Judgment and Typology:
The Culture of Technology at the University of Pennsylvania

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During the school's last accreditation review, the visiting committee observed that they had never received a list identifying the faculty by typedesign, technology, theory, etc.— and they had to come to recognize that not as an oversight, but as an identifying feature of the University of Pennsylvania. The school does not support laboratories or independent research personnel, like some of the larger research schools, yet neither does it parcel out its technology courses to faculty from other schools and disciplines, as is common in many other "design" schools. This condition certainly has its origin in the school's uniquely interdisciplinary history, beginning under Dean Holmes Perkins with the structural/constructional interests of Lou Kahn, Anne Tyng, and Romaldo Giurgola, the experimental work of Robert Le Ricolais and August Komendant,' and Peter McCleary's work on the philosophy of technology.' It continued with the passive-solar curriculum work of Donald Prowler and Harrison Fraker[3] and the "details" of construction written about by Marco Frascari.[4] The disciplinary boundaries between technology, design, and theory/criticism continue to be regularly crossed and blurred, both in the work of individual faculty members and within the organization of the curriculum.

The technology courses and faculty are wholly integral to the identity of the school, both for the historical reasons cited and as a result of the decision that all faculty should teach in the design studio. What are the consequences of such a decision? How does this change the instruction in technology and what lessons or cautions might it offer? This paper undertakes to answer those questions by reviewing the sequence of technology courses as currently offered, and then examining the four core technology courses individually, asking about the relative strengths and weaknesses of this approach. But what are the relevant questions or criteria? The courses are all taught according to the standards of their respective fields, using current texts and methods, introducing field measurements, site visits, dynamic computer tools and modeling techniques as needed. In the formulation of this presentation, we have retroactively identified the common, critical features of the pedagogy as judgment and typology. As the session papers demonstrate, the organizational categories are neither imposed on the courses nor are they slavishly applied by the different instructors. The categories of judgment and typology actually constitute features of a common culture rather than a unified plan or method.

We use the term culture not as one side of a simple opposition, like C.P. Snow's "Two Cultures" of literature and science nor to recall the antagonism of Le Corbusier's Engineer's Aesthetic versus Architecture, but in Snow's hopeful sense of the term as the "qualities and faculties which characterize our humanity."' We distinguish the culture of technology within which we operate from either the technical skills that form the subject of much of our teaching or the general technological culture whose instrumental premises are the subject of so much critical writing. In some instances, it has been described a culture of phenomenology, and while the phenomenal informs much of our work, that designation limits the discussion to a translation of theoretical premises onto professional practices. It might better be called a culture of construction or of building, but that would privilege the physical act of assembly, and so we retain the somewhat ambiguous term, culture of technology, to indicate the constellation of qualities and faculties that characterize our curriculum.

TYPOLOGY AND JUDGMENT

Typologies are common to many organizational systems and architecture has had its share of such schema; the most widely discussedare typologies of use—house, office, factory, etc.— and of formal arrangement— tower, bar building, shotgun house, etc. The idea of universal or essential characteristics has been much discredited today, not least as it applies to the concept of type, but we are seeking to describe common characteristics that emerge from within a discipline or discourse. This is a somewhat weaker idea of type, and it makes no claim to govern all aspects of architectural production; it does offer a useful characterization of each of the technological subjects. Examining the technological types offers a pedagogical tool for explaining the nature of individual technologies and for making them memorable to the students. Conversely, one could even define the individual disciplines

by the systems of typology with which they work; that they each offer a coherent, and disciplined, lens through which to view architecture. Structure offers the familiar types of bearing wall, frame, shell, etc.. Construction begins with materials or families of materials. brick, steel, concrete, and so on, while environmental systems can be organized from the point of view of the building's environmental characteristics — climate or internally-load dominated — or the more familiar HVAC types — gas hot water, VAV, radiant slab, etc.

Most real buildings involve hybrid types and competing claims among the various systems. A classic example is the high-rise, which involves the steel or concrete frame, the elevator, the air-conditioner, and the curtain-wall. Each system follows its own typological demands and also adapts to the others. Examining complex buildings imposes architectural order on the different skills and concepts required to understand and analyze them. Shifting typological views exercises the imagination, forcing evaluation of the competing claims or requirements of the different disciplines.

Beginning courses in architectural technology necessarily emphasize the acquisition of basic concepts and skills according to the internal logic of their separate disciplines: the principles of force or heat transfer or strength ofmaterial. This approach derives from the rationalized organization of technical knowledge, however the value of those individual concepts are often not clear to students until they are placed in context and not just the context of their respective disciplines, but in the messier context of the design studio. This has been a perennial subject of discussion among teachers of technology and, on occasion, among the framers of architectural curricula. One solution is to introduce technological topics — structures, construction, and HVAC—directly into the design studio, fitting their instruction to specific building types or situations. Studio is the ultimate site in which architectural judgments are formed and tested, but its concerns, its ethic, must be present in preparatory courses as well and that perhaps is the underlying issue with which we have struggled in the core technology sequence at Penn.

It is rarely possible to articulate the precise ethical questions present at each level of the everyday decisions made in design. By ethic we do not mean morals, but characteristic in the sense developed by David Lactherman in his examination of geometrical thinking.

> 'Ethics' must be understood here in the Aristotelian sense of ta *ethe,* as the settled characteristic way human beings have of acting in the world or of comporting themselves toward one another or toward themselves (for example as teachers and students). The sense of 'ethics' intended here has its archaic roots in Heraclitus' adage 'A human being's ethos is his daimon.'[6]

It is our contention that each technological system has an ethic, a characteristic way of organizing the world, and so possible of obscuring it. The resolution of the competing claims among the different technological systems is the basis of informed design judgments. As with the typological concepts through which they are expressed, the ethical questions raised by specific technologies are deeply intertwined with one another and with the broader architectural culture. The goal of discrete technology courses, as opposed to those integrated in studios, is to formulate the topics native to each discipline andexplore the manner in which they are and have been resolved in the profession. For example, the question of low buildings versus high ones can be framed in terms of structural efficiency, of comfort, or of construction and use of materials. The criteria of judgment are always specific, like all ethical questions, are developed on a case-by-case basis. It is that premise which has led our core technology sequence to conclude with a case-study course on Comparative Studies in Building Systems.

TECHNOLOGY COURSE SEQUENCE

The technology portion of the three year Professional Degree in Architecture consists of a sequence of "core" courses, a selection of "designated" courses. a core technology studio, elective courses, and elective studios. A number of the elective courses have been presented at previous ACSA meetings and it was partly the observation that they held common premises that inspired this paper. In this session we present papers that deal with the sequence of required "core" courses; these include three two-semester courses in the first year— Structures, Construction, and Environmental Systems — and a one semester Case Studies course taken in either the Fall or Spring of the second year. The designated technology courses are also generally taken in the second year, in conjunction with the case studies course; recent designated offerings include:

- 631: Concepts of Structures, Peter McCleary
- 633: Art of Detailing, Alan Levy
- 634: Forms of Process, Robert Marino
- 635: Energy and Form, Donald Prowler
- 638: Light and Color, William Braham

Students interested in further investigating issues in technology can choose from a number of elective courses. Recent offerings include:

- 731: Philosophy of Technology, Peter McCleary
- 733: Live-Work: Mechanization of the Household & Workplace, William Braham
- 734: Architecture of Stairs, Nadia Alhasani
- 735: Construction in the Modern World, Annette Fierro
- 736: Building Production and Culture, Nadia Alhasani
- 738: Emerging Technologies, Peter McCleary
- 739: Engineering of Architecture, Peter McCleary

In addition to the core and designated elective courses, the final core studio, 601: Building Housing, focuses its instruction on technological issues using "housing," with its inherent repetitiveness as a vehicle for integrated studies of techno-

logical questions, to explain its extent in design, and explore its various scenarios. This is an opportunity for students to apply the basic knowledge acquired in the core, research typological implications, and search for innovation. The individual studio sections focus on different systems or technologies ranging from construction (Nadia Alhasani, Annette Fierro) to structure (Robert Marino), production (Louise Harpman), or environmental systems (Tom Phifer). These studio sections share a common site and program, as well as a common review schedule. Submission requirements are specific to the individual sections. In addition, one elective technology studio is offered every semester; its recent instructors include Nadia Alhasani, James Carpenter, Todd Dalland, Nicholas Goldsmith, and Peter McCleary.

In its third year of implementation, this configuration specifically weaves design and technology together, challenging the students preconceived notions about the addition and/or integration of empirical knowledge to design. It is crucial to stress the importance of collaboration among the technology faculty as well as their role as design instructors. This is evident in the quality of the projects produced by the students and reflects their integration of design and technology.

This integration is also evident in the thesis projects, which serve as a final measure for this method of instruction. Projects pursued by many students well exceed the required exercise of technical skills, incorporating technological issues in the very formulation of their thesis projects. Recent proposals have included an exploration of illumination and display, the articulation of novel structural systems, the innovative applications of building materials (folded aluminum), and the registration of time-of-day and of season through illumination. Other projects have celebrated innovative technology through an investigation of virtual spaces and intelligent buildings for the next millennium.

CORE COURSES

The four presentations in this session describe the core technology courses. The individual authors and titles are as follows:

- Richard Farley
  "Architectural Structures: Tools and Articulations"
  Structures: 531/532a

- William Braham
  "A Physiology of Building: Reptilian, Canine, and Monstrous"
  Environmental Systems: 531/532b

- Lindsay Falck
  "The Judicious Section: Integrator of Construction Technology"
  Construction: 531/532c

- Nadia Alhasani
  "Layering and Revealing: Production Processes of Building"
  Comparative Studies in Building Systems: 631/632

REFERENCES

1 A detailed history of the school can be found in Ann L. Strong and George E. Thomas, *The book of the School: 100 years: The Graduate School of Fine Arts of the University of Pennsylvania* (Philadelphia: GSFA, 1990).
Peter McCleary, "Some Characteristics of a New Concept of Technology," *Journal of Architectural Education, 42* (Fall, 1988), pp. 4-9.

3 Donald Prowler, and Harrison Fraker, *Project Journal: Teaching Passive Design in Architecture* (Philadelphia: University of Pennsylvania/US DOE/ACSA, 1981).

4 Marco Frascari, "The Tell-the-Tale Detail," *VIA 7: The Building of Architecture* (1984).

5 C.P. Snow, *The Two Cultures: And A Second Look. An Expanded Version of Two Cultures and the Scientific Revolution* (New York: The New American Library, 1963).

6 David Rapport Lachterman, *The Ethics of Geometry: A Genealogy of Modernity* (New York: Routledge, Chapman and Hall, 1989).