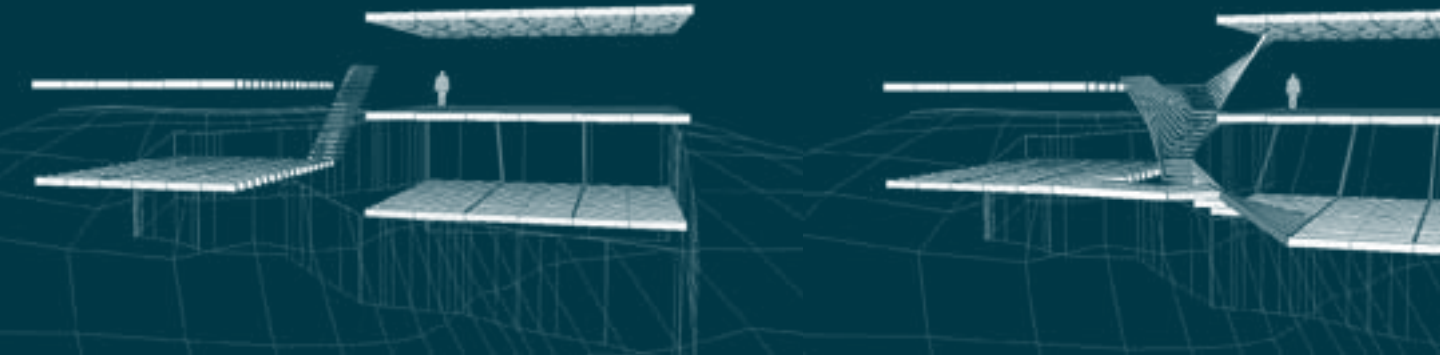


OPPORTUNITIES IN NEW FORM GENERATION



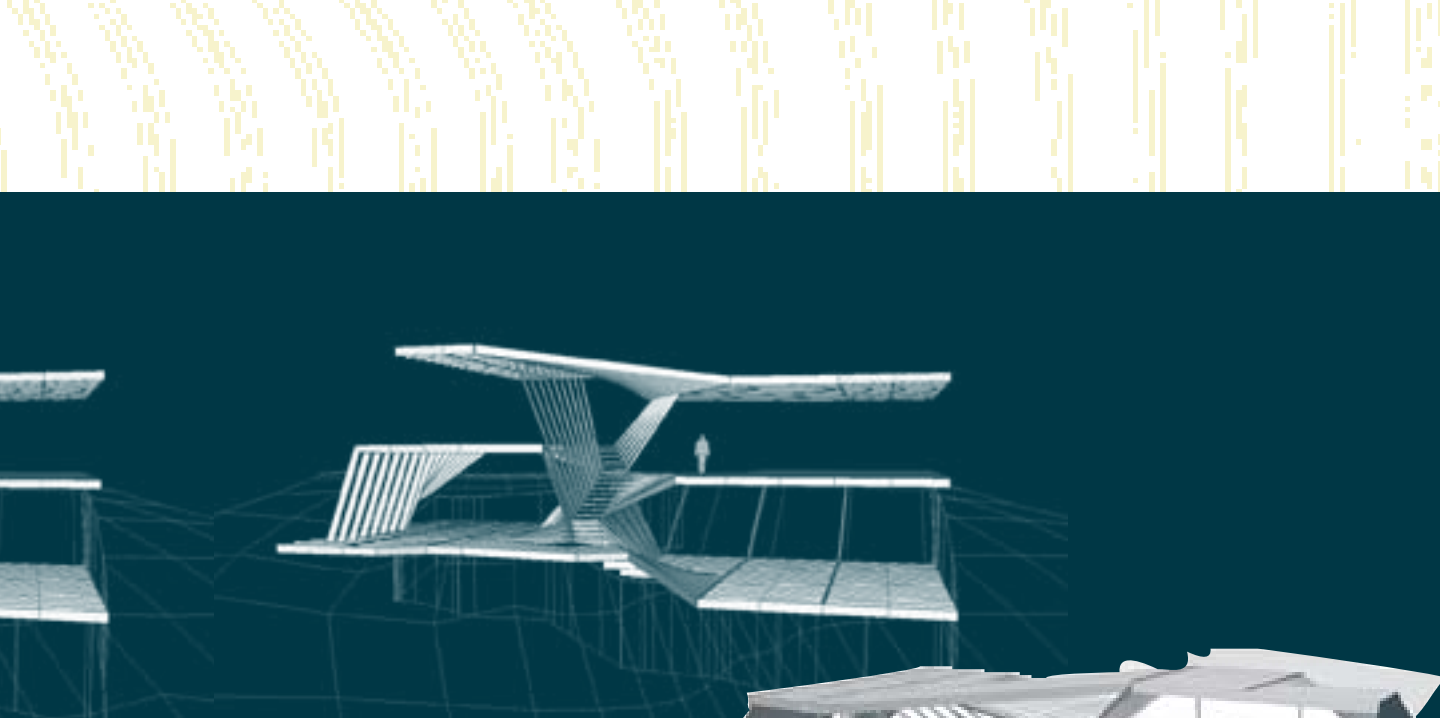
BY HARRISON S. FRAKER JR.

**Where does meaningful built form come from?
What generates form that inspires the imagination, becomes memorable, and enriches our lives?**

Questions like these have challenged the planning and design professions for millennia. Spawning much theorizing, especially over the last half century, this questioning has reached a level of urgency because powerful new digital design tools allow us to generate form previously unimaginable.

(Background) Informatic Voronoi by Dan Sullivan, Protocology 101 Instructors Burke/Shepherd

(Above) Systems Recombinatio by M.Arch. student, Emergent Esherick Studio, Instructor: Tom Wiscombe

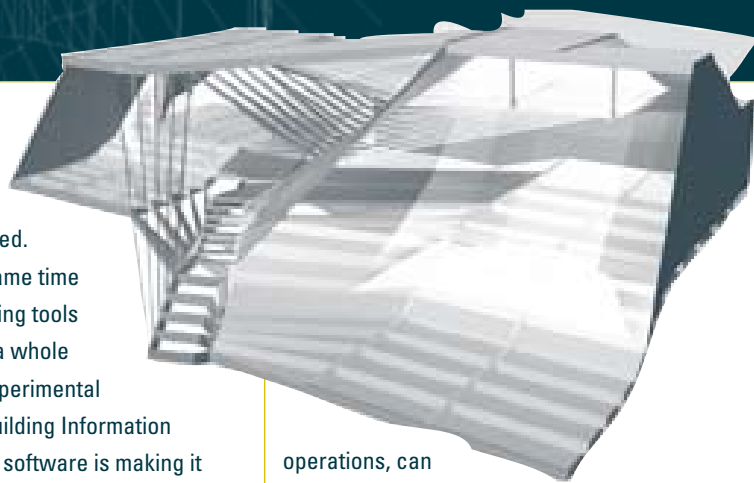


New computer software (like Maya and Rhino) enable the transformation of spatial geometries according to a set of “rules” or algorithms, generating emerging forms which would have been almost impossible to imagine without the computer and which gain meaning from an understanding of the steps of their serial emergence. The formal order and spatial geometries of previously separate building components, like skin and structure, a stair and floor support, the desired affinities between program spaces, etc., can be considered together. Their geometric “DNA” can be programmed to interact through a series of feedback “instructions” to produce a new “hybrid” spatial synthesis—a new combinatorial form.

Just as it is only possible to digitally conceive of these forms, the ability to construct such forms is only possible through the digitally guided manufacturing of their pieces. Through the computer, the object is not only the end result of its own generative history, but also its construction depends on the embedded geometric “DNA” in its digital record—process and products (in both

thinking and making) have become co-joined.

At the same time as digital modeling tools have spawned a whole new wave of experimental form making, Building Information Modeling (BIM) software is making it possible to conduct detailed analyses of building performance on multiple levels. The software allows the three-dimensional construction of a virtual building. It assembles the building into “intelligent” three dimensional “objects” (like a wall, floor, roof or skin) which can be assigned physical properties, such as structural characteristics, thermal and light transmission values, acoustical characteristics, and cost, to name a few. By assigning specific properties to the building components or “objects,” it becomes possible to run powerful dynamic simulation models. A building’s dynamic interaction with climate, its mechanical system operation and energy performance, its structural behavior, its acoustical qualities, its first cost and operating costs, and many more



operations, can be simulated in real time. Different options can be tested. It allows for rapid prototyping of different alternatives with input from multiple consultants. Work on the evolution of a design can proceed almost simultaneously because changes and adjustments are propagated through the system automatically. All of these capacities, while available, are still relatively difficult to operate without extensive experience with the software and knowledge of building systems, but their promise is revolutionary for the profession and education.

Paradoxically, these revolutionary digital modeling tools only enhance, rather than negate, the last 50 years of theorizing about the generation of form. In surprising ways, they collapse

Imagine that, as the 3D modeling programs spin out new spatial and material forms, BIM could provide empirical performance evaluations to help choose a preferred iteration.

or layer multiple theoretical propositions on top of each other and afford the possibility that they be reconsidered together. However, some theoretical practices have obvious affinities.

In his introduction to *Diagram Diaries* titled “Dummy Text, or the Diagrammatic Basis of Contemporary Architecture,” Robert Somol argues that the diagram has replaced the sketch as the primary generator of form. In contrast to Christopher Alexander’s “patterns” and Robert Venturi’s iconographic fragments, Somol points out that Peter Eisenman’s axonometric

diagrams are self-referential; their subject is the emergence of their own form. He explains that Eisenman seeks to create an architecture that is beyond the organization of the program (Alexander) and free from associations (Venturi). Whether this is possible is a highly contested theoretical question. Nonetheless, Eisenman’s experiments, his “cardboard architecture,” highlight that understanding and meaning can come from formal diagrammatic operations — the serial tracing of a building or landscape’s emergence.

Clearly, the parametric generation of form through digital modeling tools shares many characteristics with Eisenman’s diagrammatic operations (not surprisingly, Eisenman’s practice has now become digital). It presents a puzzle; a sense that the form has been produced by a series of operations and has been driven by a hidden “code” that begs discovery. The end result fascinates by challenging us to imagine its prior conditions. The form engages our conceptual imagination.

The idea that built form can have a diagrammatic emergence — that it is a phase in a phase-change process, is not a new idea. It can be traced back to insights about time and perception in both simultaneous (synthetic) and serial (analytical) cubism. It owes a greater debt, however, to the inspiration of the landscape and ecological succession, where everything is “in the making.” It was made visible by Lawrence Halprin in his *RSVP Cycles*, but further when he asked participants in his workshops “to draw the process which created a place.” The idea of time and process, as manifest in any site being a phase in a phase-change process, is central to current landscape-design discourse. But, it also begs many questions.

It eventually leads to other





including other theoretical propositions about the site, program, structure and construction referenced above. Thus, through the computer, theoretical design speculations and empirical analyses come together, enhancing the evaluation of a preferred solution. While we are still a long way from achieving full integration, we are getting closer and partial integration is already feasible. In the meantime, as the projects that follow illustrate, we are in an exciting time of experimental form generation. Each of the projects, along with some of the most notable examples of contemporary practice, are engaged in finding ways to make the diagrammatic generation of form not only have meaning within its own referential system, but also to create broader meanings beyond their internal logic. Finding those strategies and connections to broader meanings is as emergent a search as the diagrammatic operations themselves. For the promise of integrating 3D parametric modeling and performance simulation to enhance the generation of meaningful form, the practitioners and faculty involved in each must join forces in a concerted effort. ^{Fw}

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(Facing page and above left) DIGITAL WEAVE: SFMoMA Installation from Prof. L. Iwamoto Graduate Seminars & Studio: CAD/CAM TRANSLATIONS
(Above) Underfloor Air Distribution Design Guide by Fred S. Bauman

theoretical propositions beyond Eisenman's. If form has a diagrammatic emergence beyond a static decorated diagram or collage, how do you know what phase in the process is optimal and represents the design that should be built? (a question posed by Michael Speaks). Can transformational operations lead to a formal "conclusion?" Do the transformative operations apply to the whole building (as in Eisenman's projects), or can they be applied to parts of a building with other parts "fixed," against which the transformations are read? (See the work of Holl, Herzog & de Meuron). Other questions emerge such as: Where do the parametric algorithms come from? What different orders do they reference? (See Venturi's iconographic associations.) Is it inevitable that we read a previously unimagined parametrically generated form against its prior known type (Colquhoun's typology and design method)? What about the site and context? Can they be thought of as having their own emergence? If so, can the phases in their emergence be reconstructed, imagined

or diagrammed? ("Contextualism," Frampton's "critical regionalism," Halprin's hidden processes). Can such diagrams reveal new insights, or hidden potentials, where a design idea can engage these "givens" to produce a new combinatorial form? Also, what about the program — why should its "patterns" (Alexander, ironically Koolhaas's Seattle Library) be excluded from the diagrammatic operations? All of these questions and their theoretical backgrounds may help answer the question about what phase in a phase-change to choose.

The answer to how one integrates all of these questions may also reside in the integration of these three-dimensional parametric modeling programs with BIM. Imagine that, as the 3D modeling programs spin out new spatial and material forms, BIM could provide empirical performance evaluations to help choose a preferred iteration. In this way, the environmental performance, the ecological footprint as a form generator, for example (see Olgay, Fitch), can be integrated with other issues of form generation,