INTRODUCTION

First Iteration—A Conference on Generative Systems in the Electronic Arts

The First Iteration conference was a unique and speculative event, designed to develop a dialogue about the use of *process* in contemporary electronic arts practice [1]. It brought together a small group of researchers, artists, theorists and critics from the domains of science and art for an intense and productive exploration of this complex field.

As initiators of the event, we were conscious of the plethora of "Art & Technology" and even "Art & Science" conferences and symposia that already exist. We did not wish to duplicate the domains already covered by such events. Our focus was limited and specific, perhaps even slightly "nerdy," and certainly we had no idea what the response to our call for participation might be. Fortunately, a group of about 80 individuals from all over the world shared our faith in this idea and joined us in southern Australia for 3 days to participate in this inaugural event.

Conference components included paper presentations, artist talks, performances, a video and film program and a gallery exhibition. Due to the "multiple media" nature of contributions, the published conference materials included an audio CD, a CD-ROM and printed proceedings [2]. The papers reproduced in this and the following issue of *Leonardo* represent a broad cross-section of the material presented at the conference [3]. It is hoped that through this publication, we can reach a wider audience. We encourage anyone interested in this area to participate in Second Iteration, which again will be held in Melbourne, 5–7 December 2001.

The conference adopted the perspective of the artist for whom the process of algorithmic specification in software (or implementation in hardware) is inextricable from the artifact. For such work, the process or algorithm is as much the "art" as is any physical or virtual artifact produced. The conference was set up to explore the issues surrounding the construction of physical and virtual machines as a process of art-making, something that, although touched upon by many, is seldom a conference's major theme.

The use of generative systems as both a methodology and source of inspiration for creative works has a long and distinguished history and one that certainly pre-dates the modern computer. While much work in this area has come from the domain of computer-based music and composition, we did not limit our focus to any particular art form or area of practice. Indeed, participants represented many disciplines: from visual artists to computer scientists; from musicians to feature-film animators; from programmers to museum curators. Many of the participants came from several of these domains, and it is our feeling that this eclectic mix of backgrounds was one of the conference's most important assets.

While considering what to include in the event, we found that a number of artists and art movements, particularly in music, made use of formalist generative processes. For example, the work of experimental British composer Cornelius Cardew, in *Paragraph 7* of his work *The Great Learning* (1968), makes use of a music composition algorithm that relies on a set of agents (human singers), each following a deterministic set of rules. The complexity that emerges from this interaction of singers is quite astonishing. A live performance of *Paragraph 7* was included as part of the First Iteration performance program.

Without attempting to limit or formally classify "generative art," we have found it helpful to adopt a biological metaphor when describing works such as those presented at the con-

ference. We use the terms genotype and phenotype as analogous representations of a productive methodology. Generative art practice focuses on the production and composition of the genotype. When run, interpreted or performed, the genotype produces the phenotype—the work to be experienced. The phenotype is the realization of the process represented or encoded by the genotype.

For example, Cardew's score for *Paragraph 7* (some text and a set of instructions) may be viewed as a genotype. The execution of the score (by a group of human singers) produces the phenotype (the physical performance). Like its biological counterpart, each phenotype (performance) is recognizable as a member of the same "species" and is statistically similar to every other phenotype of the species. Nevertheless, despite the similarities of the works in the species Cardew's score defines, each performance is unique. The co-operating agents and the environment in which they act subtly change the phenotype's characteristics, ensuring that no two performances are identical. A particular species' characteristics may also be highly dependent on the environment.

Plainly, in the case of *Paragraph 7*, such qualities would not emerge if the work were represented as a conventional score. Not only would such a score be an order of magnitude larger than its "algorithmic" counterpart, it would also fail to capture the essence of the work. The score would suffer from the same drawbacks as an audio recording of a particular performance: namely the performance's dynamic and emergent properties (arguably the composer's principal intent) would be lost.

Intrinsic to any genotype creation is the utilization of *information-theoretic heuristics;* that is, intuition or informal methods are used to determine the form, representation, and information content of the genome. The genotype exploits database or information amplification through the environment in order to reach the phenotypic stage. Just as organic genes encode the "plans" for constructing organisms (often several orders of magnitude more complex than the genes), likewise generative art "encodes" process. This kind of work is therefore implicitly concerned with dynamics, fluidity and change—issues directly related to the study of life and the morphogenesis of form.

Present-day composers are adopting these ideas. As conference keynote speaker Alistair Riddell argues in his paper "Data Culture Generation," data has replaced music as a cultural object. The role of the composer has therefore been recast as a data-manipulator, data-creator, data-generator. As other contemporary artists such as Brian Eno have argued, soon popular music may not be acquired as musical instance (recorded performance), but as process specification (program code). The artist becomes the creative designer of musical processes, recordings become programs and the act of listening repeatedly to a particular sequence of sound events shares popularity with these new ways of experiencing a musical work.

As a glimpse of this possible future, the paper by Palle Dahlstedt and Mats Nordahl describes an abstract computational world where virtual creatures evolve sophisticated strategies for sonic communication. The world generates an intricate composition with recognizable patterns and forms but with a novelty and complexity reflecting the metaphor on which it is based.

Since the earliest records of creative expression, artists have sought inspiration from, and reflected upon, nature. Over the previous centuries the meaning of the term "nature" and the context in which it is used have changed dramatically. Emphasis has shifted from a pure reflection upon form to a multiplicity of interpretations of nature. Key amongst these is the recognition that emergence and process are as much a part of nature as the forms and behaviors they produce.

Our understanding and appreciation of nature has also shifted in response to scientific theories, notably Darwin's (and Wallace's) theory of evolution by natural selection. More broadly, our theories of nature have come to include the wider processes of the universe as explored by the physical sciences.

Scientific theories of nature, however, cannot be viewed in isolation. A complex nexus of experience, mediation by media and interpretation of scientific theory influences the

representation of our beliefs about nature. Added to this mix is the increasingly politicized "construct" of nature, ecology and culture. Consequently, it is possible to see why artists no longer seek influence from the "purity of form."

In his paper "The Abstract Organism: Towards a Pre-History for A-Life Art," Mitchell Whitelaw explores possible relationships between two prominent European avant-garde painters and a group of contemporary electronic media artists whom Whitelaw denotes as "A-life artists." Each group of artists, in and of their time, addresses its practice through the lens of contemporary science. However, they are also searching for something that science alone cannot provide, or has not addressed. Contemporary and avant-garde artists of the late nineteenth and early twentieth century have sought to explore the sublimity and inscape of nature. For some modern-day artists, this lies in the sublimity of process—not from within nature, but *in silico.*

One of the important debates that emerged at the conference was the issue of representation and the way artists "borrow" elements from scientific theory (and hence the social credibility of science) to incorporate them into their work. Process-based views of nature have, in recent times, enjoyed a widespread enthusiasm in both art and popular culture. This has been enhanced and accelerated by the widespread adoption of computers (essentially process-based tools) and the popular myths that surround new technologies such as genetic engineering and artificial intelligence. Nevertheless, one has to ask the question, "Why are works that use terms like *Artificial Life, Chaos Theory* and *bio-anything* given such seemingly transparent credibility?"

Misappropriation is not a new phenomenon between art and science. Scientific ideas are often seen as cultural property. The theories of any credible individual "scientist" are often perceived in popular culture as fixed, absolute and matters of fact. The truth of an individual's theory or hypothesis is often implicitly and seamlessly extrapolated to be representative of the entire scientific community ("them"). Within the art community, the basis of "truth" in science is seen as increasingly suspect—merely a product of discourse. What is often ignored is a real understanding of the scientific method, peer acceptance, concepts of falsification and the notion of truth in a theory. Often such disagreements are reduced to ontological propositions, ultimately dependent on the opinion of the proponent.

While such issues have been well covered by a variety of disciplines and from many perspectives, we felt it a goal of the conference to keep these discussions open in relation to an artist's practice. In addition we hoped that the conference would encourage artists to be more rigorous in their understanding of assumptions about scientific theories. Likewise, we felt that those from the scientific community could benefit from a wider cultural understanding of the assumptions made from within their worldview, and of the interpretation of their metaphors by a general audience.

Issues addressed by participants were not all theoretical. Our aim was to fit the conference between the extremes of discussing "the art without reference to the tool" and "the tool without reference to the art." Hence, experienced practitioners in the area were encouraged to talk about the technical and conceptual processes that go into making a generative artwork. Naturally, these issues were not discussed in complete isolation. The audience constantly kept speakers mindful of the context of their work in relation to contemporary critical theory.

For example, individual proponents of generative techniques address the question of control and the role of the user/viewer/audience in very different ways. The *Living Melodies* system of Palle Dahlstedt and Mats Nordahl may evolve sonic organisms independent of a user or audience. In contrast, Agostino Di Scipio's system, as described in his paper, "Iterated Non-Linear Functions as a Sound Generating Engine," provides dual roles for the composer as programmer and as data-manipulator. Here, the artist is constantly trying to form meaning from, and find balance between, chaotic sound generation and a structured musical composition. In essence, the composer seeks a meeting-place between two distinct modes—one a generative process, the other a structural system.

As described in Troy Innocent's paper "The Language of Iconica," the role of the user/viewer may be pivotal. Innocent's world shares a common heritage with the *Living Melodies*

system, in that it is based on an evolutionary metaphor. His world evolves through the interaction and play of the user as mediated through an iconic language designed specifically for the work.

It is not our intent (nor our role) to make judgments about the validity of generative systems in relation to other methodologies within the context of an arts practice. However, we have found generative techniques useful and insightful, as have many others. Also encouraging is the coupling between different art forms and the distinct languages and ideas with which they are associated. Paul Brown further addresses these issues in his conference review paper.

It is our feeling that artists and scientists have some shared points of reference upon which to develop further collaborative relationships. We hope the conference may continue to explore these ideas and issues and that Second Iteration may provide another international forum for papers, exhibitions and performances in Australia, December 2001.

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References and Notes

1. The papers presented here have been selected from the proceedings of First Iteration, a conference on generative systems in the electronic arts. This event was held 1–3 December 1999, at Monash University in Melbourne, Australia. The conference was organized through the Centre for Electronic Media Art within the School of Computer Science and Software Engineering.

2. Copies of the full printed proceedings, the CD-ROM "D" and audio CD "A" are available for purchase online from the conference web site <http://www.csse.monash.edu.au/~cema>; by e-mailing the editors at <cema@csse.monash.edu.au>; or by post: First Iteration Conference, School of Computer Science & Software Engineering, Monash University, Wellington Road, Clayton, VIC 3800, Australia.

3. A second selection of First Iteration conference papers will be published in the next issue of *Leonardo* (Vol. 34, No. 4, 2001).