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Emergent Matters: Reflections on Collaborative Practice-led Research¹

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This paper will show how collaborative practice-led research can lead to the generation of new knowledge and new artistic work. In it we will address two aspects, firstly how separate creative practices can positively combine when connected by a research focus and, secondly, how a digital technology can be a catalyst for collaborative practice-led research. We begin by outlining some central concerns pertaining to collaborative and practice-led research and describe how these approaches can come together in a creative arts context. As an example of effective collaborative practice-led we present a case study description of our computational art project that generates animated image and sound. We point out interesting parallels between emergent properties of the generative techniques of practice and the collaborative research relationship, and conclude that it is the emergent nature of the collaborative and creative processes that produce research and artistic outcomes that are more than the sum of the parts.

The structure of this article begins by outlining the two board themes of this paper, practice-led research and collaborative practice, then moves to a description of our *Pixels* project which illustrates how these two streams can be successfully combined within a the one activity.

Practice-led Research and the role of the artefact

From an important perspective practice-led research can be typified as a bottom-up approach to research where the areas of interest and approach are derived from individual interest, skill and context. This constructivist perspective on research favours a relativist ontology where knowledge is contextual and truths are more or less well-informed and sophisticated, rather than being correct or incorrect (Guba and Lincoln, 1994). From this perspective new knowledge, based on research findings, and artistic works are created in parallel. In a description of this approach by Carole Gray she states that practice-led research is,

“...initiated in practice, where questions, problems and challenges are identified and formed by the needs of practice and practitioners...the research strategy is carried out through practice, using predominantly methodologies and specific methods familiar to us as practitioners in the visual arts [or relevant creative fields].” (Gray, 1996)

The key to this description is in the opening phrase “initiated in practice” where the emphasis is on knowledge derived from practice and not the artefacts produced by that practice. This is a differentiator between research involving practice, where knowledge and understanding are prioritised, and practice outside the research content in which artefacts are traditionally the significant outcomes. This statement is important because, while apparently obvious, the implications of this simple statement are far reaching.

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Artefacts are inevitably read, understood and evaluated from within a context and, taking the relativist stance of constructivism, are open to changing meaning when read in different contexts. In order for the research findings to be understood or evaluated, the meaning of the artefact within the research context needs to be accessible. It is hard to imagine how this can happen without some form of exegetical articulation. The often expressed claim that the artefact or output is enough simply doesn't bear scrutiny. One of the problems contemporary arts practices have is that their internal discourses are not widely known or understood by the general public, which is at least one of the reasons for that public's well documented resistance to much contemporary art, and at the core of much resistance to practice-led research. Therefore considerable attention to communicating the potential understandings generated by the artefact is necessary to enable validation of research findings and, in our experience, also assists artistic practice particularly that done in collaboration.

This position is taken further by Nigel Krauth who, in his article *The Preface as Exegesis*, states "the position of the creative researcher in the culture of the twenty-first century is not oracular: it is interactive" (Krauth, 2002). Within this view, the role of an exegesis is to expand on, rather than provide an additional explanatory of, the artistic practice or artefact. Anne Burdick echoes a similar emphasis on the reflective nature of practice-led research in her comments about the difference between design and design that serves as research.

"Designers who are conducting research through their practice create work that is intended to address both a particular design brief and a larger set of questions at the same time. In most cases, the inquiry is sustained over a period of time and the designers created body of work in response—projects and practices that serve as experiments through which they interrogate their ideas, test their hypotheses and pose new questions. Critical reflection is a necessary component of design research practice. Designers must be able to articulate their questions and conclusions" (Burdick, 2003:82).

There is, however, a strong resistance to the requirement for an exegetical articulation among some creative practitioners. This resistance seems to be based on several confusions. Traditionally, the core of practice, especially creative practice, has been seen as mysterious and impervious to scrutiny. The secrets or mysteries of creativity are deemed to be impenetrable to any kind of explication; indefinable and ultimately inexpressible even to the creative practitioner themselves. It should be understood that deriving new insights through creative practice is not synonymous with understanding creativity. Estelle Barrett in a recent article (Barrett, 2004) has eloquently mapped aspects of this exegetical scepticism to an emphasis on the artefact at the expense of the generating practice. She writes that this dominating focus on the commodity of creative endeavour reinforced by institutions like the museums and galleries has blinded us to the logics of their making. She has further observed how "...conventional forms of criticism tend to focus on the finished product rather than material, intellectual and cognitive processes that produced it...the internal representation of the ideas that produced the artwork is then obscured by the vehicle in which it is carried" (Barrett, 2004). This is strongly supported by the system of commodification that has grown around these objects; as the monetary value of these objects grows so does the mystique surrounding them. It should be understood that the value of creative practice and its artefacts for research is quite separate from any commodity value either may or may not have.

The value of practice in practice-led research is in "consciousness raising". It does this by empowering the artist-researcher, and the surrounding culture in general, by allowing the voice of that 'alternative' logic of practice to be made accessible and heard. From this voice come potentially new insights that contribute to the fabric of human knowledge.

In summary, then, it seems that for creative practice to be considered as research there are three requirements to be met. Creative practice and its outcomes need to be,

- *differentiated* from previous work of the researcher and field such that the elements of exploration and discovery are identifiable,
- rendered *accessible*/available through either publication and/or exhibition as a public activity, one open to scrutiny by peers,
- *transparent* and clear in its structure, process and outcomes – that it provides clear explication and explanation that is usually exegetical in nature,
- *transferable* so that information or outcomes are useful beyond the specific research project or applicable in principle to other researchers and research contexts. This requires that the practice and outcomes are adequately theorized, described and contextualized.

These issues are especially true as our making environments and contexts begin to shift and become more complex and discipline boundaries become increasingly blurred. As Christiane Paul, observes in relation to digital art in particular.

“The creation process of digital art itself frequently relies on complex collaborations between an artist(s) and a team of programmers, engineers, scientists and designers... Digital art has brought about work that collapses boundaries between disciplines – art, science, technology and design – and that originates in various fields, including research and development labs and academia” (Paul, 2003:22).

This complex practice environment is an increasingly common making reality for many practitioners and highlights the need for explanation as a way of mapping and keeping track of this collaborative cross-disciplinary creative input. This scenario highlights the shift towards the increased collaboration opportunities and needs that exist within the creative arts practice and forms the background against which our *Pixels* project has developed.

Collaborative research

There are a number of research models that are described as collaborative, so it is important for us to be clear about what we mean by it. In our case, the collaboration was between two artist-researchers from different disciplines, visual art and music, working on a computational arts project. Our collaboration was a project that resulted in joint practical and theoretical outcomes that also fed back into our individual artistic and academic work, and we will discuss the project in more detail later in the article.

Apart from the joint researcher model that characterizes the authors project, other ways of organizing collaborative research include the purposeful seeking by a lead researcher of participants as co-researchers within the process, which is sometimes referred to as co-operative research and has strong links to participatory design practices (Schuler and Namioka, 1993). Another use of the term collaborative research is to describe a mentoring or supportive relationship between researchers, often senior and junior, where one or more act as critical friends to the ‘lead’ researcher on a project (Beaumont and O’Brien, 2000). There are also collaborative research studies focusing on cooperation between institutions, as for example in Australian ARC Linkage grants between university and industry, education research collaborations between universities and schools (Shacklock and Smyth 1997) or medical research activities between research centres and hospitals.

Even within joint researcher collaborations between peers, as in our case, there are some distinctions that can be made about how disciplinary boundaries might shape the research practices and directions. In intra-disciplinary collaborative research the researchers are from the

same discipline and collaborate out of a shared interest or because they bring complementary skills such as, combining theory and practice backgrounds, having different genre or style expertise that enable comparative studies, and so on. When collaborating across different discipline backgrounds there can be a range of collaborative approaches, summed up by Crabtree and his colleagues in this way,

"*Multi* means 'many.' In multidisciplinary research many disciplines contribute their piece to solving the problem... *Inter* means 'between' or 'among.' In interdisciplinary research, each contributor... talks from his or her expertise, so there is a conversation... between and among disciplines... *Trans* mean 'across' or 'beyond.' In this research the conversation takes place... in a new common space and goes beyond and across what any one discipline offers. The idea is to create a new shared language" (Crabtree 1994: xiii-xiv).

In our case the collaboration began as an interdisciplinary one then became trans-disciplinary as the original skill and knowledge boundaries dissolved over time. Daniel was from a painting background, Andrew from a computer music background and the new common space was computational arts.

Two contrasting practices

Within our collaboration the methods of operation are pluralist, eclectic and, most importantly, negotiated. However, before examining how that collaboration works it is useful to understand something of each person's individual background and practice.

Andrew Brown is a musician with a strong interest in the use of digital tools that support and amplify creativity. These interests have led him to investigate areas of algorithmic music making including genetic algorithms and artificial life and to the development of a theory of creative engagement.

His recent work has focused on the design and programming of new software-based musical instruments for performance and composition, where the usability of the both conceptual foundations and the interaction design have been important. Stylistically his creative practice has ranged from popular song to electroacoustic soundscapes, which always aim at an expressivity and emotional power balanced against elements of technical interest and experimentation.

Significant influences on Andrew's practice to this point included:

- Computer-assisted composition, particularly influenced by the work of Martin Heidegger (1977) on the phenomenology of humans' technologically mediated relationship with the world.
- Musical processes that are minimal, serial or stochastic, as in the compositional works of Steve Reich, Arvo Pärt and Iannis Xenakis.
- Artificial life and, in particular, emergent processes including genetic algorithms (Goldberg, 1989) and cellular automata (Wolfram, 1994).
- Usability design, in particular human computer interaction (Winograd and Flores, 1986).

Daniel Mafe is a visual artist whose work has up until now been exclusively identified with the medium and practice of painting. Fundamental to this practice though has been a longstanding interest in geometry and systems, and the phenomenological impact of the work on the viewer has always been a strong focus.

His artistic and pictorial interests, while firmly anchored in abstraction are not in formalism per se. Abstraction is seen as a means. The work engenders a strong emotional charge and whilst built upon a geometric foundation is markedly atmospheric and optical. The images flux and as a

whole the painting unfolds slowly over time and acting as a mirror to the vagaries of the viewer's perception. For the viewer the work can be quietening and immersive, the colours subtle, yet luminous. The surface proffers an elusive, ambiguous spatiality, while the circumscribed shapes seemingly describe diaphanous and vaporous volumes. The aim is to create a finer awareness in the viewer of their perceiving processes, rendering as tangible that bridge or link between body and mind.

Significant influences on this practice and hence on the project in question include

- The pioneering abstract films of James Whitney, particularly *Yantra* (1957) and abstract cinema
- The relationship conceptually and practically between the apparently exclusive realms, pictorially speaking of the monochrome in painting, particularly as a repeat phenomena over the last 90 years and of the fraught relationship of pattern and ornament within the modernist art.
- Stephen Wolfram's book *A New Kind of Science* (Wolfram, 2002) was Daniel's first visual introduction to the complexity of patterns that cellular automata can generate. Wolfram's research and speculations about CA has been highly significant; he articulates the significance of the move from simplicity to great complexity. It was the first introduction to an explicitly generational model of creation and the notion of emergence. Of interest here are Galanter's speculations of generative art's history and his definition highlighting the defining role of system in generative art and A-life (2003).
- Islamic ornament/pattern i.e. Critchlow (1976) and Christopher Alexander's book on carpets and pattern (1993)



Figure 1: Installation view of exhibition Recent Paintings by Daniel Mafe 2003 viewed by Andrew Brown

In the early stages of this project these interests have been a driving force in shaping the “visual look” of several outcomes the project. However, it is true that as the project develops and the

familiarity with the program's capacities grows, this is less and less a routine point of departure. In effect these two practices have combined to produce a third.

The Project, *Pixels*, a brief biography:

By way of introduction the program *Pixels* can be described as a generative system for animated visual textures, and more recently with newly developed music possibilities, both of which derive from an underlying procedural evolution. In the *Pixels* work the primary algorithm is a cellular automata. The program can indefinitely generate algorithmically stochastic shifts within paradigmatically determined fields of imagery and sound, and multiple translucent fields combine to create surprising, unpredictable and beautiful interactions of pattern. The graphics and sound are all generated in real time and while the geometries/phrases are a constant the colours, pitches, rhythms and the transforming shifts between the various layers, are endlessly changing and do not repeat.

The project had its origins in a mutual interest in cellular automata, a computational process where an array of elements change their state according to the state of neighboring cells. This local organisational scheme leads to larger-scale emergent patterns and behaviour. These cell arrays are often visualized as grids where each segment is coloured according to the cell value. Rapid generations of state changes lead to an animation of the grid matrix.

At the very early stages Andrew had already constructed some visualization experiments of cellular automata, amongst them a simple two-cell array we named "wrestling pixels" (WP) that became the entry point, the beginning point of the collaboration.



Figure 2: A still image from *Wrestling Pixels*

Daniel observed that the WP clearly mimicked the "push and pull" effect between colours as described and demonstrated by the famous pioneer of abstract expressionism, Hans Hoffman. The rules used by WP combined a mixing of the cell colours with a randomised noisiness such that the colour of each cell was similar but never quite settled to be equal or stable over time. It was this ability for the tension in the algorithmic organising structure to be manifest as a visual energy that created the excitement for us. This encouraged Andrew to study the paintings of Daniel and then further develop the embryonic *Pixels* program to digitally emulate the structuring, optical dynamic and shape lexicon evident in these paintings.

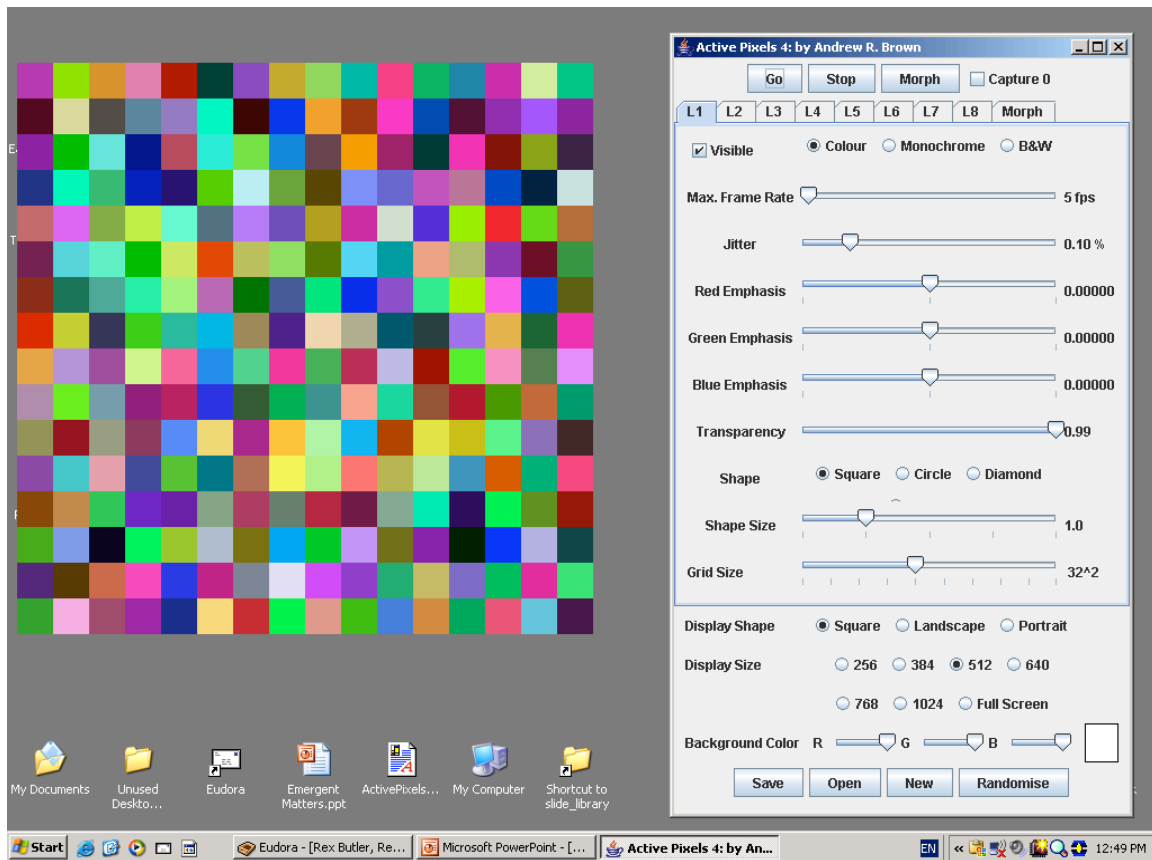


Figure 3: Image of the starting state and control panel for the *Pixels* program

The initial stages of this creative conversation were understandable tentative. There was however a strong mutual respect for each other's knowledge bases and work. This allowed for the necessary grounding of trust to enable work to start and develop. Over time this has been gradually extended, leading to the development and emergence of a third and new creative identity, a shift that in fact mirrors a move from an inter- to a trans-disciplinary mode of collaboration. Painting and music composition became computational media art.

Early on, it quickly became clear there were many mutual interests, pleasantly surprising at the time although, in retrospect, not so surprising given our individual work which focused strongly around pattern, systems and minimalism. These interests conformed strongly to the notions of generational art as defined by Galanter,

"Generative art refers to any art practice where the artist uses a system, such as a set of natural language rules, a computer program, a machine, or other procedural invention, which is set into motion with some degree of autonomy contributing to or resulting in a completed work of art" (Galanter: 2003).

At the outset of this project Andrew is very much the designer of the software and Daniel a consumer. Daniel uses the software exploring and testing its potential and offers Andrew feedback on strengths and weaknesses. Discussions were scheduled weekly and established themselves as pivotal in the developing of ideas for the work as well as for exploring ideas within the work. These ideas, speculative in nature, are very much focused on the potential uses of the program and its outputs and new possible directions.

Each software feature that is added opens new possibilities in thought. For example, early on it was clear that the program required the capacity to morph from one range of settings to another. While there was an endless kind of visual infinity generated from within one parameter dimension there was a bound on the range of values that could sustain prolonged interest. Indeed the major interest seemed to be shifting from one group of parameter settings to another; the cumulative affect of this was at times exhilarating, the potentials endless. By allowing a movement to occur between ranges of settings this potential of endlessness was realised more fully. It threw up many more surprising and totally unpredictable visual results than could have been anticipated. The program itself mapped ways of moving from one setting to the next and the pathway was always a little different and never predictable.

The fact that the program itself became an even bigger contributor to how the work was made was also a source of excitement as this pointed to a direction each of us wanted the work to take. Over time Andrew has been able to introduce other innovations such as adding the capacity for working more layers, horizontal and vertical screen formats in addition to the initial square one and new shapes including octagons and diamonds to the shape catalogue.

There is always a sense of excitement with the introduction of innovation to the program. The formal developments allowed by these innovations to open up new vistas in relation to ideas and to a sense of increasing scope for the project. The bigger the range of options the less predictable and the more interesting the results seem to be.

Once the theoretical aspects were mostly established in the visual realm, attention was focused on a musical rendering of the same underlying data set. Sound has been a late arrival to the work but an eagerly anticipated one. With sounds arrival the opportunity for a stronger interpenetration into one another's territories and expertise becomes possible. This became very evident in the constructing of the piece exhibited in the exhibition *jOurney, Without Memory*.

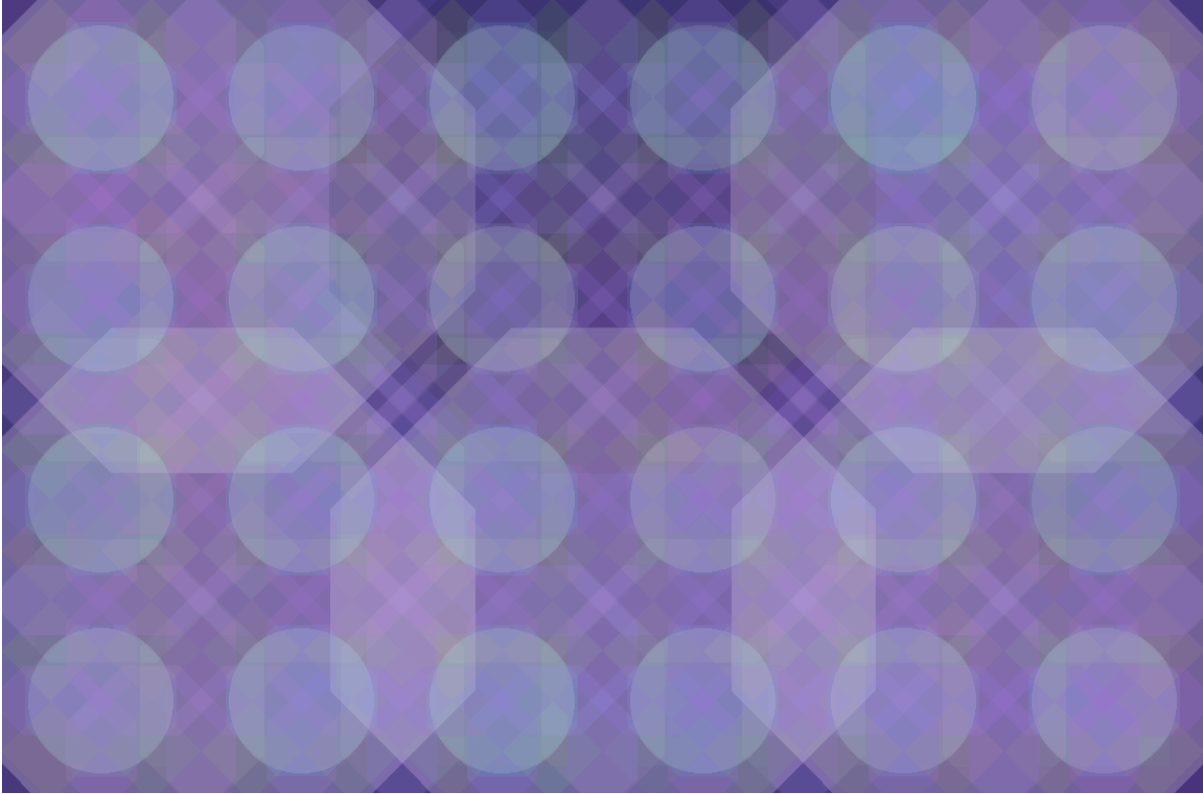


Figure 4: A still image from *Without Memory* in the exhibition *jOurney* (March 2005)

With the introduction of sound, a distinct shift in the working process occurred in how space was needed in each element to allow the vision and sound easy entry to the work as a whole. The visual had to be emptied out a little and this was reflected in the production of the musical texture which had to be thinned so as not to dominate. If each was too complete in and of itself, no space was left for the two elements to combine and work as one...the work became too crowded, give and take was required. And indeed this can be seen as a metaphor for the collaboration as a whole. As the work proceeded, a shared language developed out of discussions, a swapping of background literature, and the ability to find a common expression in what had evolved into a new media practice.

There are a range of outcomes from the project, including some clear creative outputs like the art works which can be exhibited through digital projection, DVD or as 2-D prints. There are also commercial opportunities that include licensing the generative software for wider use, and the creation of procedural texturing for digital platforms such as computer gaming environments. On the research side there is the chance to document characteristics of the cellular automata process that have been revealed by this process and to inform those working with cellular automata in other disciplines. The main areas for theoretic investigation to date include amplifying creativity through semi-autonomous computational processes, the aesthetics of dynamic systems and representational systems for evolving media forms. Each of these theoretical investigations drive the project forward and together with the creative practice activities form a complex iterative continuum of collaborative practise-led research.

Discussion:

We have found through the *Pixels* project that creative practice in a research context can lead to new knowledge. This knowledge is embedded in creative practice as an embodied or tacit

knowledge. Information about this knowledge can be found in the people creating it, the culture in which it is created and consumed, the processes used to create it, and in the artefacts produced – but cannot be found in only one of these alone.

Paying attention to these aspects of the practice and its context can lead to insight and further understanding. This understanding will start as a personal insight and is then elaborated and verified through dialogue and practical exploration to reveal new ways of understanding in the discipline. The moment of personal insight that leads to research is echoed by Peter Downton in his book *Design Research* where he writes,

“there is a moment in the process where something is new to the designer—a new insight, an understanding of how to achieve a desired end, a satisfying arrangement of elements. If remembered or recorded, this moment of knowing starts on the path to becoming collective knowledge” (Downton 2003:95).

This method of generalizing from personal revelation through practice involves articulation, investigation, experimentation and verification, in short, research through practice.

The collaborative process can assist in the stimulations of these new insights and in the verification of their significance. In our collaboration the ideas are suggested by either party but those that survived were the ones that resonated with the experiences of both collaborators and were found valid by the application in practice. Through collaboration, practice and research processes are enriched by the introduction of ideas and sources outside the normal sphere of the individual researcher, and the collaborative process combines skills and expertise in a way that opens up opportunities for exploration otherwise closed. In the *Pixels* project the significance of findings and new directions was filtered through both visual art and music lenses which provided a dampening stability that increased validity and provided a more rigorous test of the salience and significance of new ideas and outcomes.

Practice-led research builds on the fact that creative practice has always been a knowledge generating activity. Some of that knowledge will be new to the practitioner, but known to the field. While valuable research outcomes will be new to the field(s), and some may be influential in disciplines beyond its origin. That new knowledge may be evident in the artefact created but, if well understood, should also be expressible by the artist-researcher in other forms as well. To be valuable to the discipline the knowledge must be validated through repetition, certified through broad agreement and disseminated through presentation and publication.

Collaborative research is, in many ways, a research approach whose time has come. In an increasingly complex and fast-paced world the old maxim that ‘two-heads are better than one’ seems new again. We have found that collaborative research has a number of clear benefits, as demonstrated to us within the boundaries of the *Pixels* project. For example, there is a **breadth and diversity** of skills and insights far in excess of what a single person could possibly supply. This is particularly evident in computational media arts where collaborative teams are more common than in the traditional creative arts. This is supplemented by the **compounding** of skills and knowledge amongst the collaborative personnel in areas that are shared, reinforced and learned. Consequently the value of the **emergent outcomes** goes far beyond the straightforward production of any artefact. The collaboration as a resource begins to build up a range of informations or knowledge itself, which is far in excess of the simple sum of its component parts. As well, the emergent core of practice-led research produces a value in excess of any single artefact or document produced. When properly executed it generates clear articulations of new knowledge through descriptions, techniques, processes, tools and artifacts that result from collaborative practice-led research activity.

This is not to say that collaboration is without its challenges. All aspects of the collaboration need to be negotiated and this is not without its frustrations. The **pace and coordination** needs close managing in relation to deadlines, goals and general administration. Other issues include **attribution and contribution** where issues of authorship need to be discussed and understood equally by all collaborators. We have found that this is very much a question of understanding each others intentions and being clear about expectations, rather than backtracking or auditing contributions. Individual contributions to a project within a trans-disciplinary collaboration are often not predictable. For example, within our project it would seem that Andrew would deal with all matters related to sound and Daniel with image but in reality there is not such a simple division of labour and this blurring of 'roles' has become even less clear as we continue to work together. In a multi-disciplinary teams functions and tasks are often clearly delineated, but in trans-disciplinary collaboration this is not so; instead responsibilities are shared and must be negotiated and worked through. Consequently, as the project proceeds, there are increasingly pronounced soft edges or porosity between contributions.

To further complicate contribution in The *Pixels* project, there are generative techniques which have the responsibility for creation of the final artifacts in real time, so there is a sense in which responsibility for the creative work is shared with the process and thus with the algorithm (perhaps even the computer) that executes that process. There is not space for us to fully explore the role of computer as artist here, but even if this issue has no practical consequence in terms of copyright there can certainly be a difference in approach and attitude toward computational art when the computer or, at least the algorithmic process, is understood as a contributor because some elements of the decision making processes are given over to it. In a similar vein. This parallels the surrendering of autonomy and a sharing of responsibility between researchers in collaborative projects.

We cannot measure the effects of collaboration or computational processes in a precise way but our results, although tentative and incomplete, show that our research and creative practice outputs have increased significantly as a result of the collaboration. It is certainly apparent to us in the case of the *Pixels* project that the emergent outcomes, both intellectual and practical, have been more than the sum of our previous individual efforts in both quantity and quality. As such we look forward to pursuing further collaborative practice-led research.

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