansion of electronic music studios in Universities and the consequential cost implications, to commission a report from Jonathan Harvey, with a view to constraining and perhaps also concentrating future investment. 'It proposed the elimination of small departments via a programme of staff transfer and closure. The strategic funding of

electroacoustic studios thus became essentially a peripheral consideration in a much larger agenda.’³⁴⁸

The outcome of this report predated a major funding crisis for universities that occurred in 1986, causing a fundamental review of the sector as a whole. Harvey’s report was strongly supportive of maintaining and if possible enhancing the provision of electronic music within the music curriculum and this militated against any notion of a concentration in selected institutions. This effectively curtailed National Studio developments until the 1990s. Indeed, by the time of the bid for a studio in the South Bank the worst of the funding crisis had passed and university studios were beginning to multiply at a significant rate. As Manning stated:

‘By the early 1990s, following the abolition of the UGC in favour of the Universities Funding Council in 1989, and the return to significant investment with the establishment of the new post 1992 university sector, that the need to ensure that all music departments should receive adequate funding for electroacoustic music was finally recognised.’³⁴⁹

Furthermore, as has been noted the priority of many was not so much the availability of an especially well-equipped studio for all but the need to establish shared equipment pools for concerts.

In terms of a time map the Birmingham bid came at the point where the future viability of a national facility was already becoming a major concern, and the final Yorkshire bid was in many respects a disaster waiting to happen as the growing number of potential stakeholders simply underlined the sheer diversity of interest and priorities, none of which could be satisfactorily met by a unitary building-based enterprise. It is important nonetheless not to undervalue these bids in terms of their positive impact on both creative and technical developments in the UK. A key factor here was their impact on stimulating a sense of community, and the positive consequences of this have been discussed in detail. These communities were already established before the bids for a national studio became material

³⁴⁸ Manning 2012

³⁴⁹ Manning 2012

considerations, and indeed the resulting symbiosis has had a major influence on the subsequent course of organisations such as the Sonic Arts Network.

Electronic Music Studios (London) Limited was a ground-breaking studio, set up in the UK at a time when there was no comparable facility. It was also unique in combining private investment in new techniques of synthesis involving computers with a commercial manufacturing enterprise that was to rival its American counterparts. Their synthesisers were to become commonplace in UK university studios and were also small and cheap enough to be owned by individual composers and performers. University studios in turn also were to play a huge part in the development of the genre. Although these varied greatly in size and output they nonetheless provided the foundations for the studios we have today. Within little more than five years starting in the late 1960s over thirty studios had opened and operational, each pursuing its own teaching and aesthetic ideas. From these centres of creativity came the primary initiatives for establishing a national studio, and yet it was their growing success that finally undermined the case for one.

It is important nonetheless to recognise the contributions of those who worked entirely outside the university sector. Whereas Peter Zinovieff's work with EMS is probably best known in this context one must not overlook one of the greatest lone pioneers was Daphne Oram. Her Oramics system is of such importance that there is now a whole archive dedicated to it at Goldsmiths College and the machine itself is on display at the London Science Museum. It has been shown that the circumstances in the UK in terms of funding both studios and also bursaries for composers to work in them were less than favourable throughout the period studied. Bearing this in mind it is remarkable just how much activity took place in electronic music at the time, leading to a legacy of works which is significant and internationally important.

The Future

The role of organisations such as the Sonic Arts Network has changed greatly in recent times. In 2008 the Sonic Arts Network, British Music Information Centre, Society for the Promotion of New Music and the Contemporary Music Network were more or less obliged to merge by the Arts Council to form Sound and Music, currently based at Somerset House in London. Time will tell how beneficial these changes prove to be in the very different environment that exists today. The era of pioneering and public advocacy on the scale described in the earlier

chapters has come to an end, and it remains to be seen whether the former sense of community will survive. Perhaps most significantly, with advances in technology it is no longer necessary to have a large central composing resource; however the issues and challenges associated with public performance still remain. Organisations such as BEAST in Birmingham still transport their equipment to different venues and spend considerable time creating their rig for each concert, in the same way as the EMAS equipment pool was used thirty years ago.

Along with a performance space, also lacking is a meeting place for those interested in electronic music, where composers and technicians can share ideas. It is a common anecdote that the most productive place in IRCAM during the latter part of the last century was around the coffee machine. But here again the case for such a resource has significantly diminished with the burgeoning of IT communications as a much cheaper and more convenient means of sharing ideas. Here too the world has moved on.

Review of the availability of primary sources

For the benefit of those who may wish to take this work further the last part of this conclusion concentrates on the availability and potential value of the primary sources that were identified and studied for this thesis.

A significant proportion of the information used in this thesis resulted from one-to-one interaction with the pioneers themselves, and with the further passage of time it is inevitable that these interactions will cease to be possible. It is vital that the historical recollections of these pioneers and personnel associated with the early development of electronic music in the UK are recorded before they are lost, and a great deal of work still remains to be done in this context. The sad deaths of Hugh Davies and Tristram Cary during my research makes this situation only too clear. This is an inevitable limitation in my research and should be born in mind by future researchers in the field. It is vital that the memories, experience and knowledge of those composers remaining are not lost.

The personal archives of the pioneers are of paramount importance. When I began this period of research there were few opportunities to study primary sources. As I have explained throughout, many of the sources of information for this thesis have been the personal archives of composers. Many of these archives were simply boxes of unsorted paper, making the

process of research extremely long and tedious. Since beginning my research in 2004 the literature available on early electronic music in the UK increased as a result of two important archives becoming publically available, those of the great pioneers Daphne Oram and Hugh Davies. The Daphne Oram Collection is now well established thanks to ongoing work at Goldsmiths College, and much is to be gained from further study.

I began work cataloguing the Hugh Davies Archive at the British Library in 2007 but unfortunately I was unable to complete the project due to funding constraints placed on the department at the British Library. It is nonetheless a very large collection and can be visited by arrangement, which is better than not at all. The one institutional archive available, that of the BBC, proved valuable, not only specifically in the context of the Radiophonic Workshop, but also more generally in terms of the relationship between the BBC and contemporary music at that time. Access in this context is more difficult given some overriding considerations of confidentiality that still apply and there is no central register of documents. However further perseverance in this context may bear further useful fruit.

It is also important to consider that the passage of time affects the recording media itself. The accepted shelf life of magnetic tape is around thirty years, and some brands of tape have proved significantly less robust than others. It is thus vital that digital copies of these recordings are made before it is too late. Thankfully this process has begun in some cases. The Hugh Davies archive, for example, now exists in digital form at the Sound Archive of the British Library. Initiatives such as the EARS project³⁵⁰ are also making useful contributions in this regard.

The history of electronic music in the UK is rapidly becoming popular, and there are an increasing number of enthusiast groups, exhibitions and events. For example, at the time of writing (October 2011) the Oramics machine is on display at the Science Museum in London. Composer Peter Zinovieff has resurfaced after many years and has started participating in public seminars once again and earlier this year gave a talk at the Red Bull Music Academy³⁵¹ that included further information about the development of his MUSYS studio.

³⁵⁰ The ElectroAcoustic Resource Site project (EARS) is an initiative based at De Montford University and aims to provide resources for those wishing to conduct research in the area of electroacoustic music studies.

³⁵¹ The Red Bull Music Academy is an annual series of lectures given in a different international city each year. In 2010 this was in London where Peter Zinovieff gave a lecture entitled 'The Russian-English renaissance

Although such appearances are invariably informal, from time to time they can bear useful fruit in an academic context, especially when they are recorded and made available via internet portals such as Vimeo and Youtube. Such developments will allow future researchers to interact directly with primary sources in a way not possible when I began my research. One particular area of research that remains to be done in this context is the political situation regarding the national studio bids. For this to be studied in significant depth it may be necessary to study Government papers that have not yet been released into the public domain. Only time will tell.

The history of electronic music in the UK is unique and also instructive in terms of what can be learnt from the different ways in which like-minded creative artists will at times work independently and at others come together to further goals of mutual interest. Where developments in other countries have been significantly influenced by powerful groupings of composers and researchers such as at the GRM and IRCAM in France and Stanford and MIT in the USA, so it has been the case here that other, largely self-funded means of coming together have served an equally useful purpose in terms of promoting increased knowledge and understanding of the medium within the community. This thesis provides a record of these developments and hopefully will stimulate further critical debate.

man's guide to quadraphonic sounds'. A video can be found at www.redbullmusicacademy.com/lectures/dr-peter-zinovieff-the-original-tectonic-sounds.

Bibliography

Alcorn, Pamela Mary. *Perspectives of electroacoustic music: a critical study of the electroacoustic music of Jonathan Harvey, Denis Smalley and Trevor Wishart*. PhD Thesis, University of Durham, 1992.

Anderson, Barry. 'Electronic Music Studios in Britain – 7: West Square, London'. *Contact Magazine*, 17 (Summer 1977): 24-26.

Anderson, Barry. & Emmerson, Simon. 'Minutes of an ad hoc committee meeting'. *The Electro-Acoustic Music Association of Great Britain*, 28th September 1978. (from Simon Emmerson)

Appleton, Jon H. & Perera, Ronald C. (Ed.). *The Development and Practice of Electronic Music*. New Jersey: Prentice-Hall, 1975.

Arnold, Stephen. 'Electronic Studios in Britain – 9: University of Glasgow'. *Contact Magazine*, 19 (Spring 1978): 20–21.

Astor, Michael. *Arts Council New Activities Committee Report*. March 1970. (Hugh Davies Archive)

Ayres, Mark. *A History of the Doctor Who Theme*. See the website: http://ourworld.compuserve.com/homepages/Mark_Ayres/DWTheme.htm#Beginning. Accessed 15th April 2005.

____. 'Tristram Cary'. *Obituaries, The Guardian*, 2nd May 2008.

Babbitt, Milton. *Letter to Don Banks*. 19th June 1968. (Hugh Davies Archive)

Banks, Don. & Davies, Hugh. *Minutes of the SPNM Electronics Sub-Committee*. 5th December 1967. (Hugh Davies Archive)

Banks, Don. (Chairman). 'Minutes of a special meeting of the Executive Committee'. *Society for the Promotion of New Music*. 3rd May 1968. (Hugh Davies Archive) [a]

____. *Letter to Hugh Davies*. 10th July 1968. (Hugh Davies Archive) [b]

'Banks, Don; Boase, T. S. R.; Briscoe, Desmond; Cary, Tristram; Cruft, John; Derbyshire, Delia; Dickinson, Peter; Dougharty, Eric; Drew, David; Dunbar, Alexander; Evans, Peter; Falkner, Keith; Faulkner, John; Foggin, Miles; Gilbert, Anthony; Hall, Michael; Harvey, Jonathan; Keys, Ivor; Lumsdaine, David; Manduell, John; McCaldin, D. J.; Mellers, Wilfrid; Moreau, Annette; Musgrave, Thea; Oram, Daphne; Orton, Richard; Patterson, Paul; Rye, Christopher; Souster, Tim; Troup, Malcolm; Winter, Keith; Woolf, John; Zinovieff, Peter'. *Summary of points discussed at a meeting of the Calouste Gulbenkian Foundation*. 22nd September 1971. (from Peter Manning)

Battier, Marc. & Landy, Leigh. 'Electroacoustic Music: a century of innovation involving sound and technology – resources, discourse, analytical tools'. *Organised Sound*, 9/1 (2004): 1-2.

Battier, Marc. 'Electroacoustic music studies and the danger of loss'. *Organised Sound*, 9/1 (2004): 47-53.

BBC Press Service. 'Third Programme, October 7'. *BBC Press Release*, 1st October 1957. (Daphne Oram Collection)

_____. 'BBC Opens Britain's First Radiophonic Workshop'. *BBC Press Release*, 22nd May 1958. (BBC Archive) Cat. R97/11/2.

Begley, Patrick. 'The Future of the Long-Playing Record'. *The Irish Monthly*, 79/942 (Dec. 1951): 529-533.

Beida, David. 'The Need for an Artists Council'. *Circuit 9, Magazine of Friends of the Arts Council Operative*. (c. April 1969): 1-6. (Hugh Davies Archive) [a]

_____. 'FACOP conference advertisement'. *Circuit 9, Magazine of Friends of the Arts Council Operative*. (c. April 1969): 13-14. (Hugh Davies Archive) [b]

Berio, Luciano. 'Studio di fonologia musicale'. *The Score*, 15 (1956): 83-94.

Borwick, John (Ed.). *Sound Recording Practice*. Oxford: Oxford University Press, 1994.

Brattico, Elvira. & Sassanelli, Fiorella. 'Perception and Musical Preferences in Wishart's Work'. *Journal of New Music Research*, 29/2 (2000): 107-119.

Briggs, Asa. *The Birth of Broadcasting in the UK*. Oxford: Oxford University Press, 1961.

Brindle, Reginald Smith. *The New Music. The Avant-garde since 1945*. London: Oxford University Press, 1975.

Briscoe, Desmond & Curtis-Bramwell, Roy. *The BBC Radiophonic Workshop: The First 25 Years: the Inside Story of Providing Sound and Music for Television and Radio, 1958-1983*. London: BBC Books, 1983.

Brooker, F. C.. 'The BBC Radiophonic Workshop'. *Electronics and Power*, 11/1 (January 1965): 24-29.

Burt, Warren. 'Chadabe: Electric Sound. A Review'. *Computer Music Journal*, 22/1 (Spring 1998): 73-74.

Burtner, Matthew, 'Regenerative Feedback in the Medium of Radio: Study 1.0 (FM) for Radio Transceiver'. *Leonardo Music Journal*, 13 (2003): 39-42.

Cary, Tristram. 'Electronic Music: A Call for Action'. *Musical Times*, 107/1478 (April 1966): 312-313. [a]

- ____. *Letter to Hugh Davies*. 19th September 1966. (Hugh Davies Archive) [b]
- ____. *Letter to Hugh Davies*. 18th November 1966. (Hugh Davies Archive) [c]
- ____. *Letter to Hugh Davies*. 17th October 1968. (Hugh Davies Archive)
- ____. 'The BSEM National Studio Plan'. *British Society for Electronic Music*, June 1969. (Hugh Davies Archive)
- ____. 'Electronic Music - background to a developing art'. *Audio Annual, HiFi News*, Bristol: The Stonebridge Press, (1971): 42-49.
- Casken, John. *Correspondence with the author*. 2007
- Casserly, Lawrence. 'Plus ça change: Journeys, Instruments and Networks, 1966-2000'. *Leonardo Music Journal*, 11 (2001): 43-49.
- Chadabe, Joel. *Electric Sound: The Past and Promise of Electronic Music*. Upper Saddle River, N.J.: Prentice Hall, 1997. [a]
- ____. 'The Electronic Music Foundation'. *Organised Sound*, 2/1 (1997): 25-27. [b]
- ____. 'Electronic Music and Life'. *Organised Sound*, 9/1 (2004): 3-6.
- Cholij, Irena. 'Gerhard, Electronic Music and King Lear'. *Tempo (New Series)*, 198 (October 1996): 28-34.
- Clark, Mark. 'Suppressing Innovation: Bell Laboratories and Magnetic Recording'. *Technology and Culture*, 34/3 (July 1993): 516-538.
- Clarke, Michael. 'Extending Contacts: The Concept of Unity in Computer Music'. *Perspectives of New Music*, 36/1 (1998): 221-246.
- Cleverdon, Douglas. *Radiophonic Music*. 2nd May 1957. (BBC Archive)
- Collins, Nick. 'Recursive Audio Cutting'. *Leonardo Music Journal*, 13 (2003): 23-29.
- ____. 'Composers inside Electronics: Music after David Tudor'. *Leonardo Music Journal*, 14 (2004): iv, 1.
- Coopers & Lybrand Deloitte. *Beyond the Millennium, A National Centre for Electronic Music Working Papers*. July 1991. (from Peter Manning) [a]
- ____. *National Centre for Electronic Music, Beyond the Millennium. Prospectus*. October 1991. (from Peter Manning) [b]
- Cremaschi, Andres. & Giomi, Francesco. 'Parrole: Berio's words on Music Technology'. *Computer Music Journal*, 28/1 (Spring 2004): 26-36.
- Cross, Lowell. 'Electronic Music 1948-1953'. *Perspectives of New Music*, 7/1 (Autumn - Winter 1968): 32-65.

- Crowhurst, Norman. *Electronic Musical Instruments*. England: Foulsham-Tab Limited, 1975.
- Dart, Thurston. *Letter to Hugh Davies*. 26th September 1967. (Hugh Davies Archive)
- Davies, Hugh. *Archive of Papers, Personal Research, Correspondence, Photographs, and Recordings 1943 – 2005*. London, The British Library, 2007.
- Davies, Hugh. *Letter to Tristram Cary*. 19th September 1966. (Hugh Davies Archive)
- _____. *Letter to Thurston Dart*. 23rd September 1967. (Hugh Davies Archive)
- _____. *Letter to Don Banks*. 15th July 1968. (Hugh Davies Archive) [a]
- _____. *Letter to Ren and Yael of Electronic Music Review*. 14th October 1968. (Hugh Davies Archive) [b]
- _____. *Letter to Tristram Cary*. 17th October 1968. (Hugh Davies Archive) [c]
- _____. *Letter to Michael Graubert*. 1971. (Hugh Davies Archive)
- _____. 'Electronic Music, History and Development'. (Typewritten document) (Hugh Davies Archive). Also available in Vinton, John (ed). *Dictionary of Twentieth Century Music*. New York: Dutton, 1974.
- _____. 'Electronic Music Studios in Britain – 4: Goldsmiths' College, University of London'. *Contact Magazine*, 15 (Winter 1976): 29-31.
- _____. 'The Electronic Music'. *Tempo (New Series)*, 139 (December 1981): 35-38.
- _____. 'Gentle Fire, an early approach to Live Electronic Music'. *Leonardo Music Journal*, 11 (2001): 53-60.
- _____. *Sounds Heard*. United Kingdom: Soundworld Publishers, 2002.
- _____. 'Daphne Oram, a tribute to a pioneer'. *Obituaries, The Guardian*, 24th January 2003. Also see the website: www.sonicartsnetwork.org/oram. Accessed November 2004.
- _____. 'A History of Sampling'. *Organised Sound*, 1/1 (2006): 3-11.
- _____. 'Drawn Sound'. *Grove Music Online*. Oxford: Oxford University Press. Available from: Grove Music Online. (Accessed 3rd November 2004)
- _____. *List of studios*. (Hugh Davies Archive)
- _____. *RAM Studio*. Handwritten notes. (Hugh Davies Archive)
- Derbyshire, Delia. *Letter to Hugh Davies*. 23rd November 1965. (Hugh Davies Archive)
- DiScipio, Agostino. 'Centrality of techné for an aesthetic approach on electroacoustic music'. *Journal of New Music Research*, 24/4 (1995): 369-383.

- Dixon, John. *Electroacoustic music pre-1960: historicity and ideology: an approach to listening and appreciation*. PhD Thesis, University of Durham, 2000.
- Douglas, Alan. *Electronic Music Production*. London: Pitman Press, 1973.
- Douglas, Basil. 'Gramophone Notes'. *The Musical Times*, 91/1293 (November 1950): 429-431.
- Dowd, Timothy. 'Culture and commodification: technology and structural power in the early US recording industry'. *International Journal of Sociology and Social Policy*, 22/ 1/2/3 (2000): 106-140.
- Edison, Thomas A. 'The Perfected Phonograph'. *The North American Review*, 146/379 (June 1888): 641-650.
- _____. *Means for transmitting signals electrically*. US Patent No. 465,971, 29th December 1891.
- Eimert, Hebert. 'What is Electronic Music?'. *Die Reihe 1, Electronic Music*, Universal Edition (1965): 1-10.
- _____. 'How Electronic Music Began'. *Musical Times*, 113/1550 (April 1972): 347+349.
- EMAS. *Draft Application to the Calouste Gulbenkian Foundation by The Electro-Acoustic Music Association of Great Britain*, 2nd December 1978. (from Simon Emmerson)
- Emmerson, Simon. 'Electronic Studios in Britain'. *Music and Musicians*, XXIII/11 (July 1975): 24-26.
- _____. 'Electronic Music Studios in Britain: Coordinating resources'. *Report for the Arts Council*, 1977. (from Simon Emmerson)
- _____. *Agenda for the Electronic Studios Meeting to be held at York University*. 31 March – 3rd April 1978. (from Simon Emmerson)
- _____. 'Minutes of a committee meeting'. *Electro-Acoustic Music Association of Great Britain*, 14th June 1979. (from Simon Emmerson)
- _____. *Draft letter to the Arts Council*. 15th January 1982. (Hugh Davies Archive)
- _____. (Ed.). *The Language of Electroacoustic Music*. London: Macmillan, 1986.
- _____. 'Live electronic music in Britain: three case studies'. *Contemporary Music Review*, 6/1 (1991): 179-195.
- _____. *Music, Electronic Media and Culture*. Aldershot: Ashgate, 2000.
- _____. *Conversation with the author*. London, March 2008.
- Ernst, David. *The Evolution of Electronic Music*. New York: Schirmer Books, 1977.
- Fearn, Raymond. *Maderna*. Switzerland: Harwood Academic, 1990.

- Fisher, William Arms. 'The Radio and Music'. *Music Supervisors' Journal*, 12/3 (February 1926): 8-72.
- Flynn, George. W.. 'Listening to Berio's music'. *Music Quarterly*, 61 (1975): 388-421.
- Freire, Serigio. 'Early Musical Impressions from Both Sides of the Loudspeaker'. *Leonardo Music Journal*, 13 (2003): 67-71.
- Garrard, M. R.. *Memo to H. C. P. Ops.* 8th November 1956. (BBC Archive)
- _____. *Memo to G. R. Fog.* 24th February 1959. (BBC Archive)
- George, R. V. A.. *Memo.* November 1956. (BBC Archive)
- Gerhard, Roberto. 'The Contemporary Musical Situation'. *The Score and I.M.A. Magazine*, 16 (June 1956): 15-27.
- Giomi, Francesco. & Ligabue, Marco. 'Understanding Electroacoustic Music: Analysis of Narrative Strategies in six early compositions'. *Organised Sound*, 3/1 (1998): 45-49.
- Giomi, Francesco. 'Luciano Berio, A Testimony'. *Organised Sound*, 8/2 (2003): 231-232.
- Graubart, Michael. 'Electronic Music Studios in Britain – 6: Morley College, London'. *Contact Magazine*, 16 (Spring 1977): 16-17.
- Graves, C. G. 'Broadcasting in Britain'. *Annals of the American Academy of Political and Social Science*, 177 [Radio: The Fifth Estate] (January 1935): 55-60.
- Greville, Ursula. 'Radio in Britain'. *The Musical Quarterly*, XI/2 (April 1925): 157-163.
- Griffths, Paul. *A Guide to Electronic Music*. Bath: Pitman Press, 1979.
- Harrison, Jonty: 'Denis Smalley, EMAS and (Electro-Acoustic) music'. *The Musical Times*, 130/1759 (September 1989): 528-529+531.
- Harvey, Jonathan. *Report for the Arts Council on the Electro-Acoustic Music Association of Great Britain*. October 1983. (Hugh Davies Archive)
- Haynes, Jim. *Arts Council Newsletter*. 28th October 1969. See the website: www.jim-haynes.com.
- Hinton, Graham. *EMS The Inside Story*. See the website: <http://www.ems-synthi.demon.co.uk/emsstory.html>. Accessed 3rd November 2005.
- Hodgkinson, Tim. 'An Interview with Pierre Schaeffer'. In *Book of Music and Nature*, ed D. Rothenberg & M. Ulvaeus, 34-44. Wesleyan University Press, 2001.
- Hodgson, Brian; Osborne, Nigel; Anderson, Barry; Butler, Carol; Emmerson, Simon; Montague, Stephen; Smalley, Denis; Vyner, Michael; Grierson, Ronald; Snowman, Nicholas; Horsburgh, Ian; Harvey, Jonathan. *A National Studio for Electronic Music at the South Bank*. c. 1986. (from Peter Manning)

- Hodgson, Brian. 'Delia Derbyshire. Pioneer of electronic music who produced the distinctive sound of Dr Who'. *The Guardian*, 7th July 2001.
- Holmes, Thomas. B. *Electronic and Experimental Music*. New York: Charles Scribner and Sons, 1985.
- Howe, Hubert S. Jr. *Electronic Music Synthesis, Concepts, Facilities and Techniques*. London: Dent and Sons, 1975.
- Hutton, Jo. 'Radiophonic Ladies'. *Sonic Arts Network*, 2000. Currently available from: web.archive.org/web/20060517133312/http://sonicartsnetwork.org/ARTICLES/ARTICLE2000JoHutton.html.
- _____. 'Daphne Oram, Innovator, Writer and Composer'. *Organised Sound*, 8/1 (2003): 49-56.
- Jome, Hiram J. 'Public Policy toward Radio Broadcasting'. *The Journal of Land and Public Utility Economics*, 1/2, (April 1925): 198-214.
- Julien, Olivier. 'Introducing Students to musical technology: the case for reel - to - reel analog tape machines'. *British Journal of Music Education*, 17/2 (2000): 197-208.
- Judd, F.C. *Electronics in Music*. London: Neville Spearman, 1972.
- Keane, David. *Tape Music Composition*. Oxford: Oxford University Press, 1980.
- Koenig, Gottfried Micheal. 'Henri Pousseur'. *Die Reihe 4, Young Composers*, Universal Edition (1960): 13-28.
- Kostelanetz, Richard. 'John Cage, a conversation about radio'. *Music Quarterly*, 72/2 (1986): 216-227.
- Landy, Leigh. 'The Electroacoustic Community'. *Organised Sound*, 2/2 (1997): 1-3.
- _____. 'Reviewing the Musicology of Electroacoustic Music'. *Organised Sound*, 4/1 (1999): 61-70.
- Le Groupe de Recherches Musicales de l'O.R.T.F. and The Independent Electronic Music Center, Inc. *Repertoire International des Musiques Electroacoustiques*. USA: MIT Press, 1968.
- Levin, Thomas Y.. 'Tones from nowhere: Rudolph Pfenniger and the Archaeology of Synthetic Sound'. *Grey Room 12* (Summer 2003): 32-79.
- Link, Stan. 'The work of reproduction in the Mechanical Ageing of an art: Listening to Noise'. *Computer Music Journal*, 25/1 (Spring 2001): 34-47.
- Luening, Otto. 'Some Random Remarks about Electronic Music'. *Journal of Music Theory*, 8/1 (Spring 1964): 89-98.

____. 'An Unfinished History of Electronic Music'. *Music Educators Journal*, 55/3 (November 1968): 42-49, 135-142, 145.

Lumsdaine, David. *Conversation with the author*. York, November 2005.

Maconie, Robin. 'Electronic Music Studios in Britain – 8: University of Surrey, Guildford'. *Contact Magazine*, 18 (Winter 1977): 24-25.

____. 'Extraordinary Meeting', *EMAS Newsletter*, 2/2 (April/May, 1980). (From Simon Emmerson)

____. *The Works of Karlheinz Stockhausen*. Oxford: Clarendon Press, 1990.

Maddocks, Fiona. 'Electrifying the South Bank'. *The Independent*, 8th October 1986.

Manning, Peter. 'Electronic Studios in Britain – 3: University of Durham'. *Contact Magazine*, 14 (Spring 1976): 27-29.

____. *Electronic music and the computer: a critical study of the development of electronic music systems and the introduction of computer-based technology, with particular reference to the interface problems encountered in composer/machine communications*. PhD Thesis, University of Durham, 1977.

____. 'Invention and Innovation: A vital partnership'. *EMAS Newsletter*, April 1979.

____. 'The evolution of interactive graphical control interfaces for musical applications'. *Organised Sound*, 4/1 (1999): 45-59.

____. 'The Influence of Recording Technologies on the Early Development of Electroacoustic Music'. *Leonardo Music Journal*, 13 (2003): 5-10. [a]

____. 'The Electroacoustic Music of David Lumsdaine'. In

David Lumsdaine, Between Two Worlds, ed. Michael Hall. Arc Publications, 2003. [b]

____. *Electronic and Computer Music*. New York: Oxford University Press, 2004.

____. 'The significance of techne in understanding the art and practice of electroacoustic composition'. *Organised Sound*, 11/1 (2006): 81-90.

____. 'The Composer and studio designer: the exchange of musical and technical information'. (Hugh Davies Archive)

____. *Email correspondence with the author*. 23rd May 2012.

Manzoni, Giacomo. 'Bruno Maderna'. *Die Reihe 4, Young Composers*, Universal Edition (1960): 115-121.

Mathews, Max. V. *The Technology of Computer Music*. Cambridge, Mass: M.I.T. Press, 1969.

McLeod, Ken. 'Space Oddities: Aliens, futurism and meaning in popular music'. *Popular Music*, 22/3 (2003): 337-355.

McWhinnie, Donald. *The Art of Radio*. London: Faber and Faber, 1959.

Miller, Jonathan. 'Ron Berry: Synthesist, Designer, Hobbyist'. *Sound on Sound*, February 1996. See the website: www.soundonsound.com/sos/1996_articles/feb96/ronberry.html.

_____. 'The Modular Modeller'. *Sound on Sound*, July 1997. See the website: www.soundonsound.com/sos/1997_articles/jul97/ronberry.html.

Montague, Stephen. 'Barry Anderson 1935-1987'. *Tempo (New Series)*, 166 (September 1988): 12-20.

Morgan, Robert. P. 'A New musical Reality: Futurism, Modernism, and 'the art of noises''. *Modernism & Modernity*, 1/3 (1994): 129-151.

Morton, David. "'The Rusty Ribbon': John Herbert Orr and the Making of the Magnetic Recording Industry, 1945-1960'. *Business History Review*, 67/4 (Winter 1993): 589-622.

_____. 'Armour Research Foundation and the Wire Recorder: How Academic Entrepreneurs Fail'. *Technology and Culture*, 39/2 (April 1998): 213-244.

Naumann, Joel. & Wagoner, James D.. *Analog Electronic Music Techniques*. New York: Schirmer, 1985.

Oram, Daphne. *Archive of Papers, Personal Research, Correspondence, Photographs, and Recordings 1925 – 2003*. London: Goldsmiths College, 2007.

Oram, Daphne. *Letter to Dr. Anderson*. 23rd January 1953. (Daphne Oram Collection)

Oram, Daphne; Eckersley, T. H.; Cleverdon, Douglas; Almuro, Andrew. *Historical Outline*. (BBC Document), November 1956. (Daphne Oram Collection)

_____. *Letter to her parents*, 5th October 1957. (Daphne Oram Collection)

_____. 'Electronic Music'. *The Composer*, 9 (Spring 1962). (Daphne Oram Collection) [a]

_____. *Letter to Hugh Davies*. October 1962. (Hugh Davies Archive) [b]

_____. *Letter to Hugh Davies*. 3rd February 1963. (Hugh Davies Archive)

_____. *An Individual Note of music, Sound and Electronics*. London: Galliard, 1972.

_____. *Notes*. 1983. (Daphne Oram Collection) Also available online, see the website: www.daphneoram.org/oramarchive/bbc/. Accessed 17th February 2010.

_____. 'Transcript of an interview'. *Tower Folly, Kent*, 1st June 1991. (Hugh Davies Archive)

_____. 'Looking Back... to See Ahead'. *Contemporary Music Review*, 11/1 (1994): 225-228.

- ____. *Handwritten notes*. (Daphne Oram Collection)
- ____. *Notes for 25 Years of the BBC Radiophonic Workshop book*. (Daphne Oram Collection)
- Orton, Richard. 'Electronic Music Studios in Britain – 1: The University of York'. *Contact Magazine*, 12 (Autumn 1975): 33-35.
- ____. *Electronic Music for Schools*. Great Britain: Cambridge University Press, 1981.
- Osmond-Smith, David. *Berio*. Oxford: Oxford University Press, 1991.
- Palombini, Carlos. *Pierre Schaeffer's typo-morphology of sonic objects*. PhD Thesis, University of Durham, 1992.
- ____. 'Machine Songs V: Pierre Schaeffer – From research into Noises to Experimental Music'. *Computer Music Journal*, 17/3 (Autumn 1993): 14-19. [a]
- ____. 'Pierre Schaeffer, 1953: Towards an experimental music'. *Music and Letters*, 74/4 (1993): 542-557. [b]
- ____. 'Technology and Pierre Schaeffer'. *Organised Sound*, 3/1 (1998): 35-43.
- ____. 'Musique concrète revisited'. *Electronic Musicological Review*, 1/2 (June 1999). See the website: www.rem.ufpr.br/-REM/REMV4/vol4/artipalombini.htm.
- Paulu, Burton. *British Broadcasting: Radio and Television in the UK*. Minneapolis: University of Minnesota Press, 1956.
- Pinch, Trevor & Trocco, Frank. *Analog Days: The invention and Impact of the Moog Synthesiser*. USA: Harvard University Press, 2002.
- Piper, David. *Letter to Hugh Davies*. 30th September 1968. (Hugh Davies Archive)
- Porter, E.W.S.. *Memo to D. H. Morgan, P.K. Young and D. Briscoe*. 20th March 1959. (BBC Archive)
- ____. *Memo to William Glock*. 8th October 1960. (BBC Archive)
- Potter, Caroline. *French Music Since Berlioz*. England: Ashgate, 2006.
- Potter, Keith. 'Hugh Davies'. *Obituaries, The Independent*, 7th January 2005.
- Powers, Ollie D. *Interactions Between Composers and Technology in the First Decades of Electronic Music, 1948-1968*. PhD Thesis, Ball State University, 1998.
- Reid, Gordon. 'All about EMS, Part 2'. *Sound on Sound*, December 2000. See the website: www.soundonsound.com/sos/dec00/articles/retrozone.asp. Accessed 3rd April 2012.
- Reynolds, Simon. 'Sorcerers of Sound'. *Review, The Guardian*, 20th September 2008: 18.
- Roads, Curtis. *The Music Machine*. Massachusetts: MIT Press, 1989.

- _____. *The Computer Music Tutorial*. Massachusetts: MIT Press, 1996.
- Roberts, F. A. (ed.). 'Radiophony'. *Engineering*. 6th June 1958. (BBC Archive)
- Robindore, Brigitte. 'Luc Ferrari: Interview with an Intimate Iconoclast'. *Computer Music Journal*, 22/3 (1998): 8-16.
- Sadie, Stanley. 'Why we need a national electronic studio'. *The Times*, 4th July 1969.
- Salzman, Eric. *Twentieth-Century Music, An Introduction*. New Jersey: Prentice-Hall, 1988.
- Santi, Piero. 'Luciano Berio'. *Die Reihe 4, Young Composers*, Universal Edition (1960): 98-102.
- Saul, Patrick. *Letter to Daphne Oram*. 5th February 1962. (Hugh Davies Archive) [a]
- _____. *Letter to Hugh Davies*. 5th March 1962. (Hugh Davies Archive) [b]
- Schaeffer, Pierre. & Malina, Frank. 'A conversation on music and kinetic art'. *Leonardo*, 5/3 (1972).
- Schrader, Barry. *Introduction to Electro-Acoustic Music*. New Jersey: Prentice-Hall, 1982.
- Schwanauer, Stephan. & Levitt, David A. (ed.). *Machine Models of Music*. London: MIT, 1993.
- Schwartz, Elliott. *Electronic Music, A listeners Guide*. London: Secker and Warburg, 1973.
- _____. 'Electronic Music: A 30 year retrospective'. *Music Educators Journal*, (1978): 37-41.
- Sear, Walter. *A Guide to Electronic Music and Synthesizers*. London: Omnibus Press, 1972.
- Davies, Hugh. *Service de la recherché de le R.T.F.* Unpublished manuscript. 1961.
- Davies, Hugh. Annotations in *Service de la recherché de le R.T.F.* Unpublished manuscript, Hugh Davies Archive. 1961.
- Slotten, Hugh Richard. 'Universities, Public Service Experimentation, and the origins of Radio Broadcasting in the United States, 1900-1920'. *Historical Journal of Film, Radio and Television*, 26/4 (October 2006): 485-504.
- Smalley, Denis. 'Electronic Music Studios in Britain – 5: University of East Anglia, Norwich'. *Contact Magazine*, 16 (Winter 1976): 14-16.
- _____. (Hon. Secretary, EMAS). *Minutes of a Meeting of the Board of Directors*. 15th July 1985. (from Simon Emmerson) [a]
- _____. (Hon. Secretary, EMAS). *Minutes of a Meeting of the Board of Directors*. 4th October 1985. (from Simon Emmerson) [b]

- Stockhausen, Karlheinz. 'The concept of Unity in Electronic Music'. *Perspectives of New Music*, 1 (Autumn 1962 - Spring 1963): 39-48.
- _____. 'The Origins of Electronic Music'. *Musical Times*, 112/1541 (July 1971): 649-650.
- Strange, Allen. *Electronic Music, Systems, Techniques and Controls*. USA: Wm. C. Brown Co. Pub., 1972.
- Symes, Colin. 'A sound education: the gramophone and the class room in the United Kingdom and United States'. *British Journal of Music Education*, 21/2 (2004): 163-178.
- Tilson, Jos. *FACOP working document number two*. 30th June 1969. (Hugh Davies Archive)
- Tingen, Paul. 'BASF 60 Years of Magnetic Tape'. *Audio Media*, 66 (May 1996): 53-64.
- Truax, Barry. 'Letter to a 25 year old electroacoustic music composer'. *Organised Sound*, 4/3 (1999): 147-150.
- _____. *Acoustic Communication*. USA: Ablex Pub., 2001.
- Ussachevsky, Vladimir. 'Notes on a piece for tape recorder'. *Music Quarterly*, XLVI/2 (April 1960): 202-209.
- Von Foerster, Heinz. & Beauchamp, James W. (ed.). *Music by Computers*. New York: John Wiley and Sons Ltd, 1969.
- Voorvelt, Martijn. 'New Sounds, Old Technology'. *Organised Sound*, 5/2 (2000): 67-73.
- Wade, Frank. *Memo to H. S. B. A., Colour Tone Instrument: Electronic (Light) Music*. 5th June 1957. (BBC Archive) Cat. R97/11/1.
- Wen-Chung, Chou. 'Varese: A sketch of the man and his music'. *Music Quarterly*, LII/2 (April 1966): 151-170.
- Whitney, John. 'To paint on water. The Audiovisual Duet of Complimentality'. *Computer Music Journal*, 18/3 (1994): 45-52.
- Whittal, Arnold. *Musical Composition in the Twentieth Century*. Oxford: Oxford University Press, 1999.
- Wick, Robert L. *Electronic and Computer Music*. London: Greenwood, 1997.
- Wilkinson, Marc. 'Two months in the Studio di Fonologia'. *The Score*, 22 (February 1958): 41-48.
- Willatt, Hugh (Secretary General, ACGB). *Arts Council of Great Britain: New Activities, Council Paper 433*. 10th October 1968. (Victoria & Albert Museum) Cat. ACGB/35/146 Box No. 2.
- Winter, Keith. *Minutes of the inaugural meeting of the British Society for Electronic Music*. 14th February 1969. (EMS Archive)

- ____. 'Electronic Music Studios in Britain – 2: University College, Cardiff'. *Contact Magazine*, 13 (Winter 1975): 31-33.
- Wilson, Giles. 'Daphne Oram, the unsung pioneer of techno'. *BBC News Online*, 23rd January 2003. See the website: <http://news.bbc.co.uk/1/hi/uk/2669735.stm>.
- Woolf, John. *Letter to Hugh Davies from the SPNM*. 16th August 1967. (Hugh Davies Archive)
- Worner, Karl H.. *Stockhausen: Life and Work*. London: Faber and Faber, 1963.
- Zinovieff, Peter. *Some thoughts on a low-cost music/arts studio*. 23rd June 1969 (EMS Archive) [a]
- ____. *Letter to BSEM committee*. 10th September 1969. (Hugh Davies Archive) [b]
- ____. *Letter to The Times*. 26th June 1970 (EMS Archive) [a]
- ____. *MUSYS Manual*. 1970. (Thanks to Peter Manning) [b]
- ____. 'Peter Zinovieff Electronic Music Diary Summer 1976'. *Bulletin of the Computer Arts Society*, May 1977. See the website: <http://members.tripod.com/werdav/vocpzino.htm>. Accessed 13th June 2007.
- ____. *Seven Deadly Synths*, 26th March 2010. Available online at: <http://www.redbullmusicacademy.com/daily-news/post/0/0/1377>. Accessed 2nd July 2011.
- ____. 'Voltage Controlled Studio'. *EMS London Ltd Marketing document*. (Hugh Davies Archive)
- Various. *The BBC Written Archive*, Reading.
- Unknown. *A Report on Radiophonic Music at the Features Department Conference 1957*. 19th June 1957. (BBC Archive) Cat. 97/11/1. [a]
- Unknown. 'Horror on the Third'. *The Daily Telegraph*. 7th October 1957. (BBC Archive) [b]
- Unknown. 'The BBC's Radiophonic Workshop'. *The Times*, 24th May 1958. (BBC Archive) [a]
- Unknown. *Unsigned document*. 1958. (BBC Archive) [b]
- Unknown. *Memo to the Radiophonic Effects Committee*. 13th August 1959. (BBC Archive)
- Unknown. *Radiophonic Workshop Report*, 19th December 1961. (BBC Archive) [a]
- Unknown. 'Attachment of Tel. Tech. Ops. Sound Mixers'. *BBC Radiophonic Workshop Report*, 29th December 1961. (BBC Archive) [b]

Websites:

www.delia-derbyshire.org

www.ems-synthi.demon.co.uk

www.vintagesynth.com

www.composersdesktop.com

www.whitefiles.org