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Archaeology of the Digital

In every exhibition and every publication I have been involved in, it's always been really difficult to be an architect. I think it is because the materials that you're exhibiting or publishing might be the final objects; it's never the actual building that you bring into the museum. You're always debating about how to show things like process and how to select and discriminate between different materials, materials which were really sometimes never meant to be seen or meant to be exhibited.

Architecture, in this sense, is very different from most other artistic and creative fields, where it's very clear what is meant to be exhibited and what's meant to be archived.

Also, in my contact with institutions, I am always amazed at how complicated things become as they change media. The difference between a drawing and a photograph and a painting and a sculpture and a model is incredibly complex. I would just like to point out that any architectural output reproduces, in microcosm, all of the departmental problems of any art or design museum, because an architecture project usually involves everything from photography to physical objects to drawings and sketches... And when you add digital, it gets even more complex.

A position that I would take—and I don't know if it's my position, or the CCA's position, or some form of collaboration—is that you can't isolate the digital. There's no digital moment in most architectural projects. The digital has found a way to be present throughout the entire process. In dealing with a project or an archive, it's conceivable that you could just strip out every sketch and have all those sketches be separate from drawings and models and photographs. With digital, there's no way to conceive of ever isolating it.

Another observation on my part—perhaps it's speculation—is that a robust body of scholarship has been produced in the last 25 or 30 years on the history and theory of digital technologies for visualizing and describing objects geometrically. There's a lot of work that's been done on the use of digital technologies in fields ranging from the mechanization of certain kinds of drafting tasks all the way to questions of building information management—or BIM. And there's presently a whole lot of work being done on organizational theory and cybernetic theory.

Those areas of study are very well-covered. What I find is less developed is the history and theory of the digital as a design medium, or how digital technology changed the way designers thought about architecture. That could be because, in the recent past, a lot of architects and theorists made very promissory claims about the role of digital technology with respect to authorship, and it could be that those claims
were so promissory and futuristic that people now want to give it a little time before that history gets written—which I think is probably a good idea.

I also think there was a generation of architects who practiced history and theory, as well as historians and theorists, who didn’t have a working knowledge of the different softwares and hardwares used. It would therefore be difficult to write a history or a theory unless you had a working knowledge of some of that material.

And if that’s ever going to happen, can it happen without the native digital material preserved? Without the actual files it’s very difficult to get a picture of what was going on.

The real question worth asking today is what architects and institutions should be saving. How do you discriminate between that stuff? How do you archive it? And also as importantly, why has it already been purged? It’s shocking how many people—an institution or an architect—will keep an archive but purge a lot of the digital material.

Why would it be purged? It’s either because there’s so much of it that you don’t know what to save and what to cull—and so it all gets tossed—or because there’s a pervasive assumption that digital technology has not played a creative or conceptual role in design, and is therefore not seen to have intellectual or creative merit. It’s seen more as a mechanical part of the instruments of service and construction, rather than design. I was just at a conference last year where three out of four art historians claimed architects can’t sketch with a computer, so why should we talk about the computer?

On this topic of digital technology, institutions have to get involved with the designers earlier. They need to have a discussion with them about what’s important and how things are being used. There are a lot of assumptions which I think are incorrect, from both sides of the table—from the architects and the institutions—about what digital material should be collected.

My conversation with the CCA began in a very innocent way when the CCA acquired my Embryological House Project—I think at least 10 years ago. We were going through everything and inventorying things, and I just innocently asked, “Do you want the digital material for the archive? And if so, what material do you want?” The CCA’s response was, “We want everything.” But that initial, simple question really had a whole lot of implications.

There were digital presentation materials, like images, models made using digital technology, animations and videos. They were in all kinds of different formats and had been translated in all kinds of different ways. There were sketches and drawings that were done as part of the design process, and a lot of those sketches and drawings were done in 2D and 3D in different softwares. There’s all the digital correspondence. There was a website done for the project when it went to the Biennale. There were custom scripts and codes, and machine files to use for
manufacturing, that is, files used to translate and talk between different machines. There was the actual software and the actual hardware, which even ten years ago you couldn’t open anymore. And then there were all of the digital publications and catalogues and interviews and videos.

The project was about how to design a series of 50,000 houses algorithmically, so there are literally thousands, if not tens of thousands of models, and some of the tooling used to make them at scales that go from something that would fit in your pocket to a two-tonne piece of foam that was CNC-cut—which the CCA does not have, but I think everything else they have. So there were all those physical things that were digitally produced with all of the files that led to their digital production. There were sketches, there were 2D drafted CAD files that were used to generate those 3D models, there were scripts. The software that the Embryological House was designed in doesn’t even exist anymore. It’s been sold twice and integrated into other packages. The machine it ran on was a $70,000 Silicon Graphics workstation—which I still have. But the software was all coded with a time stamp which is impossible to crack, so you can’t actually open it anymore.

We used Excel to manage these 50,000 files by plugging it into a MEL script editor. There were different softwares used to run the machines, to make the moulds for the models and to do the 3D prints—thousands of 3D-printed models.

There were many different kinds of digital material, and at the time of those conversations with the CCA some of them could not even be accessed anymore. So the digital archive presented a much larger problem, in my estimation anyway, than the physical archive. That range of material was typical of what most architects of my generation were using in their projects, and a lot of the intricacies of production and design were unknown to the institution and needed to be assessed in order to know what to save and what to get rid of.

In parallel with the acquisition of the Embryological House Project, the CCA and the Langlois Foundation organized a conference called “Devices of Design” in response to the use of digital media and software technologies in architectural design and construction; and with the goals "to evaluate the consequences to contemporary theory and practice," and "to look at the urgent archival and conservation issues that new media and technology raise for research institutions." The study of architectural history and theory in North American schools has radically changed in the last 15 to 20 years with the emergence of digital technology, shifting from looking at questions of contemporary architecture and design towards pure history. Therefore, part of the project with the digital archive was also to reengage history and theory with a topic that was being overlooked by theorists and historians. If you lose everything it’s going to be very hard to ever evaluate what was going on in the 1980s and ‘90s.
The Archaeology of the Digital initiative that I’m developing with the CCA is not an attempt to write the history or prehistory of the digital in architecture, but to study experimental projects of that period and to figure out what to collect from them and how to preserve them. One of the ways we discriminate what needs to be preserved is with a series of oral history interviews with the architects and collaborators on the projects, to find out what they think is important and if anybody still has any digital material.

Through the interviews we are starting to build a picture of how a technical and intellectual network was forming. And through other programming at the CCA, like the summer Toolkit for PhD students and other symposia, there’s an effort to reengage theory and history with contemporary design.

The starting point of Archaeology of the Digital was identifying the influential, original or innovative projects from the 1980s and ‘90s, and looking at the use of digital technology in relation to the complete project. We decided to look at twenty-five projects, many of which had already been exhibited at MoMA and the Centre Pompidou in the 1980s and ‘90s, but we wanted to look at them now in a different light and to find out what existed in terms of the digital materials. It’s surprising how little still exists.

We have put together two exhibitions until now—Archaeology of the Digital and Media and Machines, which is now on view next door. There is also an eBook series where each one of these twenty-five projects is presented and where we can show 3D material, animations, scripts—all that kind of information that you couldn’t really publish in print. And we are planning one more exhibition with fifteen projects—but who knows what that is going to be.

As I said, the criteria for the selection of the twenty-five projects was how influential and, let’s say, canonical they were in that 20-year time period. As a cut-off we decided that the projects had to have been initiated by the year 2000, even if some of them were completed later.

We conceived of the exhibitions not only as a way to communicate why it’s important to look at these projects today, but also as a way to collect, ingest and catalogue the materials into the CCA appropriately.

Out of the list of twenty-five, there were four projects that immediately stood out, partly because of their chronology. They were very early projects conceived in the 1980s, and they were very distinct from each other. Each one of the four had a very mono-focused approach to the digital and how it would be used architecturally, and in all four cases there was a clear vision before the tools existed. There are many assumptions about digital technology, like that my generation at Columbia University was given software and hardware and, like monkeys at typewriters, started banging away and coming up with these happy accidents, creating digital architecture. That
was a little bit the message that my generation propagated to the world, and it's what a lot of people believed for a while.

What we found with the study of these first four projects is that older people developed the software, because they had a vision that existed before the technology, and so they made the technology to adapt to that vision. The situation is very different than in the other twenty-one projects.

These early projects presented in the first exhibition are: the Lewis Residence by Frank Gehry; the Biozentrum Competition by Peter Eisenman; the Expanding Sphere and Iris Dome by Chuck Hoberman; and the Odawara and Galaxy Toyama Gymnasia by Shoei Yoh. They all wanted to manage new degrees of complexity of various types, and all of them—with the exception of Shoei Yoh’s Gymnasia—had been over-published and over-exhibited. So, even though there weren't necessarily any surprises with the choice of the projects, we tried to make something new out of framing them with each other.

I worked for Peter Eisenman on the Biozentrum project, so I knew a lot about how the computer was used on it. And Shoei Yoh taught at Columbia University while these gymnasia projects were being developed, so I also knew about how the technology had worked in those. I felt I probably shouldn't have been involved in this because I was biased, but I also knew things that Eisenman and Yoh had forgotten, so I could be of some use.

For the Biozentrum by Peter Eisenman, the CCA already had the project in its archive. All the models, all the drawings, hundreds of plots—they all existed here, but not one single digital file. Eisenman, I think, changed servers and moved offices and saved the model(s), saved every drawing, saved and every sketch when he moved offices, but threw away every digital file.

For this project Eisenman worked with the Supercomputer Center at Ohio State University. We contacted them and learned that they had purged all their tape drives and files. So, no digital files existed anymore for this project, but there were hundreds of digital plots and some code that we could identify in the correspondence, mainly faxes.

The custom software that was developed to do the project at Ohio State University later became FormZ. We interviewed Chris Yessios, who was the partner on the project and the developer of FormZ. We looked a lot at the role of tools you don't think of as digital but that were in fact digital, like the fax machine and the copy machines that were used to manipulate drawings by enlarging and reducing them—which I remember everybody was so excited about at the time. My role on that project was to manually draft a logical code sequence while the Supercomputer at Ohio State was producing the same 2D information. I felt like it was a race to beat this computer or I would otherwise lose my job. I used to hum in my head the John
Henry song about a guy driving railroad ties against the machine over the mountain, who died of a heart attack at the end but won.

Every day we would get a FedEx envelope from Ohio State University—it was the first year you could overnight a package—we would open these plots, tape them together, and put them on our enlarging and reducing photocopy machine. All that was part of the digital ecology at the time, and it was important to include it in the exhibition alongside the manual drafting tools. We presented a pen plot drawing next to the corresponding manually-drafted drawing to show how the two things were happening in synchronicity. The computers were so slow that you could actually do a lot of the work better or faster manually, but the computer added some value. Other materials in the exhibition went from an insane graphic diagram of a genetic sequence, written procedural sequences describing how geometric objects should be rotated, scaled and aligned in sequences… Chris Yessios said during the interview that he didn’t think Peter Eisenman had anything to do with the computer but that he realized that he had actually met a living computer when he met Peter, because the logical procedural process of Eisenman was perfectly matched to the computer’s procedural, reversible code approach to design.

In Chuck Hoberman’s work the computer was used to manage complex, structural motion, and also to resolve complex intersections of objects in space that fold and unfold. Hoberman produced mathematical equations that were then converted into geometric operations that were then converted into computer code. He was writing all this code and writing all the software himself on the very first personal computers. And again, very few digital files remain. This was one case where we did a reconstruction for the exhibition, typing in that information and running a piece of computer software.

The first CNC manufactured architectural components that I know of were the aluminum parts for the prototypes Hoberman produced for the domes. We have lost all those files, but we have those very early 3D prints and patent documents.

With Shoei Yoh, the two gymnasia projects presented in the exhibition were form-finding experiments that responded to the different loads affecting the roof structure. The loads were input into a space-frame engineering software from Germany used by a Japanese structural engineer, and the software produced the forms of the projects. This is one of the first topological structural concepts in the field. Early 2D CAD files were used as underlays, and a controlling model of the roof was done in 3D, which allowed for every dimension and every angle of every component in the whole building to be controlled in a very early kind of BIM approach.

For Frank Gehry’s Lewis House, which was a ten-year long project, we selected a three-year period during which digital technology determined the language and the expressive character of the project. We studied the Lewis House together with Gehry’s Barcelona Fish sculpture, a complementary project in which he used CATIA software from the aerospace industry, and built physical models in parallel with the
digital models. Because they were using digital wireframes, they built wireframe models. And then model techniques evolved along with the software: the minute they could do unfolded paper, they would produce unfolded paper models; and as they explored spline surfaces, they produced waxed felt models.

There was a back-and-forth dance between digital technology and physical models, and a lot of output methods were used, with models that combined 3D prints, laser sintering, laser cutting and CNC milling, and a lot of handwork.

At the end of the three-year period we studied, Gehry’s office started to produce 2-dimensional drawings out of 3-dimensional files, closing the gap between 2D and 3D ahead of a lot of other work that was happening at that time.

The technology and computer equipment used in these projects varied a lot, from Gehry working with IBM and CATIA, Chuck Hoberman on a Mac personal computer, and Eisenman with a $8 million Cray supercomputer.

The second exhibition, Media and Machines, is not about the vision of the architects preceding the technology, but about the projects that integrated media art, interactivity, virtual worlds and other digital media—that were not architectural—for the definition of new forms of experience. The focus was not so much on new languages of form, but on new types of perception, movement and interaction.

Again, a lot of the projects are very well-documented and widely published. But even though we had to borrow models and sketches from other museums, none of these museums had any of the digital files, other than some animations or some renderings. In the exhibition we communicate the experiential component with big video projections, and we deal with a lot of controller technology and motion technology related to their interactive nature. We dissect things into their components and try to give a picture of how sensors worked and how interactivity worked with those sensors. A lot of the projects used custom applications both for the design process involving many collaborators and for the visitor experience. And then there was a lot of digital content on how to get machines to talk to each other.

We tried to avoid reconstructing anything, even though whenever you ask a living architect to give you something with their digital information, they want to remake everything. All six architects included in the exhibition would have liked to rebuild everything in a 2.0 version. "Back in 1992, this didn't work, but I know how to fix it now, so let's make it right this time." It was a real struggle not to make it right.