The Dual Heritage of CAAD Research

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The development of research in computer aided architectural design has evolved in the context of architectural design. A review of Tom Maver's work is undertaken from the perspective of his shortest paper, CAAD's Seven Deadly Sins. In that paper cautions were given to researchers. Here these cautions are interpreted in the context of the dual heritage of our field in science and creative arts. An examination of Tom Maver's own work suggests that these sins are counterbalanced by a like number of virtues and it is suggested that these are demonstrated in the corpus of his work and the community he has fostered.

1. Introduction

To conduct research in the area of computer-aided architectural design is a privilege, as is the life of any explorer. Placed as it is within the context of architectural design, the field is rich with potential. The history of this field is short, so those who engage in this research can see rewards as developments in built form build upon recent research. An increasing number of buildings opening to acclaim around the world would never have risen on their sites if not for digital tools.

The acts of discovery undertaken in research in the field of computer-aided architectural design exists both as research in architecture and as research in the sciences, of which the computational is but one. As such, these research activities are to be read against two cultures and researchers must define for themselves a position in the dialectic. On the one hand, we find ourselves in the culture of design in which discovery is observed as an ineffable act of creation, tested only in its manifestation. On the other hand, the artifacts of our research must be expressible in the definitive and unambiguous clarity of data and procedures, to be evaluated in the integrity of their reasoning. This dual heritage, however, places us in a curious culture of research. It is not a position unique to our field; the correlation between software designers and the profession of architecture, for example, has been explored [1] and the merits of the association debated [2]. For those of us who start from the field of architecture and move into computational aspects, however, the heritage of architecture is not so easy to shrug off, nor the professional values that we bring along with us.

2. Essential sin

In surveying Tom Maver's contributions in terms of published papers over the many years of his active participation in the field of computer aided architectural design, I am struck by some patterns to the work but more struck by the values exhibited in the work. Instead of summarizing these myself, I find that Maver has done so himself, by way of the shortest paper of his extensive output [3]. This brief paper offers a solid vantage point form which to celebrate his career.

In the manner of a cartographer, Tom Maver sets out the dangers in the landscape of research in computer-aided architectural design. In a little over six hundred words, Maver identified seven key dangers in research activity. The sins that Maver sets out of us are self-evident, as are most valuable observations, but that does not in any way diminish the need for such words to be said. A reflection on my own writings, for example, leads me to conclude that I commit a fair portion of the sins regularly; the example I presented at the eCAADe fest in Graz demonstrated at least five of the sins. I will not rehearse the seven here, but identify a few that illustrate the inevitability of sinning.

That it was timely to state the sins in at the CAADFutures conference in 1995 reflected the state of maturation of this field. It is not unusual, for example, to find that earlier research moved quickly and broadly across a topic, charting it for the first time. Those following on behind may not recognize the terrain and will start to describe it again, or may fail to reconnoiter appropriately to discover footprints of those who preceded them. Given this, we can anticipate that manifestations of Sin 2, *Deja-vu*, may be observed as researchers examine issues in greater depth by revisiting previously examined issues. What is warned here is we must build on foundations that we have examined, or demolish before rebuilding.

Distinguishing between wasteful repetition and productive re-exploration is a skill we struggle to cultivate in our research students. Reworking is an essential activity in discovery, recognized more readily in art than in science. The artist leads by inspirational insight that then has to be followed up by concentrated investigation to gain understanding. We can observe such a process, for example, in Picasso's series of portraits of Fernande Olivier [4] in which we can trace the intellectual reinterpretation of human physiognomy through a repetitive reworking of the portrayal of a single face over the course of a year.

The field is maturing, the numbers active in research expanding very rapidly, especially in Asia. Brown et al [5] note that Tom Maver's warnings are pertinent; all researchers are susceptible to a pioneer mentality leads them to think they are engaging problems for the first time, not plowing well-turned ground that may have only recently fallen fallow. Yet it is important for researchers to revisit problems. To sin, therefore, may be a necessary condition of progress, at least in our field of endeavor. The commission of sins is not exclusive to researchers. It has been noted that the link between practice and research in CAAD is weak. Ideas that intrigue tyro practitioners have long been left behind by researchers [6]. As research ideas are brought in to practice, we are more than likely to observe this sin. Yet these tyros will not be blessed, or burdened, by the weight of research and will inventively apply portions of the research to unexpected success. It is not infrequent in our field that research progress is made by practitioners before researchers. That we have such a close link with practice is a benefit we should cultivate, not ignore.

It is a necessary condition of our work that we find ourselves struggling between the holistic experiential goal of architecture and the reductive nature of science. Rowe [7] suggests that a procedural analysis of architectural design fails to describe the subtlety of architecture. It is likely that Sin 1 arises from such a perspective. Koutamanis [8] has echoed Tom Maver's observation that the "all-singing, all dancing, fully integrated, multi-disciplinary design decision support system" continues to appear as the goal of naïve research projects. This is the many-headed Hydra in CAAD research; no matter how many times it is slain, it rears up again. Too many research proposals continue to

allude to this and promise salvation for the designer, yet a designer trained in architecture is always focusing on the integrative complete experience and is dissatisfied by the singularity of a partial result.

Architecture is by nature an integrative discipline, drawing upon a wealth of knowledge. It has a strong tradition of interpreting its results not by acknowledge scientific metrics but through self-referential validation [7] . A researcher with a pedigree in part deriving from architecture cannot ignore, fostering Sins 5 (validation) and 6 (evaluation). Our position offers unique opportunities, however. It has been suggested that "It is in the aesthetic value that the justification of the scientific theory is to be found, and with it the justification of the scientific method."[9]. Through application of our research in design activities, we begin now to see validation of early research in manifest forms.

The scientific basis of our research progresses through incremental examination of particulars in computation and design. Not long ago, research in the field proceeded by means of substantial leaps of faith or posited itself on apparently arbitrary ideas, an activity more familiar to the architectural practitioner. As a pioneer in the field, Tom Maver surveyed a broad canvas very different to that seen by a young researcher today. Architectural research, in particular as the activity of design, proceeds by an means different to that of "normal science"[10], voraciously borrowing from other fields in the most liberal of manners. This heritage places the CAAD researcher in the most curious of positions. As the field matures, it lends itself more to the incremental, differentiated nature of the scientific model but it would be an omission if we ignored alternative.

3. Manifest virtues

Tom Maver himself noted in a later paper [11] that the perspective in 1995 of the Seven Sins was perhaps unnecessarily bleak, given the "wealth of innovative, relevant and enjoyable developments" in the field. He observed that CAAD research and application has evolved to a new level in recent years in which students have been enthused with the potential and concluded that "the future is safe with them." This closing paragraph provides the counterpoint by reaffirming that this is a discipline not only of sin but that seven virtues also are manifest.

Reviewing Tom Maver's contributions over the past decades, a pattern emerges in the works from which I might postulate a rejoinder to the Seven Sins. Let me call these the Seven Virtues if I may without sounding too sanctimonious. What I observe in the extensive collection of publications is the manifestation of the following values that underpin a lively and strong research culture:

1. Fortitude – as a participant in the research community developing and holding a commitment to research focus, rejecting the dilettante

2. Trust – willing to take risks in topics of research, in colleagues who undertake research
3. Community minded – recognition that the work is to be disseminated, shared and its adoption by others to be celebrated.
4. Fiduciary attitude – by participation, subscribing to the custody of knowledge and a research attitude, cultivating a similar attitude in others.
5. Commitment to architecture – never forgetting that the outcomes of the research are for the purposes of habitation.
6. Rejecting preconceptions – a willingness and ability to re-conceive the world
7. An open mind

I have concluded in my reflection on the 1995 paper [3] that it is essential for us to 'sin' yet what Tom Maver has amply demonstrated in his work is that this is balanced by virtues. Tom Maver's contribution is not to be measured in the papers alone. He was instrumental in founding eCAADe and CAADFutures and contributed significantly to the founding of CAADRIA as well. Through these lively organizations and the numerous students who have benefited from his attention, he has fostered the propagation of these values. He has demonstrated that research is as much a participation and cultivation of a healthy community of research, rather than research alone. His expression of sins can be read as commentary on the collective health of that community and a reaffirmation of some of the community's key attributes.

We can not ignore our heritage. The dual heritage of our research field can be seen in its beneficial outcome as the best training for undertaking research in order to "do the right thing" rather than doing things pedantically "right" [12]. That is why it is so important that we celebrate our activity as research in computer-aided *architectural* design, as Tom Maver reminds us. In his short paper, I am reminded of the humanity of our work. Architecture is for the enjoyment and enhancement of the lives of real users. Research is not an abstract activity. Through practice and application our research finds manifestation in tangible experience. For a message to come from a man so full of life, wit and spirit, should we be surprised? The Seven Sins reminds us of this humanity. It is a simple piece that pretends to nothing; indeed, at almost three times the length of his paper, this current paper probably tries to say too much. Tom Maver's legacy, however, is apparent and celebrated daily in the active world wide community of those who undertake research in computer-aided *architectural* design.

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