

# “WEEDS IN THE CRACKS”: INTERDISCIPLINARITY AND MUSIC TECHNOLOGY IN HIGHER EDUCATION

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## ABSTRACT

This article discusses how we can facilitate interdisciplinarity better in our Higher Education systems, specifically looking at “Music Technology” or “Computer Music”, considering the term in its widest meaning. It reflects on current practices and projects into the future, focussing on interdisciplinarity as such, and the contextualised interdisciplinary challenge specifically for the subjects of music technology.

## 1. INTRODUCTION

Evolution is going on in our University systems, and in academia we tend to acknowledge it only as either an administratively driven or a discipline driven (academically relevant) movement. What we tend to often forget, is that a discipline is - most of all - a social construct, not a physical truth. So my research around interdisciplinarity and music technology started with the very personal questions back in 2001: Why is it so hard, as an interdisciplinarian, to teach what we think should be taught, or to research what we think should be researched; why is it so often the case that one has to justify methodology, terminology and conceptual frameworks. Why is it that “interdisciplinarity is often seen as a critique of academic specialisation as a whole” and that it “often draws attention to the fact that what is studied and taught within universities is always a political question.”[1][Moran, p.16]

One of the outcomes of my fascination with the disciplines as such is a new journal<sup>1</sup> and it comes at a good time as we as practitioners and educators begin to reflect on our own practices within this field, discuss boundaries of this discipline or the non-existence of these; discuss if its development means that it is evolving into a new academic discipline, or that it may never represent a specific discipline... and how would we cater for this in our predominately disciplinary educational structures. It is a good time to create a discourse on how and what and in which contexts we teach and facilitate learning; where we have been and where we are going.

## 2. MOTHERHOOD AND APPLE PIE

Interdisciplinarity has been said to be the modern ‘motherhood and apple pie’ issue. That is to say, everyone, including decision makers in higher education, recognizes that it is a Good Thing.[2] It has ‘become a buzzword across many different academic subjects in

recent years, but it is rarely interrogated in any great detail’ [3].

In 1989 Liu pointed out that interdisciplinarity is the most ‘seriously underthought critical, pedagogical and institutional concept in the modern academy’ and in 2008 we still, as Sperber says, ‘do not, normally, discuss among ourselves interdisciplinarity per se. What we do is work on issues that happen to fall across several disciplines, and, for this, we establish collaboration [...]’ [4].

It seems we haven’t learned much: the classical divide between the arts and the sciences is still there. Even forty-seven years after C.P.Snow’s classic article on the cultural divide of the arts and sciences (1959) [5], the gap is still there. And although the communities on both sides of the gap might be talking, they certainly are not understanding each other.

Kant’s The Conflict of the Faculties	(1798),
Nietzsche’s We Scholars	(1886),
Snow’s The Two Cultures	(1959),
Popper’s The Logic of Scientific Discovery	(1959),
Habermas’ Zur Logik der Sozialwissenschaften	(1967),
Derrida’s Structure, Sign and Play	(1978),
Becher’s Academic Tribes and Territories	(1989),
Apostel’s Interdisciplinarity	(1972),
Moran’s Interdisciplinarity	(2002) and
Sperber’s Why Rethink Interdisciplinarity?	(2005),

Table 1

Even after more than 200 years of academic thinking and writing about this subject (See Table 1), we still live in a world where those in the sciences criticize the lack of empirical methods of humanities scholars and their seeming reliance on subjective interpretations. In turn, those in the humanities attack scientists for a misguided faith in the possibility of absolute objectivity, a narrow conception of useful knowledge and an unwillingness to interrogate the broader social, political and cultural implications of their work.

‘Many of these disagreements can be traced not only to the different scope and subject matter of the sciences and humanities, but to their contrasting assumptions about how knowledge should actually be accumulated’ [6]

So what than proves a discipline to be genuinely interdisciplinary? Is it when these two people with two functions have merged into one, successfully? Or when we are aware that have crossed a boundary?

<sup>1</sup> Journal of Music, Technology and Education. Intellect.



Fig. 1 National Academy of Science [7]

Is it when we are actually not so certain about where and who we are? Is it when we feel we have created something new, something that goes beyond the boundaries? When we have defined what an interdisciplinary area is made up of, and repeatedly redefined and redefined. When we feel we have been invaded, when there is a technology push or a creative pull



Fig. 2 Creative Pull? [8]

On a more serious note and regarding the interdisciplinary enquiry, no matter how we defined interdisciplinarity, there is a perceived dichotomy of what research is and how knowledge is acquired. [9] Without going into the details of this dichotomy, it could be summed up into methods of the types:

Quantitative	Qualitative
Empirical	Constructivistic
Positivism	Phenomenalism
A posteriori	A priori
Analytic	Synthetic
	Rationalism
Modernism	Post-Modernism
Linear	Non-linear
etc	etc

Table 2. The perceived dichotomy of research methodologies

So if we are aware of this dichotomy, have talked about it for more than 200 years, use the term “interdisciplinarity” in almost every single promotional blurb for our degrees, why is it still so hard?

Both Reading and Foster [10] suggest that “interdisciplinary study represents the future of the university. Reading argues that interdisciplinary intellectual and institutional battles have already been decisively won, and that ‘disciplinary structure is cracking under the pressure of market imperatives’”. This may be in the USA, but in the UK, QAA and Funding councils impose institutional constraints on Interdisciplinarity. RAE and TQA help reinforce disciplinary boundaries by monitoring standards within measurable units with the help of specialist assessors, or panels of experts in specific fields. “In this culture, disciplines remain a powerful force within academia and will struggle against any movement towards interdisciplinarity”. [11] This draws attention to the fact that “what is studied and taught within universities is always a political question.”[12] So it might help, when talking about interdisciplinarity in Higher Education, to distinguish between different dimensions.

- The Academic Dimension:
  - how do we allow interdisciplinary enquiry to happen, and
  - how do we foster it in our own curricula and degree structures
- The Organizational & the Political
  - which institutional infrastructure allows it to happen most easily, and
  - what policies need to be in place (HR, funding models, etc) and
  - what is a money saving device (creation of schools) and what genuinely support for interdisciplinarity
- The Social
  - the acceptance that disciplines are most of all social constructs and devising policies that support this

And the social aspect is most often forgotten in the cash-strapped era with an education system that doesn't feel very luxurious. We find a lack of social spaces for academic staff, which encourages tribal thinking, something which we seem to have inherent in our

system anyway, as Becher points out: “Men of sociological tribe rarely visit the land of the physicist and have little idea what they do over there. If the sociologists were to step into the building occupied by the English Department, they would encounter the cold stares if not the slingshots of the hostile natives ... the disciplines exist as separate estates, with distinctive subcultures” [13]

So what kind of interdisciplinarity does exist? Marilyn Stember has coined the different terms of interdisciplinarity. He differentiates between

- Intradisciplinarity  
Intradisciplinary analysis involves work within a single discipline.
- "Crossdisciplinarity"  
Crossdisciplinarity activity would view one discipline from the perspective of another, acoustics of music being one example.
- "Multidisciplinarity"  
Multidisciplinary analysis would draw on the knowledge of several disciplines, with their own different perspectives on a problem or issue. It tends to be accumulative.
- "Transdisciplinarity"  
`Transdisciplinary analysis, in Stember's words, is "concerned with the unity of intellectual frameworks beyond the disciplinary perspectives". I.e. anything that transcends by its nature the disciplinary boundaries, such as the nature of reality.
- "Interdisciplinarity"  
Interdisciplinary analysis would require the integration of knowledge from several disciplines. It would be real synthesis where the addition of knowledge from different disciplines would result in an understanding that is greater than a mere sum

However, Stember goes one to emphasize, the focus on integration in interdisciplinary enquiries should not imply that the outcome of interdisciplinary analysis will always be a neat, tidy solution in which all contradictions between the alternative disciplines are resolved. Interdisciplinary study may indeed be “messy” and contradictory. “However, contradictory conclusions and accompanying tensions between disciplines may not only provide a fuller understanding, but could be seen as a healthy symptom of interdisciplinarity. Analysis which works through these tensions and contradictions between disciplinary systems of knowledge with the goal of synthesis—the creation of new knowledge—often characterizes the richest interdisciplinary work.”[14]

### 3. INTERDISCIPLINARITY AND MUSIC TECHNOLOGY

So where does music technology fit into this system. The term of “Music Technology” has perceptually different and shifting meanings pending the context it is being used in. Besides the cultural differences of this term – in the US it means something slightly different than in the UK - this

complexity of its perception is an indication of the fragmentation of its communities into three main areas of activity: compositional-sound-and-music-technologies, sound-and-music-processing technologies and sound-and-music-production-technologies.

It seems that in the degrees of the interdisciplinary subject area of music technology, we see an example of interdisciplinary things to come. We see a collection of academic and professional communities evolving and sometimes clashing in the evolutionary and culturally ingrained tendency in academia to standardize methodology and terminology. We see the movements of sub-disciplines moving apart and regrouping and sometimes creating new single disciplines within new boundaries. And this movement is governed by different outside factors such as government policies, in Britain, for example, the Research Assessment Exercise, or the Further and Higher Education Act of 1992. The way a particular discipline — music technology — becomes established and how it evolves has as much to do with institutional and governmental politics, social constructs and pedagogical methodologies, as it does with the discipline itself,- the discipline, that never actually was one discipline: Music Technology

### 4. THE DISCIPLINE THAT NEVER WAS

As academic practitioners within music technology we know, or should, that there is a “substantial complexity involved in providing a supporting and educationally valuable environment for students and staff in an area which reaches not only over different scientific domains, but also over different working and investigatory methodologies, different approaches for presentation and practice, different underlying - but implicit - justificational hypotheses, different vocabularies and terminologies as well as different conceptual frameworks – not even to mention often different budgets and administrative units.”[15]

So how do we create a supporting and educationally valuable environment for students and staff? How do existing educational frameworks allow interdisciplinary degrees, such as music technology, to be taught? In order to investigate how different universities faced this challenge, the project “Betweening” was born in 2005. Results from the quantitative study from midway were presented at the ICMC in 2006 in New Orleans [16].

Although we all say we know that the degree curricula around music and technology are of a interdisciplinary nature (motherhood and apple pie), they are often still given as if they fit seamlessly into our traditional, mono-discipline-based academic structure. Often we find ourselves struggling in our efforts to pursue knowledge and teaching “... without being essentially constrained by the structure and content of a single discipline, including subject matter, predominant theories, typical methods, or primary schools of thought”. [17] The interdisciplinary challenge of

“betweening” still exists on all levels of academic endeavour: from teaching and learning to administration and research.

‘Betweening’, was funded by Palatine (Higher Education Academy). The aim of the project was to explore the educational landscape of music technology in HE and to provide an oversight of the different models used. It ran from 2005 – 2007, and along the way various results of qualitative and quantitative nature were presented. [18], [19], [20], [21], [22]. One of the major outcomes was a study about how the institutions allowed interdisciplinarity to happen, i.e. what models were used to facilitate the diverse range of subjects and methodologies to be acquired.

UCAS, the British Universities and Colleges Admissions Service, currently lists ca 351 degrees in the category of music technology. Simply concentrating on the aspect, of how the diverse subjects are integrated into one “interdisciplinary degree” the study identified three distinct methods of degree structure:

a) Contributions but single program: A program for the whole course has been decided before hand. Contributions come more or less from more than one department. Examples are B.Eng degrees that have contributions from Music Departments.

b) Contributions and multiple programs: Contributions from more than one department, with students choosing two or three programs for their “interdisciplinarity”. Examples can be found in the classic joint honour models.

c) Integrating Model: Contributions from one department only, but which brings in staff expertise from relating disciplines. Examples could be seen in the many Single Honours BSc Music technology degrees.

Many universities have chosen to provide interdisciplinarity through a joint degree model. In fact 60% of the music technology degrees are taught as a joint model, with contributions coming from more than one department, and students choosing two or three programs for their “interdisciplinarity”. It is a model which is well known and established, and therefore easily integrated into existing university administrative processes. It is specifically common in the arts and humanities, and logically the highest number of joint degrees in music technology were initiated with this model in mind. It does not need more or specific additional staff, and often no additional purpose-based spaces.

In these institutions, music technology or electro-acoustic composition courses tend to have been optional courses for many years before a specific music technology degree is started. The problem of setting up the degree, therefore, tends to be simply a matter of scale. So long as institutions have a financial resource allocation model in place where the funding for the student follows the student down to the level of the smallest academic unit (department or school), this model is often chosen to provide an easy way to integrate interdisciplinarity.

But many institutions have also acknowledged the limits of this model. It is the responsibility of the student to accumulate the course’s interdisciplinarity. He or she may study pure electrical engineering in one department and pure music in another (or computing science and music). It is then left to the students themselves to knowledge from studying two different subject domains in depth- and this often does not happen until the postgraduate level.

Nevertheless, for universities to create joint programmes, to which more than one department/school/unit is contributing, is one of the easiest and most cost-efficient ways to almost instantly provide an interdisciplinary degree.

## 5. SPECIALISM VS BROAD INTERDISCIPLINARITY

The questions that have occurred to many degree coordinators is that of a pragmatic balance between deep specialisms and broad interdisciplinarity. The joint degree model stems from the belief that in order to achieve new insights into an interdisciplinary subject, it is not only enough to provide to specialisms, but essential to provide as deep as possible an education in each ‘pure field’. It has been argued, that this notion stems from a still modernist view of university stemming from the 18<sup>th</sup> century and the age of enlightenment. Already 24 years ago Habermans has claimed that the project of modernity in University education may have failed. ‘The project of modernity’ stems from the 18th century (...), aiming at developing objective science, universal morality and law, and autonomous art according to their inner logic’<sup>23</sup>. The notion that a department could have experts in all areas of the degree subject area stems from this notion. Also that we can study a subject in all its forms, that its boundaries are clear and defined. But our knowledge has grown beyond the ability of universities to provide educators in all these fields, or as more recently Sperber postulates, the ‘current disciplinary system may be becoming brittle’<sup>[24]</sup>.

For a new form of interdisciplinarity the question arises whether we are in need of a new post-modern acceptance of fragmented but self-organising areas of knowledge, in which “particular foundations would emerge in the course of the inquiry rather than be predetermined in the form of discipline-bound theories, methods, and schools of thought.”<sup>[25]</sup>

Many departments may not explicitly acknowledge, nor welcome what it would mean to introduce fragmented and self-organising concepts of knowledge, but many institutions have tried to address the balance between deep specialisms and broad interdisciplinarity.

The most obvious solution taken by many institutions is by cutting some of the pure modules and providing additional ones, which include specifically the interdisciplinary aspects in an interdisciplinary fashion. These modules are often perceived by students to represent the core and most relevant courses of the

degree. I have in the past controversially called these “glue courses” [26], but as this term implies that there is a need to glue two pure disciplines via some interdisciplinary modules, it can create confusion, and specifically in institutions, where there are more flowing boundaries between the disciplines.

This model of ‘glue courses’ provides for both deep specialism and broad interdisciplinarity to be balanced by playing with the ratio between them. It also provides a reasonable additional administrative and resource burden, i.e. by adding one or two ‘interdisciplinarians’ to the staff body a heightened involvement with specifically interdisciplinary aspects can be achieved. However, this model is also felt by educators and students to have some drawbacks – besides the obvious administrative question of which educational unit will pay for the additional members of interdisciplinary staff. Additionally, once finances are sorted out, it does tend to be these members of staff who are in danger of falling between the stools, in all sorts of ways: from research assessment exercises and their strategic implications, to promotional chances or even redundancy processes. For the education of students, there is a more immediate drawback (and one that has been mentioned most often by the interviewees): students still feel that a part of one or the other pure discipline of the joint degree is irrelevant to their core interest. It is felt to be a constant process of delicately balancing ‘pure subjects’ (whatever we may mean with this term) with interdisciplinary subjects.

A few institutions have addressed this issue to the extent of having every single course in the degree relating to the interdisciplinary subject. That is, whereas in the joint model a student might study a pure C++ course in Computing science and a pure music history course in Music, in the ‘integrating model’, where every module is designed specifically for the interdisciplinary degree, he/she may study ‘C++ for music applications’ and ‘history of music technology’. It is these degrees that seem to have the largest amount of perceived relevance by students as every single course seems to be specifically tailor made for their degree. To achieve this, institutions use different resource models: one being that contributions may come from different departments, but these contributions being specific to the interdisciplinary degree. Thus the cost burden of additional staff or resources can be shared (e.g. both the engineering department and the music department having on music technology lecturer).

But the difficulties of being dependent upon another department, possibly outwith one’s own faculty, can also create conflicts. Conflicts of interest regarding a department’s own priorities may clash with the need of a shared degree model.

Another model to address this is to simply buy in staff from a discipline that does not seem core to the faculty, e.g. computing science departments permanently or temporarily hiring music performance or music composition staff. Departments are increasingly

opting for this model, but it is quite telling of our current educational landscape in the UK, driven by RAE and QAA, that these courageous examples of interdisciplinarity tend to happen more in the sciences than the humanities and arts, and more in the new universities than the old. It is logical, as this can be seen to be driven by student demand (bottom-up) rather than big institutional politics (top-down).

## 6. WITH COURAGE INTO THE (INTERDISCIPLINARY) FUTURE

But courage we need – to explore new ways of teaching and learning and researching, and most of all administering our knowledge. Obviously, on the other hand, one could ask if there is possibly more merit, certainly less resistance, in absorbing (exclusive) parts of an interdisciplinary domain within a traditional discipline and otherwise leaving everything as is. I feel that we are seeing this in Britain (and possibly other countries) today. In 2001 the communities of music in academia finally managed to convince the traditional educational sector (mainly the Research Assessment Exercise) that composition is a research activity and assessable as such, and therefore on a par with other musical activities, such as editions and scholarly approaches. However, surprisingly and without warning, this seemed to herald the exclusion of the rest of computational musicology or ‘music technology’. In the traditional engineering and computing science departments there often is still the problem of acceptance of research between music and science, priorities most often still lie in the more ‘pure’ and ‘core’ subject areas. And the music departments in Britain generally rather accept electro-acoustic composition than other ‘music technologies’, which tend to have a completely different set of working and research methodologies, such as, for example, being based on collaborative and cumulative working methods. Thus, electro-acoustic composition and sonic arts, which is increasingly being seen by its own community as belonging to music rather than music technology, has been integrated in many music departments across the country, whereas the rest of music technology has often been left standing out in the rain, to be picked up by science or engineering departments, and this more in the new universities than the old.

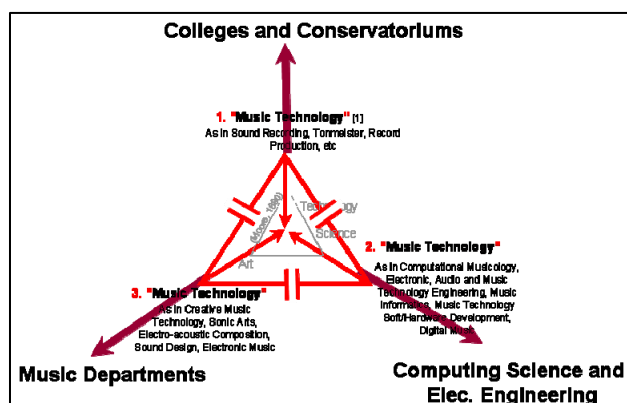


Fig. 3 Fragmentation

Rather than seeing an emergence of a new discipline, such as the history of computer science has produced, we can see a movement that is tearing the content of this interdisciplinary field into three more and more distinct disciplines with their own methodologies and terminologies. (Fig. 3). Because what else is a discipline than a social construction and, according to Fish 'a grab-bag of disparate elements held together by the conceptual equivalent of chicken-wire'[27]? That part of music technology represented by sound recording, music production, Tonmeister, for example, is more and more predominantly taught by colleges and conservatoriums. That part of music technology represented by computational musicology, music engineering, electronics and music, and audio engineering is predominantly taught in computing science and electrical engineering departments. That part of music technology represented by electro-acoustic composition, sonic arts and electronic music is predominantly taught in music departments.

Is what we are seeing in our educational institutions proof for Fish's thesis, that 'interdisciplinarity is impossible, as either one gets absorbed into another'? That the 'blurring of disciplinary boundaries results only in new hierarchies and divisions' (compare [28]). Or is it that what is emerging, is three new distinct disciplines with different working and investigatory methodologies, different approaches for presentation and practice, different underlying – but implicit – justificational hypotheses, different vocabularies and terminologies, as well as different conceptual frameworks?

## 7. CAN INTERDISCIPLINARITY REMAIN INTERDISCIPLINARY INDEFINITELY?

*'Interdisciplinarity is not the calm of an easy security; it begins effectively (as opposed to the mere expression of a pious wish) when the solidarity of the old disciplines break down [...] in the interests of a new object and a new language; neither of which has a place in the field of the sciences that were to be brought peacefully together, this unease in classification being precisely the point from which it is possible to diagnose a certain mutation' [29]*

And if we are aware of all this, if we have enough self-awareness and self-criticism of the aspects mentioned by Barthes above, then should it not be possible and certainly worthwhile to remain in an interdisciplinary state indefinitely? [30].

Interdisciplinarity has been said to be the modern 'motherhood and apple pie' issue. That is to say, everyone, including decision makers in higher education, recognizes that it is a Good Thing.<sup>2</sup> It has 'become a buzzword across many different academic subjects in recent years, but it is rarely interrogated in any great detail'. [31] In 1989 Liu pointed out that

interdisciplinarity is the most 'seriously underthought critical, pedagogical and institutional concept in the modern academy' and in 2006 we still, as

Sperber says, 'do not, normally, discuss among ourselves interdisciplinarity per se. What we do is work on issues that happen to fall across several disciplines, and, for this, we establish collaboration [...]'. [32]

But we have to admit to ourselves that the separation of 'music technology' into its three distinct boundaries has more to do with how we do something, than with what we do; or, in other words, more to do with which methodologies are more similar, and which ones are not. For example, the reason for one sub-discipline, such as electro-acoustic composition, to be more accepted in music departments, is not because it is 'more musical', nor because it is 'less technical'. It is because the methodologies for working, teaching and researching in this sub-discipline are more similar to the ones used in departments of music across the country. The same can be said of music informatics and computer science departments. Music informatics has as much to do with music, as with informatics. But its methodologies just simply do not seem to fit into traditional music departments.

The old divide between the two cultures still remains. In addition to this 200-year-old struggle between the sciences and arts, a newcomer into the world of methodologies has entered. It is now encouraged by current political agendas to create knowledge and learning through practice, through more vocationally related experiences, as demanded by the students and industry. The question here of who are the clients for universities, students or the industry, is never answered by politicians but has to be constantly queried by Higher Education Management. But it is also common knowledge that some practices of creating knowledge are more valid than others, specifically for the purposes of the RAE and, consequently, strategic decision-making processes.

In conclusion, even though we see fragmentation of a discipline as a development in progress, I still would like to ask the question if it is not possible to see music technology as one interdisciplinary subject area and to allow subject combinations to appear from student demand, industry demand or the subject matter itself. As inquiry and problem based learning theories have matured, they are slowly establishing themselves as a major drive for change in learning as well as an argument for a more self-directed process towards knowledge and skills acquisition. What certainly could help is for universities to leave the experiment in modernism – Habermas's 'project of modernity' – behind and accept what post-modernity can give to the ways we approach teaching, learning, researching and, most of all, administering our knowledge. A postmodern approach would be to accept and accommodate these new concepts of fragmentational knowledge and self-organizing areas of interdisciplinary domains of knowledge; it would present an environment



in which learning is driven by a process of inquiry, for foundations of a subject area to be created where needed in the inquiry and out of the inquiry, rather than pre-ordained and culturally engrained in specific disciplines.

In order for interdisciplinary subjects such as ‘music technology’ to flourish, without prejudice and discipline-specific cultural constraints, teaching and research have to be allowed to happen at the brink of and in the spaces between disciplines, spaces where new theories emerge out of inquiry and where they are informed but not bound by pre-existing schools of thought.

What this means for Higher Education Management in practical terms is not so clear, but in Britain, where most quality assurance processes have been perceived as a strong force for narrowing the disciplinary spectrum and disadvantaging genuine interdisciplinarity, it certainly should involve a rethinking of how we fund research and teaching; how we structure the social spaces in our universities for staff and students to mix between the disciplines; how we design resource models to allow teaching and research to happen between and among and beside the divides, and to take interdisciplinary studies finally as an explicit subject into the curriculum itself.

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