

Normal Disciplinarity: Action at a Distance

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How should we teach design? We can think of it as Herbert Simon did: "Everyone designs who devises courses of action aimed at changing existing conditions into preferred ones." On this view of design, it is hard to avoid doing it. We can also think of design more narrowly as what engineers or architects do. This may lead us to think in terms of disciplinary-specific design pedagogy. Yet on Simon's view of design we might still hope for something in common across disciplines.

We explore whether or not what is common between disciplines and design pedagogies is more significant than the current differences between them. We will propose that we mix and match disciplines, if not somehow get beyond them altogether. We start with the very idea of a discipline, and tease out several related ideas about disciplines and the problems of getting between or beyond them. We are then in a position to develop a deeper account of normal disciplinarity, to diagnose what typically keeps us separated into disciplines, and how this separation undermines the potential of design and design pedagogy. Finally, in investigating the limits of ready-made realms, we see the possibility for space-in-the-making as an alternative to the priority of eye over body.

According to the OED, "discipline" has its roots in the Latin for "instruction of disciples," and "disciple" has its roots in the Latin for "learner or pupil." The key to understanding the current state of our disciplines, however, is this entry about "discipline" as a verb: "To subject to discipline; in earlier use, to instruct, educate, train; in later use, more especially, to train to habits of order and subordination; to bring under control." Under "discipline" as a noun, the first two entries concern its sense in the earlier way, and the last five, with increasing stress on control, concern its sense in the later way. Between the second and the third entries we move from "a branch of instruction or education" to "instruction having for its aim to form the pupil to proper conduct and action."

But it would make no sense to have various disciplines if for each discipline "proper conduct and action" were exactly the same. In the later sense of the definition of "discipline," one assumes that each discipline concerns itself to bring order to a specific area of learning, and accordingly to exercise control of those aspiring to practice this discipline so that they can all work together. No doubt, as Thomas Kuhn describes in his work on scientific revolutions, there will also be times of disagreement within a discipline between two "paradigms" of "proper conduct and action." But we can still assume that the discipline will eventually settle down again, to practice, for example, normal science as opposed to revolutionary science, as the new paradigm displaces the old, taking its place as what is automatically "proper."

And two disciplines may well overlap, or be about to overlap, to some extent as well, and in this way, in some cases, the overlap is properly called "interdisciplinary." In the history of disciplines the

tendency is for each such hybrid ultimately to come to be known as another discipline. Fundamentally, this result is simply another way of talking about how a group of instructors/learners comes to hold common standards of "proper conduct and action," and to set up the social institution(s) that will guarantee that future aspirants toe the line.

So, the two levels of description of discipline are the authority of competence and the authority of control (power). In the earlier usage the former was stressed, and in the later usage the latter was stressed. We wish to shake up the disciplinary authority of control, at least enough for someone with a disciplinary background to catch a glimpse of another course of "proper conduct and action." But, more significantly, we also wish to show what tends to be left out of our courses of learning (and, in turn, out of our lives) when we work in disciplines. It is, furthermore, not at all evident that what is left out—an "improper" authority of competence—should enter only during revolutionary periods of explicit struggle between two paradigms of "proper conduct and action." We aim to show how it can be there for us all the time, as a complement to normal disciplinarity. (And it is needed too, to understand and resolve the **kind** of complex problems in our lives.)

At a more concrete level, we have experimented for nearly ten years across our own disciplines and, with other professors, across other disciplines as well. This part of our work describes more the texture of everyday life in a university rather than the particular disciplines within that life. We might well think of it as the "ground" of the disciplines: the university infrastructure and associated habits of proper conduct and action.

The university infrastructure, of course, has come to reflect the nature of the disciplines that it houses, often, respectively, in different buildings. But the university also performs a vital service no longer performed by the disciplines: literally, housing them **all**, while at another level exercising its own authority to reinforce the cement. Perhaps if the disciplines had stuck with their earlier sense, this service would not have to come so much from the university as opposed to the disciplines themselves. Instead, they form separable parts of a curriculum, the university itself provides the authority of control that holds these separable parts together, and the learners are left essentially on their own to develop the connections.

It seems that it would be to the advantage of a university to promote interdisciplinary work. On the contrary, inasmuch as the function of the university has come to be holding the disciplines together, interdisciplinary work actually tends to undermine the university authority of control as well as that of each discipline.

Ironically, the tendency of disciplines to be separable runs counter to our growing intuition that our problems cannot be analyzed into separable parts, but rather resist such analysis precisely because they are problems that disciplines cannot solve alone — or perhaps,

cannot solve even in teams of disciplines, if those teams cannot get at what tends to be left out of disciplines in the first place. We believe we are at the end of the usefulness of disciplines, including teams of disciplines.

In Bruno Latour's *Science in Action*,⁴ one example turns on a 1787 mission to sail far away from home and bring back what one finds. The most basic thing to bring home is a record of one's travels so that the next person will know what lies ahead. Today we think nothing of indicating where certain events have taken place by putting the appropriate map on a wall and sticking pins in it. But the captain of the 1787 mission had to be disciplined enough to find a way to indicate where an event took place without any map at all to put on the wall.

When the captain runs across a native person far from home, the crucial difference between their lives is that the latter simply lives at a place that the captain must find a way somehow to bring back. The native people can help him find his way, say, by drawing something in the sand, but they could not care less when the waves wash it away. The captain, on the other hand, would no doubt have returned to his ship to draw it again.

Latour speaks of this as a process of "making" what will later become "ready-made." The captain's work begins a long process of various ships bringing things back to their home center until they accumulate enough to act at a distance: they become aware of what is far away without having to move there so that they can take it into account in their thinking at home. Notice that it is not even that they can take it into account as well as they could have were they there: they do "better," because what they do is not tied to that place. The native people are "just there," seemingly disadvantaged in the light of this action at a distance, which Latour rightly sees as a kind of domination.

Moreover, as a kind of domination, the action at a distance is all the more tricky as it becomes ready-made: the making of the ability to act at a distance is forgotten, and the action at a distance is put in a black box. Right from the start of his book, Latour makes it clear that he is going in the back door of science, the door of science in the making, at a point when context and content are still unmistakably fused together: in Latour's opening examples, Watson and Crick are straining in their laboratory in 1951 to uncover the structure of DNA, and then 34 years later another scientist is working with a "nice picture" of DNA on a computer screen so that the underlying program can relate that picture to other structures — here, of course, there is no question of opening the black box of the structure of DNA itself.

We are so accustomed to the split of context and content that we can hardly be blamed if we find section III above somewhat mystifying. What is so confusing is that, for us, a map is a context for the content of our daily activities, but originally it was the other way around: before maps, we would have been in the context of our daily activities, straining to find a way to relate one context to another. What is in the content of this context that relates to the content of the others? We no longer need to ask this question. Whatever we are doing now, we can use a map to find out where we are. But this "where we are" is an example of a black box.

To begin to illustrate these terms, we can use the DNA example (see section III above). Crick and Watson had not found a way to distinguish content from context: what in this context can be abstracted in such a way that it stays the same for other contexts? This is the science question, no? But it is not different from map making. You need to know your way around the lab. You use things there to orient yourself, and you try to do so in a way that bears some relationship to the way you would do this in another lab, with different people and samples, for example. (As the social studies of science would have us note, the people are as important as anything is here: science is a social institution.) Once this abstraction is accomplished, the abstracted content becomes the context for the person at the computer 34 years later. But as a context, its making

is necessarily as tacit as that of the maps we use everyday. It is in a black box.

So, no matter how much context and content seem not to be fused together, no matter how tight a black box is sealed, it can be opened. Suppose that we need to do so because local people have access to data not available to scientists, much as, for example, native people had/have access to data not available to distant map makers? Immediately upon asking such a question we understand how action at a distance inevitably involves a hierarchy. The whole point of making action at a distance is to eliminate the need to consult local people: if local people claim to have access to data not available to scientists, then the data must be either irrelevant to the issue in question — not really data at all — or else simply not **yet** taken into account at a distance, still open to confirmation or disconfirmation by science.

Science is not alone in countering "local" intuitions. For every "normal" discipline, there is data that is not available to those who practice it. They practice at a distance from the "local" conditions that give rise to the data.

It is always worth remembering the price "local" people have to pay as they come to defer to action at a distance. In Latour's case of map making, for example, the local people were not even aware of what was happening to them. Strictly speaking, they were not yet acted upon at a distance. We can imagine, however, that as the map making became ready-made at home, its influence spread as well: its methods and terms eventually became as ready-made at the original far-away place as they had become at home. As the ability of the local people to proceed as they always had done was called into question and eventually eliminated in favor of the non-local methods and terms, resistance had to give way to deference, ultimately, to automatic deference. This process was typically a part of colonization, playing out the theme of domination understood by Latour.

We do not normally think of ourselves as colonized people. Yet we do pay automatic deference to a variety of disciplinary authorities, the trademark of which is ready-made action at a distance upon our lives. The crucial move here is one that is repeated analogously in every disciplinary area of life: the move from needing to learn to needing to be taught. The insertion of such passivity into our bodies, as we like to say, IS the constitution of automatic deference. We need only point out a couple of other such moves to set the general context here: for example, the move from needing to grow (up) to needing to be raised, from needing to love someone (a life companion) to needing to be married, and from needing to work to needing to be employed!

Putting the case of a student in the terms of Latour's example: a teacher ventures out to students to bring things back — though usually students are required to venture out to the teacher and back, bringing things to the teacher — so that the teacher can act at a distance, taking into account what the students do at their respective places, and the verdicts here are grades, directly conferred on the students. The students, for their part, have already been colonized (the turning point, according to teacher lore, is 7th and 8th grades), as they simply assume that the methods and terms of the teacher are the methods and terms that they should use as well — hence, they need to be taught.

In a university, each discipline is like a ready-made realm of action at a distance, although there may well be areas of turbulence, where the making is still evident, not yet ready-made. We can dig down to the buried makings, of course, but typically courses are built around inducing students into the ready-made realm of the professor.

Since professors have had a long disciplinary tutelage, they are in the realm of their discipline, that is, no longer feel the making of their methods and terms, except, again, in the area of evident making, their special area of inquiry, perhaps (where they are like Crick and Watson were in the beginning, still straining to "make" the crucial connections to other contexts). The lack of feeling for the making of disciplines is most evident in undergraduate courses, especially those in which little, if any, developing disciplinary information or

"news" is being shared. (What passes for innovative, interactive learning at our own university is often just a function of students relating to each other through a computer interface, in which the computer becomes a kind of black box, mediating an answer-based, as opposed to a question-based or interrogative, style of interactive learning.)

If professors from different ready-made realms try to cooperate — this is precisely the case of basic resistance — they have to dig to the making of their methods and terms in order to negotiate with each other. Some professors can do this, most are just too uncomfortable (that is, more de-familiarized than they know how to handle). Of multi- and inter-disciplinary work, multidisciplinary work is more comfortable: people just work side by side, perhaps using complementary approaches to an object of study. Then their mutual negotiation is not as crucial. If, however, we are trying for interdisciplinary work, in between disciplines, the lack of comfort rises: for then full negotiation is necessary (to overcome the de-familiarization).

So, we have two simultaneous makings in a black box: the making of the discipline (which includes, for example, textbooks), and the making of the pedagogy. The two come together in an unfortunate way when two or more professors are negotiating **both** in front of a class. How is action at a distance as pedagogy or as discipline to be **shared**? If it is designed in the first place not to be shared with the "locals" (the students), it is best exercised by **one** person. Even with disciplines side by side, let alone trying to get between disciplines, the two or more professors must resist acting at a distance on each other as they continue to act at a distance on the students and the world — or at the next level, as they also resist acting at a distance on the students and the world (though, for every action at a distance resisted, mutual making reappears, and the participants are on a different kind of ground for which they need to be prepared).

Design is idiosyncratic in this context, especially if it is supposed to be creative or innovative, not following ready-made methods or terms. Luckily, for many professors, pedagogies of design have minimized the need for venturing too far into retrieving the making required to avoid ready-made methods and patterns. That is, design pedagogies can be grouped as to whether they basically do the same thing in design as they would do in regular teaching, or else try to do something different, for example, in the mode of evident making. Multi- and especially inter-disciplinary design tend to be more in the latter camp, of course.

Engineering design tends to use the ready-made methods and terms of its own science — engineering science — to do design. The making part tends to be confined to the problem formation, not its resolution. That is, the student occupies, more and more as the engineering curriculum proceeds, the chair/desk of an engineering scientist, who acts at a distance on objects in the world, irrespective of their context. It is precisely by eliminating this context that this object is defined, non-locally, in keeping with action at a distance. The quality of this action at a distance is the quality of the design solution too: one must show that the design solution does the trick, at a distance, through engineering science analysis.

According to Louis Bucciarelli, an engineer at MIT who conducted several ethnographic studies of design in industry settings,⁵ once engineering design students are led into using engineering science analysis to show that a design solution does the trick, they will almost certainly try to exclude all aspects of the problem that represent the "locals" in any way. Bucciarelli provides a wonderful analysis of a typical engineering science problem: it starts out looking like it may well have something to do with the context in which it is posed, perhaps even referring to associated people, but in the end a student can do the problem only if she or he penetrates to the underlying form of the problem, which is essentially a problem in mathematics, unrelated to any specific worldly context. Engineering designers are, consequently, completely unprepared for the need to negotiate with other engineers the terms of the "object

world" of their designs, which, indeed, cannot be shorn of all reference to the "locals" and tend to vary, not only with different sets of "locals," but also with different engineering designers.

Because the making of "object worlds" is left out of engineering education in general, let alone in design, creativity tends to be entirely fortuitous in engineering design pedagogy. There is this moment when each student, or each team, is supposed to think up some alternative solutions (and, of course, the context for these alternatives tends itself to be quite narrow, often established through a reverse engineering exercise that automatically constrains the design possibilities). But there are typically no exercises to help the student understand how to attack this open-ended situation. The typical engineering design professor's has little if any experience with any alternative in her or his own education (an alternative that would have included, for example, risk-taking exercises to overcome fears of letting go), in any case, the real point here is to show by engineering science analysis that **whatever** one comes up with works, and if one cannot "show" it works, either come up with something else, or fail, so to speak (hence, the making of its working is already in a black box). All reviews, so far as we have witnessed, are about functionality, based on engineering science analysis ("documentation").

But how was/is engineering science analysis made? How did/does it become ready-made? What will happen if we make this making evident? (See Bucciarelli again.) If the making of engineering science is pulled out of its black box, the typical defense of designing at a distance will be groundless.

The reason why engineering design pedagogy tends to be more functional/instrumental than, say, architecture is that it is more strictly at a distance from the object of design.⁶ At our university, though not universally at schools of architecture, architects tend to be led into playing, in various ways, through various exercises, at least in studios that are less strictly at a distance from the object of study. One must learn to feel one's way into not only the object but also its context. The extent to which architecture pedagogy encourages this is just the extent to which it calls the at-a-distance into question. The engineers tend to leave this to industrial designers, if to anyone.

But not all architecture schools are like ours. In 1996, the Carnegie Foundation for the Advancement of Teaching published a special report, *Building Community: A New Future for Architecture Education and Practice* written by Ernest Boyer and Lee Mitgang. Although its critics found little that was new or overwhelmingly transformative, its adherents found a basis for multidisciplinary and service-oriented practices that had received little or no recognition to date in conventional programs and offices of architecture.

It is significant that the Carnegie report opens with a description of a fifth grade class making toothpick bridges and the authors' acknowledgment that "the tasks, thought processes, and goals we found in visits to design studios at architecture schools and those at work [here]...were so strikingly similar." They continue to note that both sets of educational intentions were to foster "the learning habits needed for the discovery, integration, application and sharing of knowledge."

As right as this assessment is about how architecture can itself be carried out at a distance in all the ways we have discussed above, the assessment still understands design education in a functional/instrumental way. After all, the toothpick bridge has defined limits for investigation and is not seen in a larger context of urban or non-urban fabric, occupation, and soon. There is no initiating question of whether or not the bridge is necessary at all, or what value it has, but instead the bridge is seen as a problem needing the traditional -- engineering style — "tech fix." These exercises are rarely about (invoking) an experience of defamiliarization, but rather act to reinforce the "getting it all at once" that is at the core of designing at a distance.

It is also important to be aware that normative middle childhood art education (as threatened as even it may seem) also relies on a

finished artifact independent of transformation. Not only does it carry on independently of the main curriculum (though this could be a benefit as well) and of the larger community condition, it also does not address a number of design possibilities: for example, the making of variable environments or artifacts in a contextual framework, and the possibility of seamlessly combining the social and technical, in some multi-, if not inter-, disciplinary manner — for which, we will argue, we really do need to turn to design in movement.

To briefly discuss the second part of this, we can say that the point of design in movement is twofold. At one level, it can make making evident, which is just movement in the ready-made realm of action at a distance. Nowadays, if not in 1787, we are always moving/working in some ready-made realm. It is like peeling away the layers of an onion: as we make one making evident, we find ourselves doing so relative to another one that is still assumed, ready-made. Defamiliarization is one way of peeling the onion. Working in two social contexts simultaneously — an ambiguity (in a space of jurisdiction) — is another. In the end these two are the same, though architects tend to talk of the former, and Science and Technology Studies or STS types of the latter, especially relative to technology (questioning the "tech fix").

For the second level, we can imagine the limit of peeling away the layers of the onion of ready-made realms to the very last one, at which point we are making the fundamental making evident. What is it? Precisely the at-a-distance itself in the making, or alternatively, space-in-the-making! Here it is important to try to imagine again what it must have been like for the captain of the 1787 mission to have to bring back home precisely those things that would allow the next captains to find their way in the ready-made space of the first map. Then try to imagine what sorts of exercises professors of

design must create in order to simulate some aspect of the original making of what are to us always already spaces.⁷

If the making of space is lost to us, we automatically take ourselves to be moving/working IN space — henceforth, we can only move to make layers of actions at a distance, ready-made realms (spaces of jurisdiction). Design in movement is utterly crucial as an element in design pedagogy because every student deserves the opportunity to catch a glimpse of the limit of the onion of ready-made realms, of space in the making. It is precisely by taking ourselves automatically to be in space that our most basic assumption is made: the priority of eye over body.

NOTES

- ¹ Herbert Simon, *The Sciences of the Artificial* (Cambridge: MIT Press, 1996), p. 111.
- Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1970).
- ³ See Thomas Dutton, *Voices in Architectural Education: Cultural Politics and Pedagogy* (New York: Bergin & Garvey, 1991).
- ⁴ Bruno Latour, *Science in Action* (Cambridge: Harvard University Press, 1987).
- ⁵ Louis Bucciarelli, *Designing Engineers* (Cambridge: MIT Press, 1994).
- ⁶ For an account of how engineering became less like architecture in this way, see Ferguson, *Engineering and the Mind's Eye* (Cambridge: MIT Press, 1992).
- ⁷ For examples of such exercises, see Bronet, Schumacher, "Design in Movement: The Prospects of Interdisciplinary Design." *ACSA Proceedings*, (Washington, DC: ACSA Press: 1998). pp. 205-211.