Between Nature and Artifice: The Landscape Architecture Research Office (1966-1979)

by

Catherine F. McMahon

Bachelor of Fine Art
Rhode Island School of Design, 2003

Bachelor of Architecture
Rhode Island School of Design, 2003

Submitted to the Department of Architecture in Partial Fulfillment of the Requirements of the Degree of

Master of Science in Architecture Studies
at the
Massachusetts Institute of Technology

June 2009

Signature of Author:. ....
Department of Architecture
May 21, 2009

Certified by:..
Arindam Dutta
Associate Professor of the History of Architecture

Accepted by:... ....
Julian Beinart
Professor of Architecture
Chair of the Department Committee on Graduate Students

Between Nature and Artifice: The Landscape Architecture Research Office (1966-1979)

by

Catherine F. McMahon

Submitted to the Department of Architecture
on March 21st, 2009 in Partial Fulfillment of the
Requirements for the Degree of Master of Science in
Architecture Studies.

ABSTRACT

Cambridge in the 1960s was a locus of experimentation and research in new computing technologies —from the production of transportation models for New England to the design of war games simulating the vagaries of the terrain in Vietnam. One research group, working in the nascent field of computer cartography, was formed in the Department of Landscape Architecture at Harvard University. The Landscape Architecture Research Office (1966-1979) represented a radical departure from existing practices within the discipline. At this time, NASA was making its first moves towards erecting image infrastructures in space—able to beam back streams of pictures describing the earth in seemingly infinite detail. The instrumental extension of man into outer space served to remake an imagination of landscape; and the research office, banking on the promise held out by satellites and computers, was preparing a technological ground to receive this new vision.

This thesis will examine two of their early projects, the first a study that utilizes a computer mapping program (GRID), to draw multiple disciplinary objectives, from physical geography to governance to aesthetics, into the same syntactical register—using the map as a technological armature to craft a new theory of landscape. The second project was an experimental studio run by two of LARO's researchers, Carl Steinitz and Peter Rogers, in which they attempt to simulate the function of an imagined computer system able to model all the interconnected processes of urbanization. Using maps and students as analogue parts they proceeded to deploy game theory to play-act the computer's operational roles. By doing this, Steinitz and Rogers sought to delimit the role of designer or architect within the mechanisms of a representational system. While the work of LARO was influential in the development of what is known as GIS today, I wish to pull this historical episode out of the technological continuum—looking instead at this moment of profound indeterminacy and speculation over the role that technology could play in the process of design.

Thesis Advisor: Arindam Dutta
Title: Associate Professor of the History of Architecture

Thesis Advisor: Arindam Dutta
Title: Associate Professor of the History of Architecture

Thesis Reader: Mark Jarzombek
Title: Professor of the History and Theory of Architecture
Associate Dean, School of Architecture and Planning

Special thanks to:
Arindam Dutta, Mark Jarzombek, John Milton McMahon III, Lorraine McMahon, David McMahon, John Milton McMahon IV, (E, A, and B, My three new brothers), Shiben Banerji, Ateya Khorakiwala, & Anthony Acciavatti.

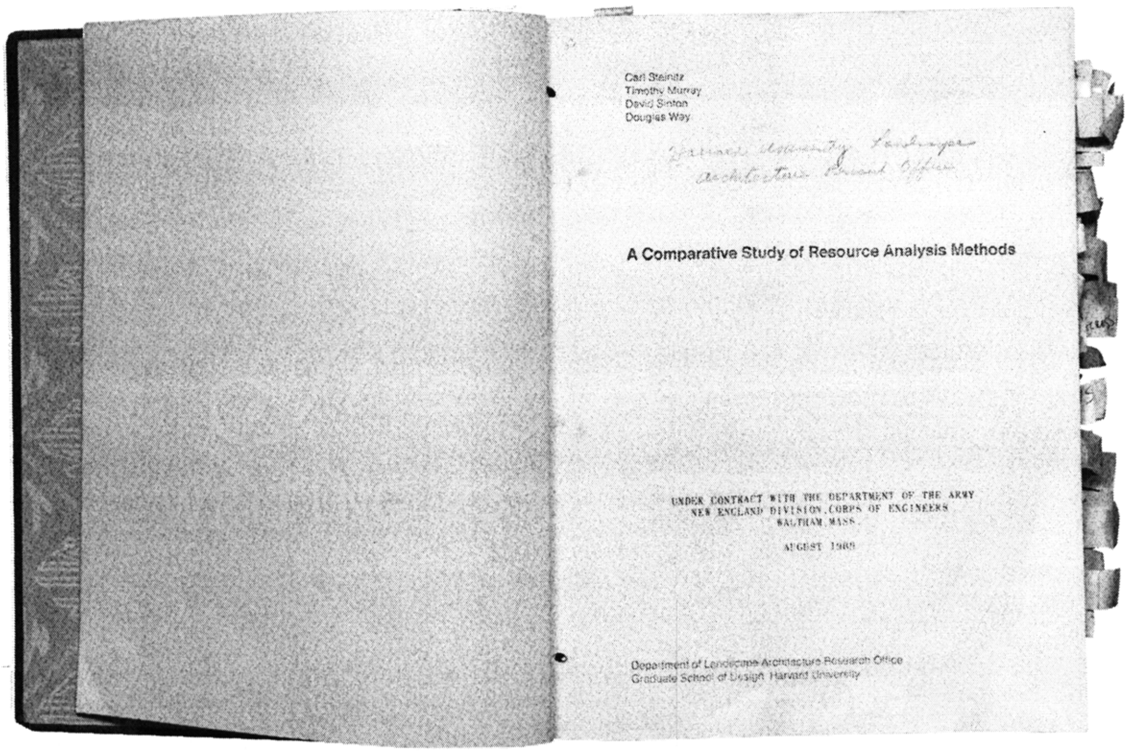


Image: *Comparative Study of Resource Analysis Methods* (Printed by Harvard University)

Introduction

The point of departure for this research was a text titled, *A Comparative Study of Resource Analysis Methods,* that I happened upon while searching the shelves in the MIT's Rotch library. The *Comparative Study* is a dry, heavy book, covered in the library's standard green book cloth; it is made up of approximately four hundred, single-sided, mimeographed pages. Bound into the front of the text is a letter, dated July 14, 1969, and addressed to Mr. Raymond Cason of the Army Corps of Engineers; the letter simply explains that the following pages comprise the final report fulfilling the requirements of research contract no. "DACW 33-68-DC-0152," not expanding upon the nature of this contract. Inside one finds a hand-typed report compiling well over one hundred maps of the Charles River Watershed in the southwest region of Massachusetts. Yet, these are not maps in the ordinary sense—floating in the center of each yellowed page is a four by five inch grid made up of singular binary symbols pressed into the page. These symbols aggregate into strange and clumsy topographical patterns, and the watershed emerges as a site thickened through black marks of data. They do not reconstruct the landscape as a navigable terrain, but rather attempt to render the landscape through categorical judgments, from aesthetics to land-use suitability to geology. Looking at the care with which each page was systematized, labeled, and laid out, and the sense of authority invested in each image, it is clear that these maps represented a cutting-edge of technology in the 1960s. When I found the *Comparative Study*, I had been doing research into the origins of Geographic Information Systems (GIS); I was searching for the genealogical strains of the technology that lay within analogue methods for overlay mapping, explored by landscape architects in the 1950s and '60s. The *Comparative Study,* while contemporary to some of the material I had been looking at, went a step beyond—moving into the sparsely populated territory of the digital terrain. Today, the fully naturalized use of technologies like GIS (across many disciplinary realms), belies the risk of failure that permeated this moment in the 1960s and '70s. In this sense, I wish to pull this historical episode out of the technological continuum—looking instead at this moment of both profound indeterminacy and intense speculation over the role that technology could play in the process of design.

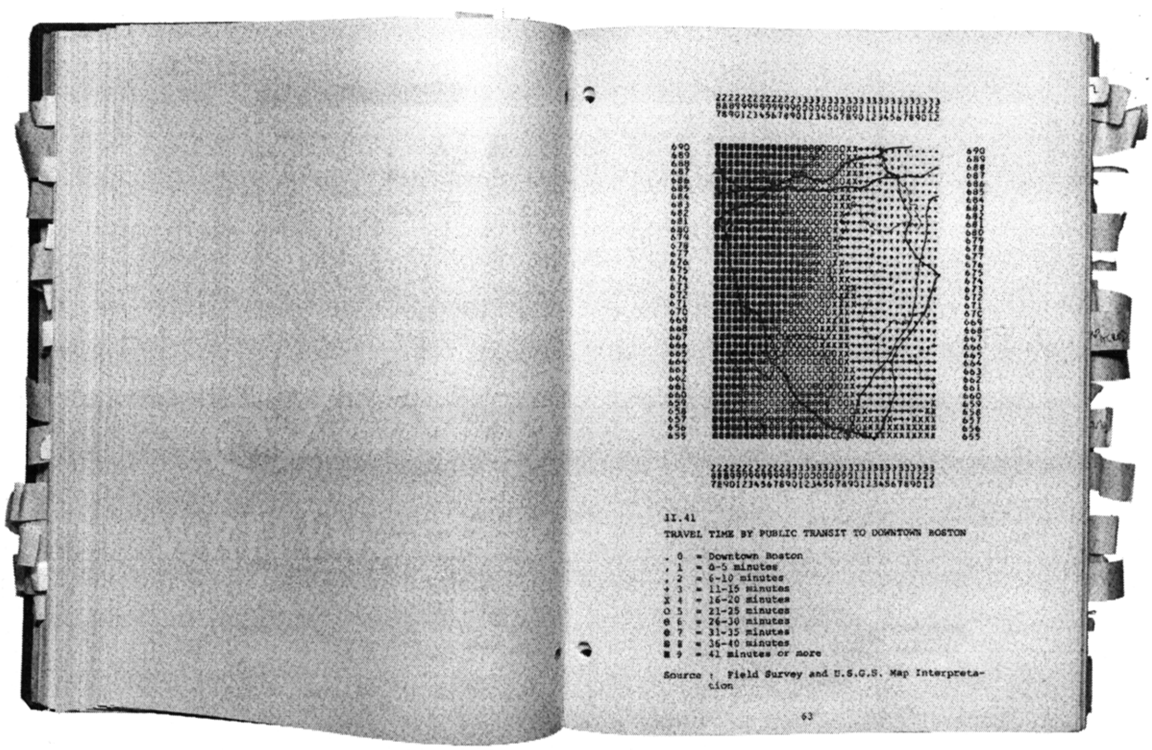


Image: *Comparative Study of Resource Analysis Methods* (Printed by Harvard University)

Looking at this text, one sees multiple forces and ideas converging, from new conceptions of the landscape with the advent of space technology, to a rapidly suburbanizing American landscape, to an interest in systems analysis and simulation models. One author recounts that at this time, "system which is represented in the simulation model might be as broad as the international system or as narrow as the decision system of a department store buyer."[1] The *Comparative Study* was produced by an organization called The Landscape Architecture Research Office (LARO). LARO was affiliated with the Department of Landscape Architecture and Laboratory for Computer Graphics and Spatial Analysis (LCG), at Harvard University. Both LARO and LCG were experimenting with the latest advances in computer cartography; the lab was focused primarily on the technological development and refinement of computer mapping techniques, whereas the research office sought specific applications for the technology in response to emerging issues within the discipline of landscape architecture. The research office was formed in 1966–and lasted until 1979, marking an era that saw the Department of Landscape Architecture investing heavily in the promise of new technologies. At this time, they developed a curriculum based largely on the use of the computer. Looking at old GSD course registers one can see that this curriculum predates the computer's arrival in the Department of Architecture by almost twenty years.[2]

With the incorporation of the singular architect into a group of designers working together on common problems, the research office served as a space to translate the authorial idiosyncrasy of existing practice into forms of production (reports, studies, etc.) that could transcend the figure of the individual. Presenting their material in formats similar to those used by scientists, the researchers were trying to strike a disinterested pose, attempting to invest their work with the sense of transparency and authority that lay in modes of scientific production. During its almost fifteen year existence, LARO embarked on a number of studies, from the documentation of pre-existing methods for resource analysis (the *Comparative Study*), to the lengthy construction of a multifaceted computer model—capturing a miniature world in programming language and linear equations—

---

[1] Coplin, William D., *Simulation in the Study of Politics*, (Chicago: Markham Publishing Company, 1968), p.2

[2] Information taken from, "Harvard Graduate School of Design Course Registers" (1960-1985) Loeb Special Collections.

LARO's researchers attempted to simulate the qualitative as well as the quantitative aspects of the processes of urbanization. Beyond satisfying the terms of their research grants, the format of the report allowed the researchers to document both the way they organized and conducted their research, as well as the design process they underwent when building simulation models. They did not work on design solutions for any particular locale, but rather they developed methods for the description of site. With an emphasis on these types of analytic and representational methods, LARO was operating in a mediatory space, designing the instruments to be used in design. The designer (working in the research group) thus becomes twice removed from the object (building, city, region, park, etc.) and design itself becomes the subject under question.

The issue of authorship raises the question: Who was working in the research office? The *Comparative Study* yields up four names, Carl Steinitz[3], Timothy Murray, David Sinton,

---

[3] Carl Steinitz, was among the few key figures that were able to bring together the different disciplinary prerogatives and people, between the lab, the research office, and the departments within the design school. This was due in large part to his diverse set of interests—that were united through the morphism of systems studies. In 1966, Steinitz was a doctoral student of Kevin Lynch's, finishing his dissertation in city and regional planning (with a focus on Urban Design) at MIT; it was also at this time that he began working with the lab as a research assistant. His dissertation *Congruence and Meaning: The Influence of Consistency between Urban Form and Activity Upon Environmental Knowledge,* investigates what he terms, "environmental meaning." In an article published from the work of the thesis, he writes, "[the research] attempts to demonstrate that there are measurable correspondences—congruences—between urban form and activity, and that the regularities in these relationships have a major influence on the amounts and kinds of meanings which the environment transmits and which people can acquire."[3] The research brings together the notational techniques, and ideas about environmental perception that Lynch's puts forth in the *Image of the City,* with the mapping techniques he was learning at the lab. In the thesis he generates a framework of computer maps that would allow an individual to communicate their experience of the city, which would then be aggregated with other individual data inputs to render the whole. In addition to this, he developed organizational techniques for building a visual lexicon by creating an atlas of snapshots of each nexus in the city—that were then interpreted for the visual legibility of their elements—in an attempt at systematizing form making. It was this systematic approach, more so than the specific content of his research (Boston) that allowed him to approach multiple types of problems. Soon after his dissertation was complete in 1967, he was hired to teach in the Department of City and Regional Planning at Harvard, and shortly thereafter moved over to the Department of Landscape Architecture. He worked towards crossing disciplinary boundaries to put forward organizational strategies for framing projects that attempted to employ the efforts of multiple disparate actors.

and Douglas Way, who together co-authored the study. The four people, Steinitz and Sinton, professors in the Department of Landscape Architecture, and Murray and Way, their students, are representative of just a few of the many figures who were involved in research based on early computer mapping at Harvard. Departing from this moment all four co-authors went on pursue diverse paths over time, from further engagement with the profession of landscape architecture to the development of spatial analysis systems in the commercial sector to political involvement in the growing environmental movement.[4] There was a convergence of figures in this place and at this time, all interested in the potentials held by the computer map, and the possibilities for spatial analysis. The reports downplay authorship, obscuring the voice of each individual, in an effort to create a singular authoritative narrative—though their individuality occasionally breaks through in the texts—revealing their struggle to construct these apparently seamless practices and technologies. These moments also reveal the stakes involved for the researchers, who had cantilevered themselves beyond the conventions of professional practice to attempt to redefine the discipline of landscape architecture.

The Landscape Architecture Research Office represents a convergence of interests, some coming from within the discipline of landscape architecture itself and others coming from outside—the stretch of Mass. Ave between Harvard and MIT saw the traffic of many kinds of activities and ideas in systems analysis, computing, social science, and the institutionalization of advanced research at this time. This thesis looks at the work of LARO in light of both the institutional history of landscape architecture at Harvard and the status of the discipline in the 1960s, when the office was formed, as well as the other activities

---

[4] Historian Melanie Simo recounts the career of Douglas Way as an example of the kind of elasticity in employment that these figures, interested in both landscape and technology, encountered. Way was particularly interested in aerial photo interpretation. She explains that Way, after his time in Cambridge, went on to receive a PhD in geography from Clark University in Worcester, and to become the Chair of the Department of Landscape at Ohio State University. She then explains that, he was recruited to serve on Vice-President Al Gore's Environmental Task Force, "working with the CIA's recently declassified satellite photos." And that as a part of this politically engaged work he went to Siberia in the 1990s to "get the intelligence agencies of Russian and the United States to cooperate on ecological assessments." Simo, Melanie L., *The Coalescing of Different Forces and Ideas: A History of Landscape Architecture at Harvard, 1900-1999*, (Cambridge: Harvard University Graduate School of Design, 2000), p.57

occurring in Cambridge at this time —that were influential in shaping LARO's discourse and working methods.

At this time, NASA was making its first moves towards erecting image infrastructures in space—able to beam back streams of pictures describing the earth in seemingly infinite detail. The instrumental extension of man into outer space served to remake an imagination of landscape; and the research office, banking on the promise held out by satellites and computers, was preparing a technological ground to receive this new vision.

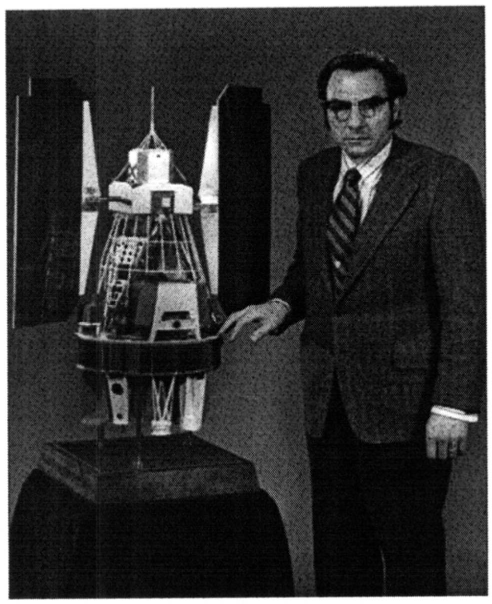


Image: Model of LANDSAT 1 Satellite (www.nasa.gov)

In Cambridge, there were a number of individuals interested in the potentials held by space, not outer-space per se, but rather the ability to understand things through proximal relations—that one can see in the nascent practices of both in systems analysis and spatial analysis. The psychologist and systems theorist, Herbert Simon, was widely influential at this time. In his book, *The Sciences of the Artificial*, published in 1969, design is identified as a process that is able to unify the natural and artificial into a new class of objects, he writes:

> "If science is to encompass these objects and phenomena in which human purpose as well as natural law are embodied, it must have means for relating these two disparate components. The character of these means and their implications for certain areas of knowledge- economics, psychology, and design in particular- are the central concern of this book."[5]

---

[5] Simon, Herbert, *The Sciences of the Artificial*, (Cambridge: MIT Press, 1969) p.6

Science (as opposed to design) must recreate knowledge of these objects discursively, by employing the systematic "means" to identify difference between nature and artifice, as well as the testable relation between the two. He proposes that one study design, in engineering, or architecture, or medicine, or management, as a way to understand the tactics these professions develop to direct processes in the landscape, or the company, or even in the body. At this time, simulation becomes a critical tool for social scientists to bring a form of measure to these interactions. Design is itself is described by Simon as possessing a directionality of purpose, he writes, that these professions are "concerned not with the necessary but with the contingent- not with how things are but with how they might be-in short, with design."[6] The study of analysis by the researchers at LARO, bordered on the edge of creating a science of design—and was subsequently translated in the form of new representational technologies. The researchers at LARO focused on analytic method in an attempt to assume a degree of transparency as they developed mapping technology, yet, representation should also be understood as a tactic developed to direct processes in the landscape, and to this end they were responsible to design.

Denis Cosgrove, the recently deceased professor of geography at the University of California, Los Angeles and noted landscape theorist wrote that "Conceptually, the map has either preceded the physical presence of the city or served to regulate and coordinate its continued existence."[7] He goes on to explain that the map, as a representational moment, occupies two distinct relations to change. In the first it functions in a fashion similar to the plan, laying the grounds upon which change will accrue, and in the second, as a regulatory function, it mediates between the past and the future acting as at the point of collapse between continuity and change. Both concepts allow instrumentalized images and representational strategies for mapping to be understood as technologies that mediate between the subject that produces them and the subjectivity produced through them. Building upon this, one asks, in what way does the representation of a certain field of knowledge produce both technology and discipline simultaneously?

---

[6] Simon, p.xi

[7] Cosgrove, Dennis, *Else/Where Mapping- New Cartographies of Networks and Territories,* Janet Abrams and Peter Hall, eds., (Minneapolis: U. of Minnesota Design Institute, 2006), p.148

Chapter 1: The Landscape Architecture Research Office

From the late '50s onward the schools of architecture and planning at both Harvard and MIT would see a proliferation of research offices and laboratories. Paralleling the organizational schemas for securing funding and generating studies traditionally found in scientific disciplines, these groups offered a site of production distinct from the studio.

The Lab for Computer Graphics and Spatial Analysis:

In 1965 and 1966, respectively, the Laboratory for Computer Graphics and Spatial Analysis (LCG) and the Landscape Architecture Research Office were formed at Harvard. Both lab and office were intimately connected, yet, as was noted earlier, LARO operated under the aegis of the Department of Landscape Architecture, whereas the lab was independent from any departmental affiliation and was merely placed under the umbrella of the design school. This allowed the lab to become not only a site of experimentation in computer cartography, but also a central locus for those individuals from a wide array of disciplines who had an interest in computer mapping to gather. Historically the lab is considered to be one of the major sites of development in the technology that would later become GIS as we know it today. In the '60s an interest in computer mapping using time-share computers had arisen across multiple sectors, from the echelons of the military or of the federal government, where that interest was formalized into large research programs, down to university students tinkering with technological components they could either pick-up or make themselves in order to improve map making techniques.[8] In a history of the

---

[8] Nicholas Chrisman's history *Charting the Unknown: How Computer Mapping at Harvard Became GIS* (ESRI Press: Redlands California, 2006), documents the institutional histories of the Laboratory for Computer Graphics and Spatial Analysis at Harvard. Chrisman was himself was a researcher affiliated with the lab, thus, he provides first hand accounts along with archival reconstructions of the lab's history. Enclosed with the text is a DVD of current day interviews with many individuals who were either students or researchers at the lab in

development of computer mapping at Harvard, a former lab researcher, Nicolas Chrisman, who today is a professor in geography at Université Laval, Quebec, notes that many of these interested individuals found their way into the lab for a visit or to stay on and work, at one point or another.[9]

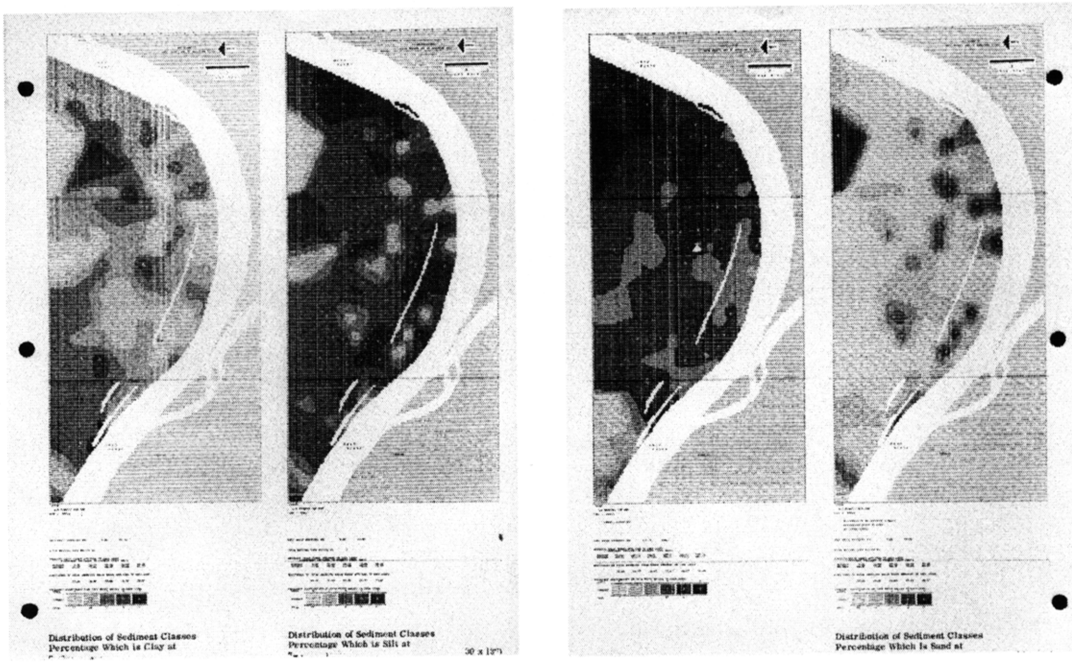


Image: Ohio River Sediment Deposits, Lab for Computer Graphics and Spatial Analysis (Printed by Harvard University, 1966-1972)

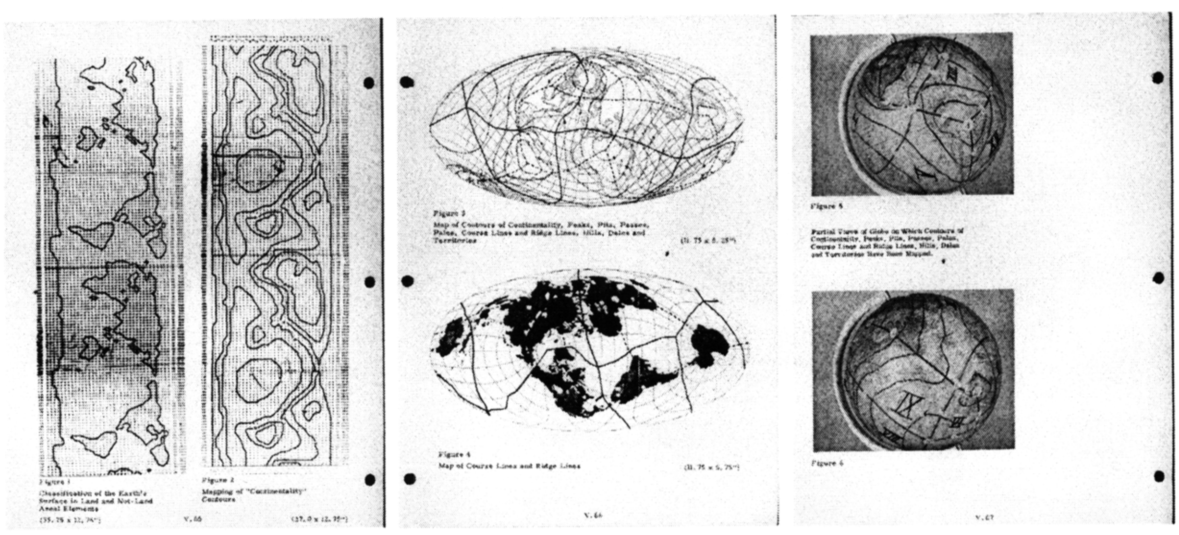
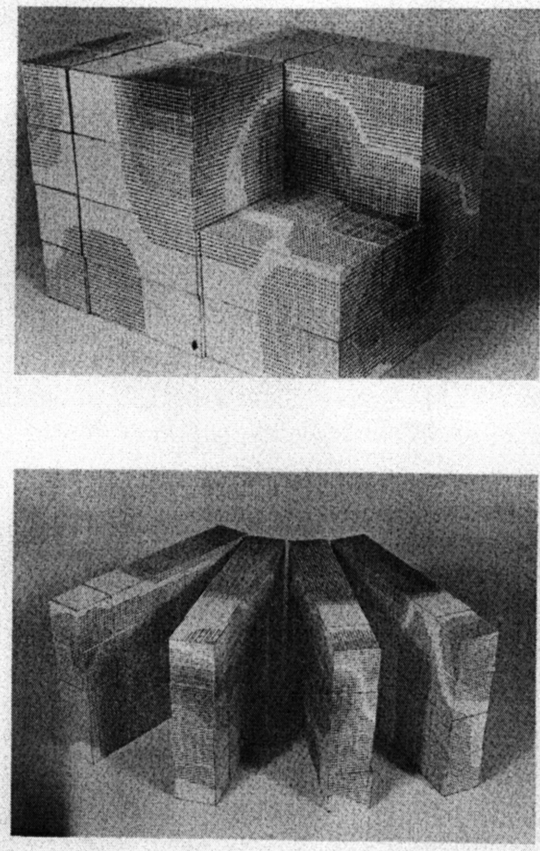


Image: Contours, Lab for Computer Graphics and Spatial Analysis (Printed by Harvard University, 1966-1972)

the1960s and 70s. These interviews provide critical insight into the basic curiosity in computer maps that many of these figures possessed, and experimented with in individual ways prior to coming to the lab.

[9] Chrisman, Interviews, (DVD)



III. 69

Image: 3d Maps, Lab for Computer Graphics and Spatial Analysis (Printed by Harvard University, 1966-1972)

Like institutions or groups formed to conduct scientific research, the lab was funded by a number of patrons outside the university. When the lab began it was funded with a fairly large sum of money from the Ford Foundation, whose priorities ranged from an interest in housing and urbanism to setting an agenda for international education within the university.[10] Howard Fisher, architect and pedagogue from Northwestern University, in Chicago, was the founder. With his own ideas about improving the technical aspects of pre-existing computer mapping techniques, Fisher had been able to secure these funds prior to

[10] Sutton, Francis X., "The Ford Foundation and Columbia," University Seminar on Columbia University, 16 November 1999. (http://beatl.barnard.columbia.edu/cuhistory/fordfoundation.htm).

approaching Harvard with the idea of setting up a lab.[11] While the lab was in operation the list of external sponsors would grow to include, the National Science Foundation, the U.S. Bureau of the Census, the U.S. Geological Survey, NASA, the U.S. Defense Intelligence Agency, the U.S. Defense Mapping Agency, the U.S. Department of Agriculture, the Federal Aviation Administration, and the Executive Office of the President.[12] Many of these sponsors funded projects that were then used by the lab as case studies to hone their techniques for mapping and the graphic display of information. This in turn, allowed for the technology to develop as the result of collaboration; yet the broad range of projects cast a wide net, and did not narrow the lab's work to a singular form of disciplinary exercise.[13]

Fisher's role was to launch the lab and bring issues of computer mapping to the fore by institutionalizing this type of research within a school of design. There were multiple subsequent directors of the lab over its approximately fifteen-year life span—following Fisher was William Warntz, a theoretical geographer in the Department of City and Regional Planning.[14] A report produced at a late stage in the lab's life, by two of its researchers, Geoffrey Dutton and Jacqueline Cohen, notes that projects under Warntz "[...] included

---

[11] When Fisher came to Harvard, he had been retired for quite some time from a long professional career of practicing architecture and was teaching at Northwestern University in Chicago. Fisher, was both a technological innovator and entrepreneur. On July 4th, 1932 Time Magazine called him "both a technician and theorist in architecture," due to his experiments in pre-fabricated housing techniques, that he had successfully formed into a company called General House Inc. His interests were multivalent and upon encountering the most current mapping techniques, displayed at a workshop given by computer cartographer Edgar Horwood, he decided to attempt his own, improved versions. He used his program SYMAP (SYNagraphic MAPping) to secure funds from the Ford Foundation that after some political setbacks, eventually found a home at Harvard in the form of the Laboratory for Computer Graphics and Spatial Analysis. For Fisher, an interest in computer mapping can be seen as emerging from a broader interest in developing technological solutions to architectural problems, rather than from the disciplinary influences (such as geography) that will be seen as the underpinnings for other figures drive towards developing computer cartography. A look at Fisher also reveals just one of the diverse sets of figures flocking to Cambridge, to develop not one singular technology but a group of technologies centered around the computer map and simulation. Source: (http://www.time.com/time/magazine/article/0,9171,743936-2,00.html), and Chrisman, Nicolas, *Charting the Unknown: How Computer Mapping at Harvard Became GIS* (ESRI Press: Redlands California, 2006)

[12] Dutton, Geoffrey, and Jacqueline Cohen, *The Laboratory: An Historical Overview (1965-81)* (http://lcgsa.mannlib.cornell.edu/lcgsa/uploads/lcghist22all.pdf)

[13] Ibid.

[14] Ibid.

hierarchical structures in human environments (river and central-place systems), geographic regularities in the distribution of population and income, minimum-path problems, and the topology of landforms and statistical surfaces."[15] The empirical and quantitative problems of the failing discipline of geography, found new life in the contours, patterns, boundaries, and proximities, of the map itself, with the aid of the computer.[16] Dutton and Cohen write, "The Laboratory's researchers came to appreciate that the elegance and economy with which spatial phenomena- and space itself- is described in software affects the power of that software to map and manage information."[17] In this sense, the technology was able to fulfill any number of roles and in the subsequent years of the lab, production became primarily focused on software development. As the funding from outside sources dried up, the lab turned to the packaging and selling of its software via mail-order service, and circulating serial publications describing new innovations in technique. It is largely due to these two forms of production, software and serial, which allowed the lab to bring the potentials of computer mapping to a large audience, and gain widespread recognition.[18]

---

[15] Ibid.

[16] The closure of the Geography department at Harvard University in 1948 by university President James Conant, is widely held to epitomize the "crisis" in the discipline as it sought ways to develop from an empirical or descriptive discipline to one that would have recourse in scientific method to engage in a more theoretical project. The geography department at Dartmouth College remained a locus of these activities, while other universities were jettisoning their departments of geography left and right. In the 50s and 60s the move towards quantitative methods, in conjunction with the development of computer mapping technologies allowed the discipline to begin to close the gap between its status and that of other sciences. This along with the rise of regional science in the United States allowed it to regain a portion of the ground it had lost within academic institutions.

[17] Dutton, Geoffrey, and Jacqueline Cohen, *The Laboratory: An Historical Overview (1965-81)* (http://lcgsa.mannlib.cornell.edu/lcgsa/uploads/lcghist22all.pdf)

[18] Charles and Ray Eames featured the work of the lab in a film on *Photography and the City* in 1969.

Nicholas Negroponte also mentions the lab and SYMAP in his book, *The Architecture Machine*, (Cambridge: MIT Press, 1970).

Contemporary histories also cite the Lab's work, such as:

Foresman, Timothy W., ed., *The History of Geographic Information Systems: Perspectives from the Pioneers*, (Baltimore: University of Maryland, 1998).

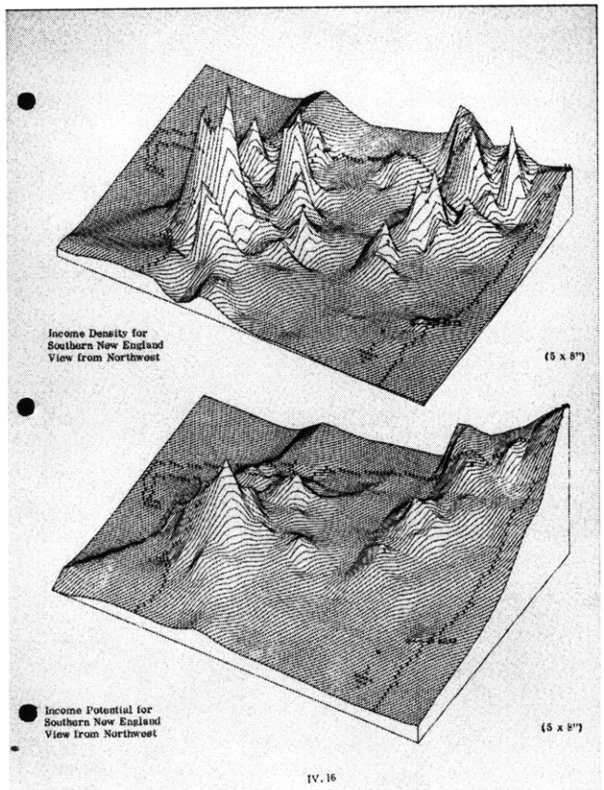


Image: Income Density / Income Potential, Lab for Computer Graphics and Spatial Analysis (Printed by Harvard University, 1966-1972)

In the same report, Dutton and Cohen, outline the core objectives of the laboratory. A reading of these objectives reveals the variegated set of priorities the researchers working in the lab had to negotiate. They write:

> "Despite some lean years, the activities of the Laboratory have continued to grow in scale and sophistication. Its central concerns, however, have remained remarkably constant. Simply stated these are:
> 1. Graphic display of spatial information.
> 2. Geographic data management and analysis.
> 3. Applications of techniques.
> 4. Dissemination of search results."[19]

The last two objectives, those of application and dissemination, can be considered together. In other words, in the process of framing use, the subject of the user is produced. In considering the user, questions of dissemination, or the best method for transferring knowledge are at stake. It is in these last two areas of production, that the research activities of the lab and the office begin to differentiate. As Chrisman explains, LARO began as a group of individuals working on specific problems within the lab. Focusing on potential

[19] Dutton, Geoffrey, and Jacqueline Cohen, *The Laboratory: An Historical Overview (1965-81)*

applications, they drew emerging concerns about the environmental planning into the lab; specifically, issues that were of interest to the professors in the department of landscape architecture.[20] As the former chair of the department, Charles W. Harris, noted in a recent interview, "The Department of Landscape Architecture had been studying large regional landscapes for several years but was seeking a more systematic method to assemble, analyze, and synthesize this information."[21] In Harris' reflection back onto the moment that landscape architecture and computer cartography came together, he uses terms that posit the organizational effects of systems thought (belonging to the realm of computer mapping), as the inevitable answers to the questions that the discipline of landscape architecture sought to ask at this time. In other words, he projects the description of their project backwards from the ends it took, eliding the leap in logics that had to occur at the point the cartographers and landscape architects found that there was something to be gained from one another through collaboration.

In the archive of reports, interviews, and mentions in institutional histories, one encounters many names associated with the research office, beyond the four names mentioned in the introduction, Steinitz, Sinton, Way, and Murray, one finds, Hideo Sasaki founder of the large interdisciplinary design firm, Sasaki Associates, who was chair of the Department of Landscape architecture at the time LARO was formed; Charles Harris, pedagogue and successor to Sasaki as chair of the department and head of the office; Walter Isard, an economist who went on to found the regional science program at University of Pennsylvania; Peter Hornbeck, professor of ecology in the Department of Landscape Architecture; Peter Rogers, a water economist and planner from the Department of City and Regional Planning; David Lowenthal, a geographer with a focus in environmental psychology, who would go on to teach in the geography department at the University College London; James Brown, a specialist in land use and regional economics, who would later chair the Department of City and Regional planning, as well as assume directorship of the MIT / Harvard Joint Center for Urban Studies; and Jack Dangermond, a student contributor to the *Comparative Study*, who would go on to found the corporation ESRI, perhaps the largest developer and distributor of GIS software packages today. This list does

[20] Chrisman, p.42
[21] Interview with Charles W. Harris and Carl Steinitz, conducted via. e-mail by the author on February 17, 2009.

not even touch upon the large number of individuals from other disciplinary realms (law, social science, political science, etc.) who collaborated with the office. Yet, this account is not meant to give a mere litany of names but rather to demonstrate the density of a network of individuals that at times appears diffuse in the archive. Carl Steinitz, mentioned in the introduction, was key in bringing together the lab and the studio in collaboration—beginning with Delmarva.

The Study for Delmarva Peninsula, was a joint effort between the Department of Landscape Architecture, and the Department of City and Regional Planning—beyond bringing together the two departments, Steinitz worked with the studio to organize the analysis of the peninsula through the use of the lab's computer program SYMAP. In the same year, 1967, the research office (still located in the lab) produced a study titled, *Three Approaches to Resource Analysis Methods*, wherein they document the methods used to describe the landscape of, Angus Hills, a soil scientist and forester from the Ontario Department of Lands and Forests, Phillip Lewis a landscape architect and professor at University of Wisconsin, and Ian McHarg, also landscape architect and professor at the University of Pennsylvania.[22] As a forerunner to the *Comparative Study of Resource Analysis Methods*, this study uses hand-drawn method to re-map and reconstruct the general principles of analysis that they interpreted from each of these three individuals' work. At the time, the three landscape planners were also invited to Harvard to visit and lecture on their method to the researchers, faculty, and the students.

While the studio and the study of Hills, Lewis, McHarg were occurring at the same time, questions of method had not found (and would not necessarily find) a unified answer. Chrisman explains that within the studio:

> "The students and faculty doing this project did not adopt any of the three models presented by Hills, Lewis, or McHarg. Perhaps due to the nature of the study area, the environmental constraints were not considered to be sharp black-and-white distinctions. Rather than solutions dictated by environmental constraints alone, this project allowed scope for the broader considerations that were the basis for the student's plans."[23]

---

[22] Chrisman, p.42-43, and
Belknap, Raymond K. and John G. Furtado, *Three Approaches to Resource Analysis Methods*, (Cambridge: Harvard University and The Landscape Architecture Research Office, 1967).
[23] Chrisman, p.47

The Delmarva project represents a serious attempt to reconstruct the nuance of the object of study inside the walls of the studio through a detailed site analysis—the use of time-consuming and labor intensive data gathering and computing processes reveals the sincerity with which they approached this task. At the same time, the very act of describing an object sets the limits for what can be imagined, or designed, within the process of proposing a new condition.

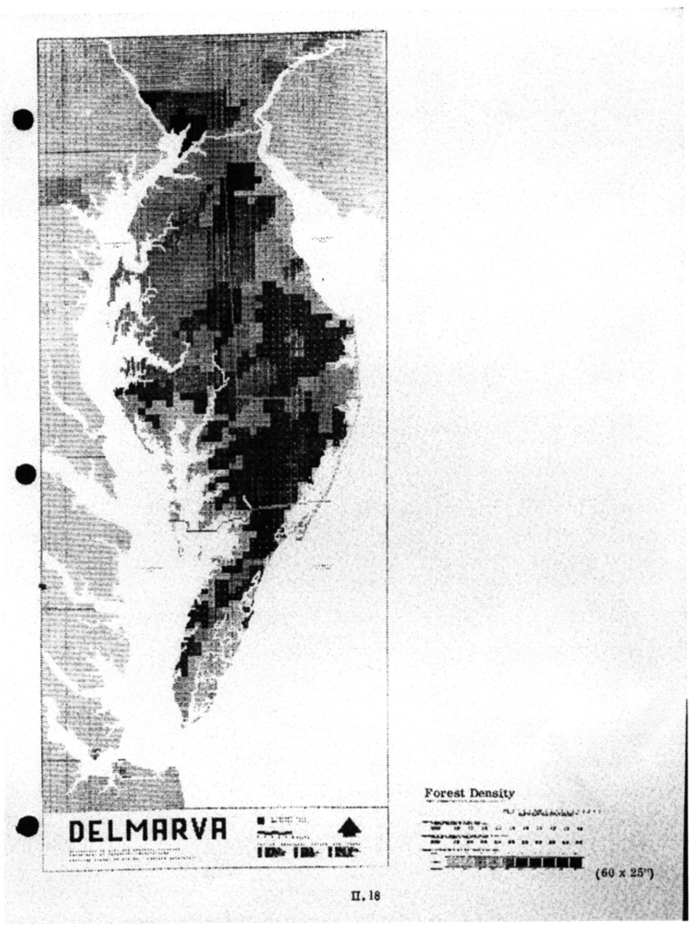


Image: Delmarva, Lab for Computer Graphics and Spatial Analysis (Printed by Harvard University, 1966-1972)

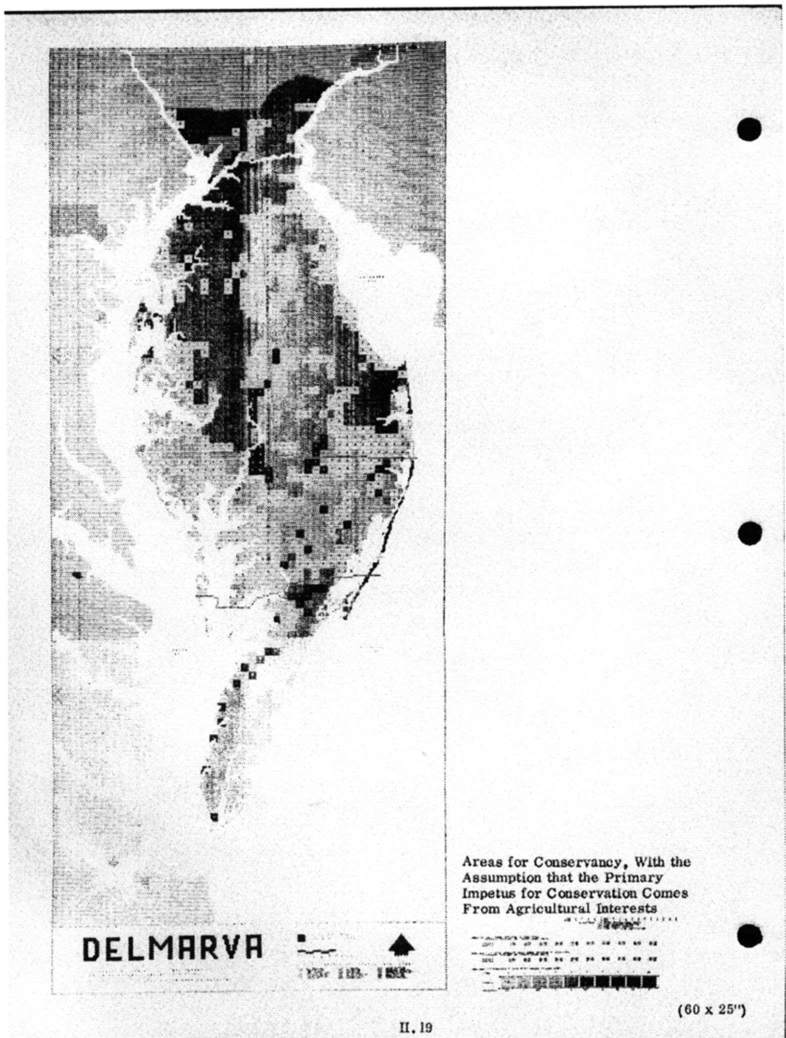


Image: Delmarva, Lab for Computer Graphics and Spatial Analysis (Printed by Harvard University, 1966-1972)

Due to his status as a former participant in the lab, Chrisman's text can also be treated as a primary document, in places his narration of events reveals the attitudes held by those engaged furthering this technological enterprise. Contained in the description of the studio cited above, is the implication that there are certain types of landscapes which experience obvious environmental pressures, that when addressed through analysis are able to give greater legibility to methods that rely on making "distinctions" through notions of "environmental constraints," on the other hand, he writes of landscapes with more subtle patterns of difference that don't respond as well to existing methods of environmental analysis. The studio's use of SYMAP is presented as a way that the students and faculty made inroads on this problem. He seems to be mildly critiquing the landscape planner, implying a limited capacity for managing information that forces the imposition of binary distinctions in the description of landscape (this critique surfaces in the writings published by LARO as well), embodied by this critique is an implicit imagination of the computer as a device that will be able to handle almost infinite volumes of data, and make complex visualizations that will serve to clarify fine-grain decisions and by-pass the limits of the human designer. Chrisman is writing an institutional history of the technological development of GIS at Harvard, and as such, there are two idealized subjects latent in his narrative, GIS as we know it today, and the imagined future of the technology on the path towards progress. When further explaining the influence McHarg and Lewis had on those in the school he writes, "Both McHarg and Lewis put substantial faith in the integrative role of the designer in looking at the whole and seeing patterns, a role that still defies direct translation to computer software."[24] Again, what is revealed is a hidden desire to replace parts of, or even the whole designer with a corporeal bundle of computer circuitry. Chrisman's observation about McHarg and Lewis, allows one to ask how the boundaries of the designer's role were being tested at this time, and what aspects of their intelligence were being isolated for replication through technology.

Charles River:

Each of LARO's studies was focused around the same region of the Charles River Watershed. In part this was due to the fact that once they had built a comprehensive database of the region it became useful to use the same database each time. Reports produced by the Army Corps of Engineers suggest another story though, one a study on *Charles River Population and Urbanization*, prepared in 1967, and another a *Water Resources Development Plan*, produced in 1972. The reports frame the import of this region as a part of what they call "Megalopolis," or the heavily populated area between Boston, New York, and Philadelphia. The USACE suggests that the watershed is an area of intensive growth, and transformation. Suburbanization of this area was proceeding at a rapid pace at this time. In 1954 and 1955 many neighborhoods on both the Boston and Cambridge sides of the river basin were flooded during hurricanes.[25] This prompted the USACE to study not only the area flooded but also the whole system of land constituting the watershed, and as historian

[24] Chrisman, p.43

[25] Haglund, Karl, *Inventing the Charles River*, (Cambridge: MIT Press, 2002), P.287

Karl Haglund notes, the USACE developed the first only "nonstructural" flood control program in the country at that time.[26] Harvard President Nathan M. Pusy headed up the Citizens' Advisory Committee, which was arguably the most influential advisory board to the USACE as they developed their plan. The study describes the CAC as "a body of more than 30 private citizens who collectively represented the industrial, conservationist, educational, recreational, and real estate interests of the watershed area."[27] Haglund explains that the USACE eventually bought up 3,252 acres of land, and secured conservation for several thousand more.[28] He suggests that these private interests underpinned much of the support and direction of the USACE plan. The USACE used the expertise of those at Harvard and MIT, such as LARO to build simulation models to test their ideas. The USACE presents the flood control plan as a chance to implement a system of management that would be contrary to their usual built control works, which they admit, "have not always been met with uniform public enthusiasm."[29] The USACE also acknowledge that, "The public is anxious to see multiple returns on its investment in the Charles." And that the, "Implementation of the recommendations presented here offers the watershed population as a whole impressive long-term benefits quite outside the issue of flood protection."[30]

Comparative Study of Resource Analysis Methods:

Each of the texts that LARO produced and are examined in this thesis is presented in the form of a report. Thick booklets, compiled by the office, they sit on library shelves at MIT and Harvard (and possibly other unknown libraries), accumulating dust for the most part. What is the value of a technical study from the 1970s today? Outmoded, they reveal the speculation over the multiple possibilities for a technological project, inherent in the moment of its inception, that no longer exist today. One asks why did the research office, gathering many strong figures into one platform, leave so few marks in the discursive fabric? In this sense, the reports, through the veil of objectivity, attempt to blend into the

---

[26] Haglund, p.285
[27] United States Army Corps of Engineers, *Charles River Watershed Massachusetts: Main Report and Attachments*, (1972), p.7
[28] Haglund, p.285
[29] US Army Corps of Engineers, p.i
[30] US Army Corps of Engineers, p.8

background of 'facts.' The Charles River Watershed appears in each study reconstituted as a landscape of formulae, cybernetic loops, and like the silt left after flooding, as aggregated data patterned across the terrain.

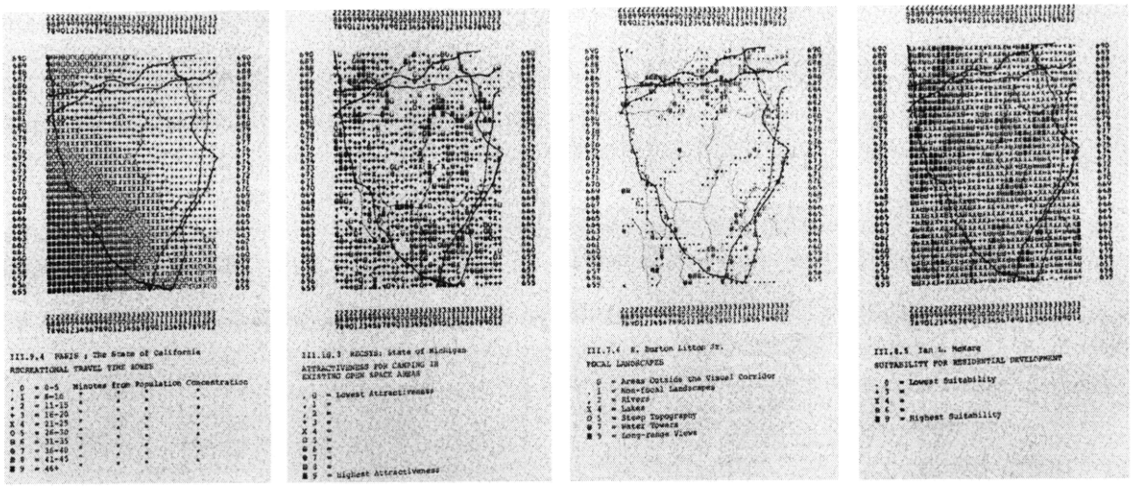


Image: Maps, *Comparative Study of Resource Analysis Methods* (Printed by Harvard University, 1969)

Image: Chrisman, Nicolas, *Charting the Unknown: How Computer Mapping at Harvard Became GIS* (ESRI Press: Redlands California, 2006)

Looking at the stack of aged pages in the *Comparative Study*, each page shows a map, a four by five inch grid of alphanumeric symbols pressed into the page (ten per linear inch), creating dark to light patterns that suggested a characteristic of the landscape such as the distribution of a single element across the site. Amidst these generalized and ungainly marks of data, snake a few linear points of reference (the primary highway network and the rivers); that serve to enhance the believability of the image as a map—anchoring the viewer within the picture through an established representational technique.[31] The maps were printed on a widely available line printer, and as a former researcher at the LCG, Nicolas Chrisman,

[31] Explained on page10 of the *Comparative Study*.

notes, "Each line was printed all at once by the impact of print slugs onto the paper through a carbon ribbon (not so different from the typewriters of the era).[32] The process of creating the computerized maps is described by the same author, first the mapmaker, "uses the manual digitizing board to establish coordinates of the controlling points on the 'source map,' and enters the information on special coding forms," in other words, a special ruler (calibrated to the spacing of the printed alphanumeric symbols) is laid across a traditional map or aerial photo, using the ruler the meaning of the data is encoded by the mapmaker at each point; this is followed by the production of individual punch-cards that are then stacked and brought to the technicians whose job it was to run them through a centrally located time-shared computer; the mapmaker would then come back a day or two later to retrieve his printed map.[33] Each point of the process corresponded to a different thought process or representational paradigm, such that the mapmaker had to envision the landscape through multiple organizational modalities. Due to the significant amount human labor required to produce even the most basic map, the study admits that the values of, "Accuracy and economy of computation are somewhat contradictory."[34] The slippage that occurs between the two values points to the nature of the gap that exists between the representation and its object.

To this end, three questions can be asked of the maps in the *Comparative Study*: What is the subject of the representation? (i.e. city / process of urbanization, distribution of resources / accumulation of value for those resources, etc.); The second question is, what is the object of the representation? In other words what is the sensory or metric relationship, or even direct sensory relationship to the site of analysis and projection? The third question asks, what is the representation's relationship to change? In other words, what are the potentials (and limits) for design located within the representation?

The initial purpose the authors assign to the Comparative Study was two-fold, the first was to gather information about individual approaches to resource analysis for comparison (collected from 16 different actors in total), the second was to test a computer mapping program (GRID) for its ability to incorporate and reorder all of the priorities brought to the regional planning of landscape. The different individuals ranged from

---

[32] Chrisman, *Charting the Unknown*, p.26
[33] Chrisman, *Charting the Unknown*, p.24
[34] Steinitz, *Comparative Study*, p.9

landscape architect (Richard Toth, Ervin Zube, Ian McHarg, Philip H. Lewis Jr., etc.) governmental agency (US Army Corps of Engineers, Soil Conservation Services, etc.), planners and planning commissions (Chester County Planning Commission), geographers, engineers, and interestingly, other computer simulation models, that were assumed to possess enough cybernetic intelligence on their own to constitute individual actors (PARIS: The State of California, and RECSYS: The State of Michigan). After gathering information about each individual (or group) the researchers then decided how to interpret their individual methods within the terms of the system. In other words, each individual's (or group's) practices engaging different representational techniques, from transparent overlay maps, computer simulations, sketches, diagrams, reports, etc., were interpreted by researchers and remade through the logic of GRID—generating computer maps of a uniform appearance, save the distribution of data. GRID was understood as a language that could mediate and replicate (to some degree) these varying practices. Difference between each designer is not determined in the aesthetic register of representation technique, but rather the way in which each individual establishes criteria for analysis and design. This issue is addressed within the opening paragraph of the introduction, the authors write:

> Given increasing public awareness of the need for resource use policies which will minimize the inevitable conflicts among the various demands for land, resource analysts, planners, and designers are challenged to go beyond the level of individuality and towards a level of understanding which approaches the theoretical.[35]

This citation reveals the central contradiction in the study, where on the one hand the authors purport to be generating an umbrella under which a multitude of practices can exist, in other words, the analytic technology they are producing (not just the computer program, but their interpretive method as well) postures as if disinterested, transparently mediating multiple agendas. On the other hand, this intent is belied when they express the desire to "minimize the inevitable conflicts," that arise in making land-use decisions. This reveals that contrary to what they may imagine their project to be, they were not only speaking about ameliorating misunderstandings or incompatibilities amongst different disciplinary registers of speech in the sole hopes of creating common language for interdisciplinary action. Rather, by streamlining the process of decision making, achieving the mean itself becomes the idealized subject of the process, and a normative theory emerges. A tension exists between

---

[35] Steinitz, *Comparative Study*, p.1

attempting to account for difference, and creating a technology that assumes conflicting priorities can be made commensurate.

If the first aspect of the study was interpretative, to translate existing method into computer language, then the second aspect was to generate what the authors call "The Comparative Base." The base uses a common geographic region, in this case the southwest sector of the Boston Metropolitan Region, or the Charles River Watershed. The "site" is an orthogonal cutout of geographic terrain based on the coordinates of the Universal Transverse Mercator grid. The authors of the study describe:

> "Defining the study area raises all the classic arguments and questions involved in defining regions. In general, the "free body cut" should be made around the smallest area which encloses all the data zones and systems which impinge on the geographical area or content under study. All data systems are then assumed to be closed within this area, an assumption which, in the light of the "spaceship earth" argument, must be heavily qualified. The area for which data are available should therefore always be larger than or equal to the area of interest. Political and physiographic data borders will rarely be as satisfactory as a somewhat arbitrary larger border which will include within it the relevant political or physiographic areas of interest."[36]

This citation addresses the different modes of delimitation that can occur when bounding a site. In fact, for them the "arbitrary" becomes the most productive, as if to imply that the imposition of an external order (grid) to overlay the geographic will at the very least reveal the limits of the cut when logics break down upon encountering the orthogonal edge. GRID was used to establish a common representational message, and the establishment of a consistent Cartesian datum underpins what comes to be understood as the geographic within the map. The nature of the grid made from repeated symbols implies its infinite extents, whereby the map seems to seep out of the land itself—and could occur at any point in the terrain. Evoking the "'spaceship earth' argument" the authors acknowledge that the limits of the site correlates to the agent's jurisdiction, and at best can only operate as a strategic section through an infinitely scalar and bound system. In addition to the characteristics of the Boston site, the methods (of others) being mapped onto this particular site (by researchers) were in actuality developed in sites all over the US, thus they had to be recalibrated to fit the exigencies of this particular landscape. The authors produce the "comparative base" as a common window onto the geographic terrain by creating a data

[36] Steinitz, *Comparative Study*, p.21

inventory of resources that define the site. In effect, what they were doing was trying to produce an outside or stable object of landscape through categorically gathered data. This object could then be traded as the material from which each individual method presented within the text was compromised. To do this, they produced series of maps showing the data, delivering their own narration of the landscape as a field of effects. The categories they choose can be loosely grouped into, physiographic features, the general programmatic uses of the land, the location of the anchors that serve to coagulate social networks (i.e. schools and correctional facilities), the transportation networks and the proximities of urban centers to other locales (measured in gradients of minutes travel time), environmental characteristics (which are defined in the negative, as detracting from the environmental quality), statistical characteristics such as population and economic factors (i.e. land-value), and lastly, the visual characteristics of the landscape (based either on formal perspectival aspects, or on gradients generated by consensus, like to dislike). In some ways this data inventory supercedes the actual object of landscape, such that the interpretation of method that occurs based upon this information, (or inventory), represents a double removal from the object. This doubling serves to further move towards the creation of the technological product as a parallel system for the regulation and control of the landscape.

The method of encoding data in a geographic form was also a way for the researchers to break down existing modes of thought through new logics of representation. In a critique of the line they write:

> "On the other hand, the expert, working with hand drawn maps and using his "best professional judgment," continually simplifies his data by synthesizing fine scale variations into homogenous and usually dichotomous zones as he draws the boundaries which characterize the graphic product of his analysis."[37]

Unlike marks made by the hand, the estrangement between man and machine promises an externalization of judgment and greater reflexivity. The computer promises "graphic product" that has the capacity for the dynamic expression of information and the imagination is created of an environment rich with data collapsed into each singular point on the map.

[37] Steinitz, *Comparative Study*, p.311

Each method that is documented in the study approaches the problem of analysis in a different way; what results in the study is not a synthetic vision of one method, but the documentation of a large set of both problems and solutions, found as they broke down the process of analysis. This is an imperfect art, yet they constantly attempt to adhere to a program of rigor while isolating strategies for both measure and classification. One method documented in the study came from R. Burton Litton Jr., a professor in Landscape Architecture at University of California, Berkley. Litton was considered exemplary by the authors due to his work on the management of visual resources within the landscape. For each individual they evaluate they first write an introduction describing the scope of that figure's work, then create a systems diagram to describe the sequence of inputs and outputs to that method, lastly, mapping the criteria onto the site shared by all actors in the study—they create a series of maps geographically depicting each analysis method. Unlike the methods that are based on inventories of land types, (i.e. marshes, forests, agricultural plots, etc.) Litton describes the landscape through the subjective lens of the observer. The authors break the Litton method into two phases:

> "In the first phase of his descriptive method, Litton defines six variables which influence the landscape as it is seen, and the observer as he sees it. These are form, spatial definition and light, and distance, observer position and sequence.[38]
> The second phase of the descriptive system involves the identification of landscape compositional types. The major ones are panoramic, feature, enclosed, and focal landscapes. These types, along with the variables, are described in two case study visual analyses of California highways. The analysis areas are visual corridors, defined as the areas which can be seen from the road. In the application of the Litton method to the Boston Region Southwest Sector, the analysis is applied to the visual corridors of the region's major road types."[39]

Here the more traditional pictorial dimensions of landscape (what they call scenic elements) are being not only translated into plan—but the spatio-temporal aspects of these categories are being flattened and redistributed across the map to create an a temporal and proximal understanding of space on the page. Each landscape "type" is marked symbolically (without perspectival directionality) along the site's highway routes. Here type carries with it the potential for qualitative assessment, i.e. a panoramic view is more desirable than a focal view at this locus within the site. An image of scenes unfolding as one drives along is not

[38] Steinitz, *Comparative Study*, p.168
[39] Steinitz, *Comparative Study*, p.169

rendered through mimicry, but is encoded in the map, therefore the act of reading must occur in order for the map to be deciphered, and only then does it engender the image of the object of landscape being sliced open for view along the curving seam of the road. Due to the singular marks of type made on the map, much of the image remains blank; in contrast to this, the *Comparative Study* also presents methods in which the whole site is topographically qualified by one value—moving from a sequential understanding of landscape to one that is environmental.

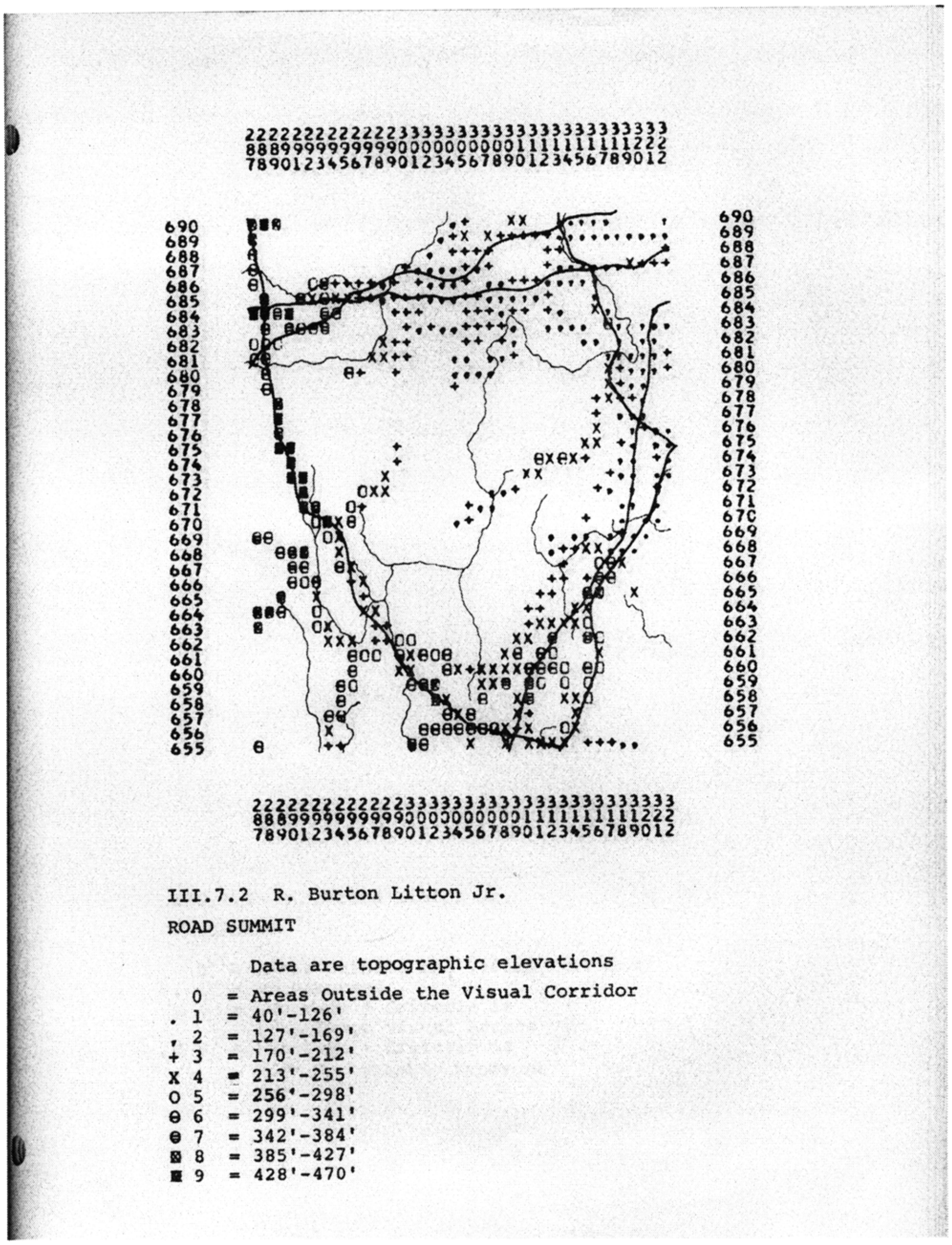
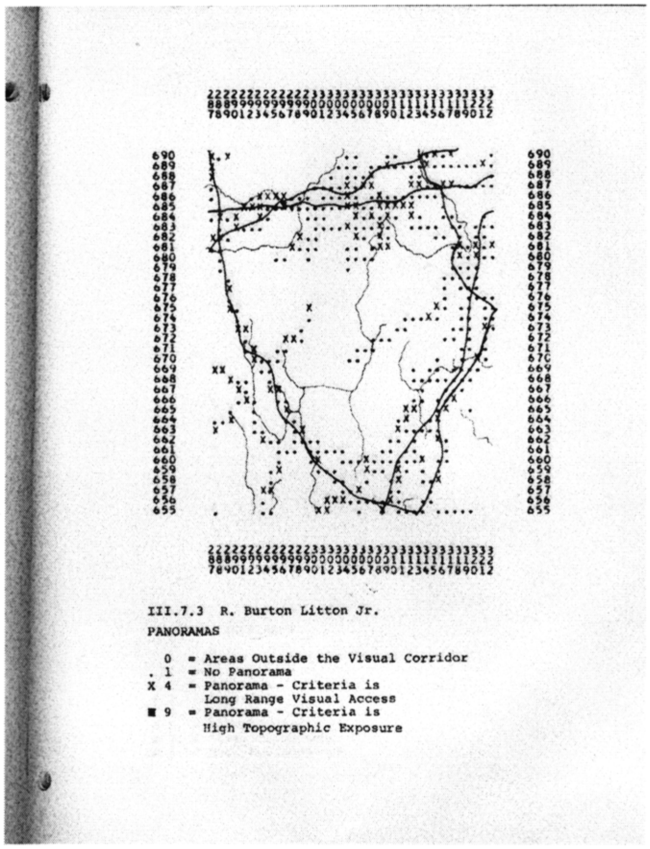


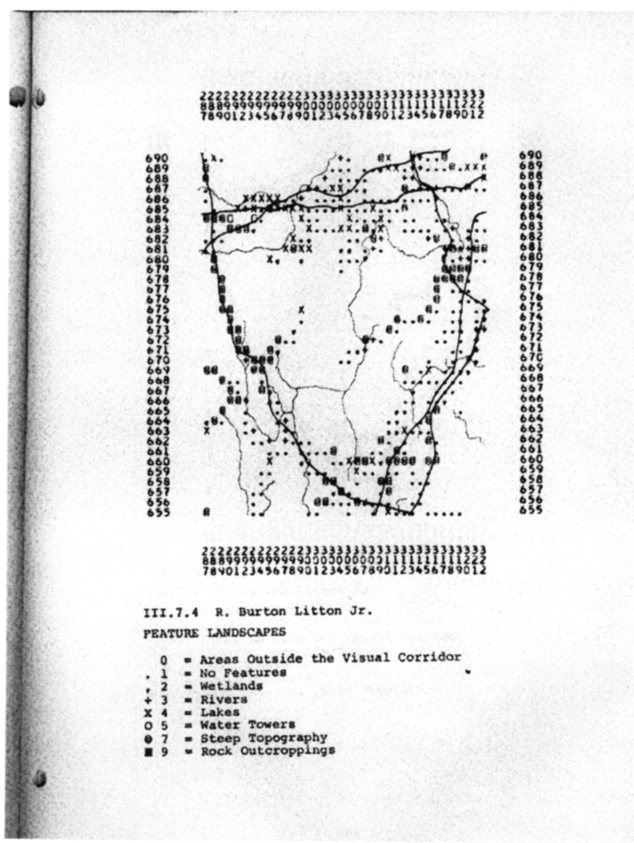
Image: Maps, *Comparative Study of Resource Analysis Methods* (Printed by Harvard University, 1969)



III.7.3 R. Burton Litton Jr.

PANORAMAS

0 = Areas Outside the Visual Corridor
. 1 = No Panorama
X 4 = Panorama - Criteria is Long Range Visual Access
■ 9 = Panorama - Criteria is High Topographic Exposure



III.7.4 R. Burton Litton Jr.

FEATURE LANDSCAPES

0 = Areas Outside the Visual Corridor
. 1 = No Features
, 2 = Wetlands
+ 3 = Rivers
X 4 = Lakes
O 5 = Water Towers
● 7 = Steep Topography
■ 9 = Rock Outcroppings

Image: Maps, *Comparative Study of Resource Analysis Methods* (Printed by Harvard University, 1969)

The authors enthusiastically report on the methods employed by Ian McHarg, whose work on "intrinsic suitabilities," allows them to explore the issue of estimating value. In this case study, the values of "suitability" and "compatibility" temper the landscape, addressing the categories of conservation, agriculture, recreation, residential development, industrial development, and urbanization. The researchers explain that:

> "McHarg has consistently attempted to integrate scientific measures into his evaluations, but the state of applied ecological science being as it is, many of his evaluations, particularly those of the predicted effect of various lands uses on natural factors, are based upon the best professional judgments of himself and his associates. The avoidance of numerical values through the use of broader categories is both a strength and weakness of the McHarg approach. Specific detailed evaluations are likely to be suspect. On the other hand, in the four-level value ranges from good to bad, McHarg makes a major simplification by his implication that all factors, when combined, are combined with equal weight."[40]

When attempting to account for an object as slippery as landscape, a conflict occurs between different systems of measure. The fact that the professional's ability to estimate is considered by the authors to be both a "strength and a weakness," reveals their hinging uncertainty over where the precise location of expertise lies. To produce authority the method must strike a balance between the audience's perception that the system of measure is sound, and the fact that if it appears too totalizing it looses credibility. The idea of a "value" that can be estimated, becomes one way to accommodate a shifting set of priorities. In the end, what would seem to be an issue for scientific reason is in actuality a matter for aesthetic judgment. And the hesitation that can be detected in the citation above is repeated throughout the text, revealing that while the researchers at LARO aimed for a sense of objectivity, they struggled over the definition of their object.

A Systems Analysis Model in Urbanization and Change: An Experiment in Interdisciplinary Education

The role of the designer was a central question in "Urbanization and Change," an interdisciplinary studio offered through the Department of Landscape Architecture in 1968. This question was addressed in the studio on two levels. The students were active

---

[40] Steinitz, *Comparative Study*, p.183

participants in the design of the simulation itself, the defined the rules for interaction, developed the linear equations, and set the parameters for each area of specialization in the model, thus design was primarily a matter of giving form to a system of representation. On another level, students were asked to consider what the role of the designer would be in the final computerized iteration of the model as they coded points of control into each of the mechanisms of the model. These control points would limit the degrees of freedom inherent in the system. In this way, the students were scripting their own future roles as architects and planners who would find themselves eventually practicing in the world outside of the academy.

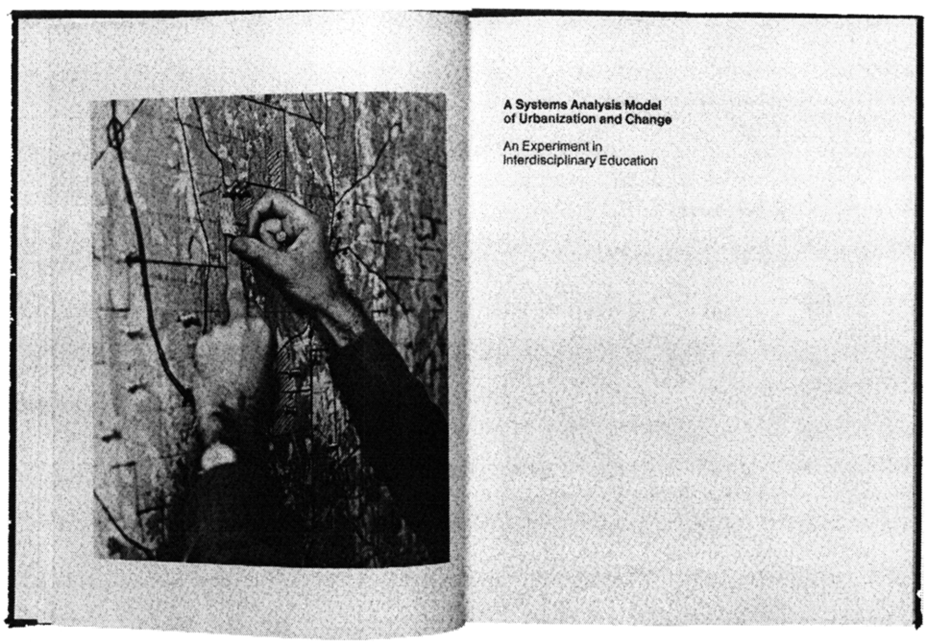


Image: *A Systems Analysis Model of Urbanization and Change* (Cambridge: MIT Press, 1970)

Two years after the studio finished, the results were published as *A Systems Analysis Model of Urbanization and Change: An Experiment in Interdisciplinary Education.* This book was compiled by Steinitz and Rogers, and published by the MIT press two years after the studio was complete (in 1970), as MIT Report No.20. The publication recounts week by week what activities the studio engaged in as they built a simulation of the potentials for urbanization and change in the landscape of the Charles River watershed. Game theory was employed to generate the analogue simulation model that the students could "play," the authors explain, "The procedures developed for the simulations themselves are analogous to the board, pieces, and rules of Monopoly."[41] The reference to a game of real-estate and banking is telling of the currents of interest underlying much of this work in simulation, but it can be taken here as simple a way to explain the combination of chance and design in the model itself, as well as the necessity for strategy when engaging the model. When the techniques used in the lab intersected with the culture of the studio, focus shifted from open-ended questions of writing program and improving graphic display, to questions with a more defined set of ends, addressing theory and method for problem solving in the regional landscape. The professors of the studio, Steinitz and Rogers, describe their thinking on this matter:

> "It would probably take several years to write a computer program for this simulation. So we did a patchwork process, and dignified it with the name "man-machine interaction." [...] These were developed as a set of rubrics for which the students then played the roles of FORTRAN statements. Of course, FORTRAN is more predictable than students; students in the middle of doing something always ask embarrassing questions. While embarrassing, this is how the model developed."

An Experiment in Interdisciplinary Education, was an attempt to find a new way for landscape architects, engineers, planners, and urban designers to communicate with one another. They write, "Schools of design have often had interdisciplinary faculties, but to date there has been no system of organization that could bring the various disciplines together into a functioning whole."[42] What is revealed in this statement is the notion that the system itself takes precedence over any one designer. Yet, the authors amend this idea in their next statement when they write, "Interdisciplinary education evokes the idealistic image of synthesizing all available knowledge, techniques, and skills into one super machine which will solve all problems. However, this interaction often has quite opposite results, such as cross-sterilization rather than cross-fertilization of fields and confrontation rather than dialogue."[43] With this said, they propose a method of working through experimentation, with the admission that the process must if effect, be messy. They write that, "The teachers and students developed a high tolerance for ambiguity in the course of the semester. There were times in which the system appeared to break down completely- for example, when

---

[41] Steinitz and Rogers, *An Experiment in Interdisciplinary Education,* p.5
[42] Steinitz and Rogers, *An Experiment in Interdisciplinary Education,* p.1
[43] Steinitz and Rogers, *An Experiment in Interdisciplinary Education,* p.1

nobody knew how to handle a certain problem."[44] The moment the system broke down was the most fruitful for education in their estimation as it closely mimicked the crises of the "real-world", and in that space new modes for problem solving would open up. Yet, in a sense the space of the studio provided a back up to the system for collaboration they were designing, for when that system broke down, conflict was resolved due to the pedagogical space of the studio.

In the report systems thought is actually identified as a new paradigm for design and is not naturalized, or taken as a given, but rather is described in its historical context. The author's explain that systems analysis and operations research came out of the theatre of war at the beginning of the twentieth century. Military establishments used OR to try and "solve very complex scheduling problems beyond the professional expertise of any one discipline."[45] The authors note that:

> "In discussing systems analysis, we should bear in mind that it is a synthetic discipline; it is a collection of viewpoints and techniques that were formerly parts of such disciplines as mathematical statistics, economics, sociology, biology, physics and engineering. In the past few years, however, with the increased use of the techniques of systems analysis, a fairly complex and detailed methodology has been derived and accumulated that constitutes a distinct body of knowledge, or at least a distinct way of looking at the solution of complex problems."[46]

It is clear that in the explication of this method, they are trying to position it carefully to ensure it acceptance within the design school. By doing this they can describe a mode of "patterning and guiding the urban process," that gives them the greatest leeway to redefine the role of the planner, which they take in its broadest meaning to "include all those professionals and roles involved with technological and physical planning."[47]

The Simulation Model:

The simulation was comprised of two distinct types of model, the first were allocation models where the objectives of programmatic types, were split into four teams, residential, industrial, open space and recreation, and centers. The second model type, were

---

[44] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.2
[45] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.7
[46] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.7
[47] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.7

evaluation models that regulated the interests of these first teams, they were political, fiscal, visual quality, and pollution. The students split into teams with faculty to design the models, they then role-played at each of the different model types during the simulation sessions. The authors explain the rules of play:

> "USGS maps of the study area were put together on the wall, and the one kilometer square UTM grid was scored on each map. Roads and town boundaries were also drawn. Figure 3 is the resulting board.
> Each of the allocation teams was assigned a color and symbol for the land use and its various subcategories, as shown in figure 4. These were prepared as chips, to be pinned to the USGS maps in the process of allocation. Aluminum-headed pins were used for all new allocations. If a conflict for a cell was present, the chips were pinned on the diagonal. Color coded pins were used for the evaluation models: red for the political, green for the financial, white for the visual, and blue for the pollution models. When an objection was made by one of these models, its pin would be placed on the offending allocation chip. The evaluation pins would be removed as objections were met, either by argument or by reallocation.
> New allocations would be marked with a clear-headed pin and reevaluated. Finally, with no remaining conflicts or objections, the chips would be stapled to the wall surface and all its pins removed. Data files would then be updated, keypunched, and the process would begin again for the next time period (or iteration) in that simulation."[48]

The simulation took place in multiple stages representing growth over time. The authors note, "This simulation is the base against which all attempts at improvement must be measured. Changes will result in an urban pattern–or a way of life–either better or worse than this one."[49]

[48] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.2
[49] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.2

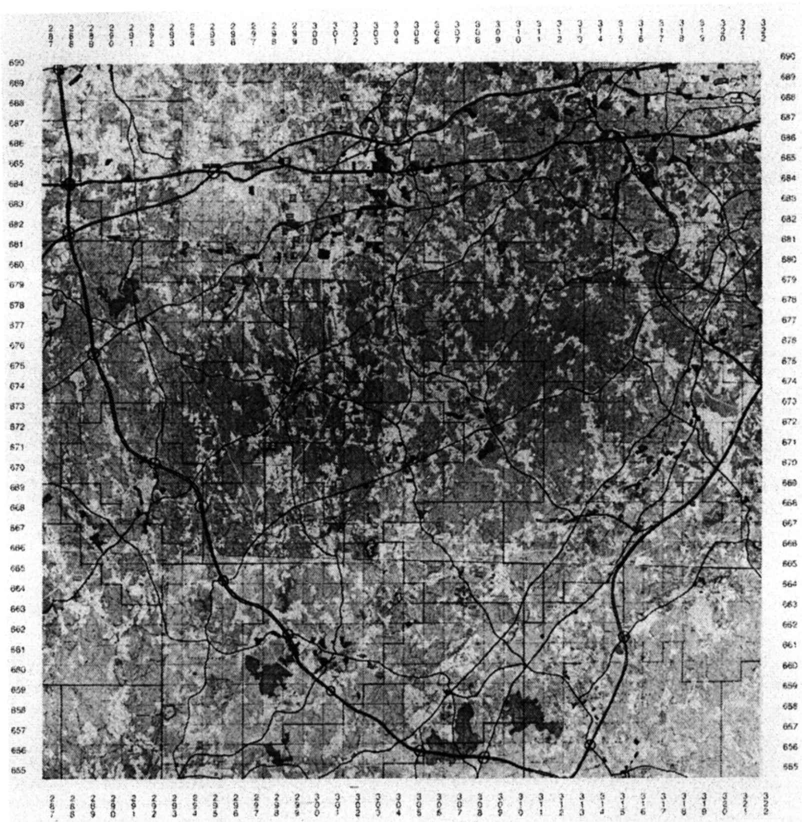


Image: Game Board, *A Systems Analysis Model of Urbanization and Change* (Cambridge: MIT Press, 1970)

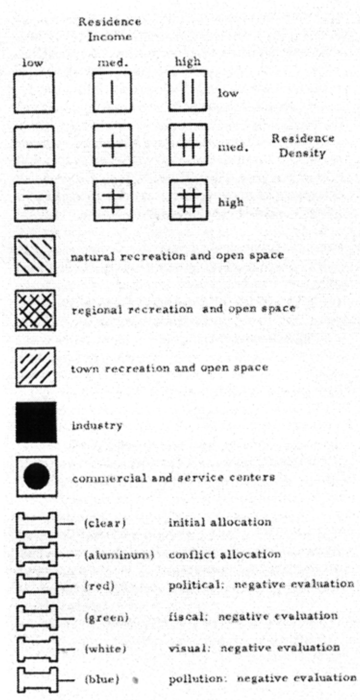


Figure 4
Key to the allocation and evaluation symbols.

Image: Game Pieces, *A Systems Analysis Model of Urbanization and Change* (Cambridge: MIT Press, 1970)

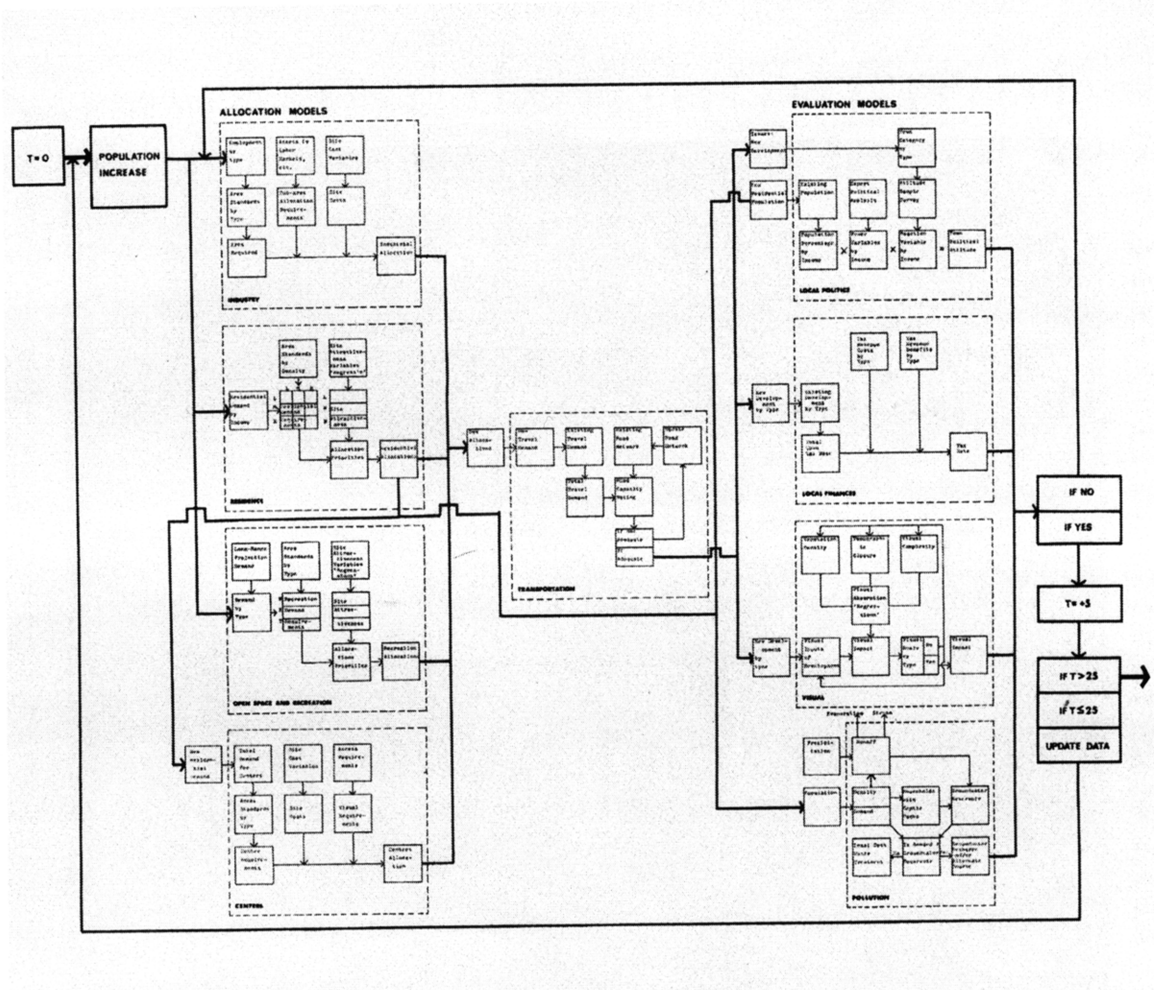


Image: "Rules," *A Systems Analysis Model of Urbanization and Change* (Cambridge: MIT Press, 1970)

The simulation challenged accepted method and expectations in the planning process. After the mechanics of the simulation are explained, the report documents the presentation of findings by the teams of student designers of each of the models. The students' reflections on building each allocation and evaluation model are documented in the report. The students who built the residential allocation model wrote that:

> "We took it upon ourselves, in the role playing of this allocation, to simulate the producer aspect of residential development. In other words, were to act out the roles of the people who would actually produce the housing, and their constraints and values would be imposed on the results of the consumer analysis. This role was often in conflict with the training we had as architects, urban designers, and landscape architects, which had urged us to act in the interest (or what we think is the interest) of the common good, the public good, the landscape good, the regional good. "[50]

[50] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.24

They go on to note that, "This, of course, would be opposite to the kind of training we're given in school, where one would never encourage this sort of thing."[51] The counterintuitive aspect of this exercise was meant to allow students to develop a more nuanced understanding of the complex forces at work in the landscape. Working in this mode as a studio serves to destabilize the pedagogical project inside of the university, and opens up pre-assumed roles for examination. On the other hand, the question why, or the question of what was directing these forces was left open and unresolved in the model, in the report Steinitz remarks, "An important side issue for planners is: If we foresee what happens, then what?" [52] Nonetheless, one can see that a part of the reason LARO was focused on carving out an interdisciplinary space within the university, in order to bring these disparate modes of thought into relation with one another, was the desire to expose the architect or planner to a new strategic terrain. Steinitz reinforces this point when recounting an anecdote from the studio, in the report where comments from the final review were documented:

> "One very instructional thing for the landscape architecture students was that this format forced the Recreation Team to develop a strategy where priorities are stated. Put yourself in a situation using the traditional studio methods-what would you do? The first thing would be to buy the river. Right? You'd spend all your money on the river. Well, in both the simulation runs, it happened that for twenty years nobody else wanted the river. You therefore might be able to say, "Well, look we don't have much of a problem there for a good long time. Let's go buy as much land as we can where we're going to have the problem, where it doesn't exist now, and then in the end we'll worry about the river." And in fact, that's how it turned out. And this is completely different from what you would normally expect a student plan to show with the values that the students have when they come in here. The format really makes you think of what the hell it is that you want to do and what is the best strategy for getting it."[53]

---

[51] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.24
[52] Steinitz and Rogers, *An Experiment in Interdisciplinary Education*, p.66
[53] Steinitz and Rogers, p.69

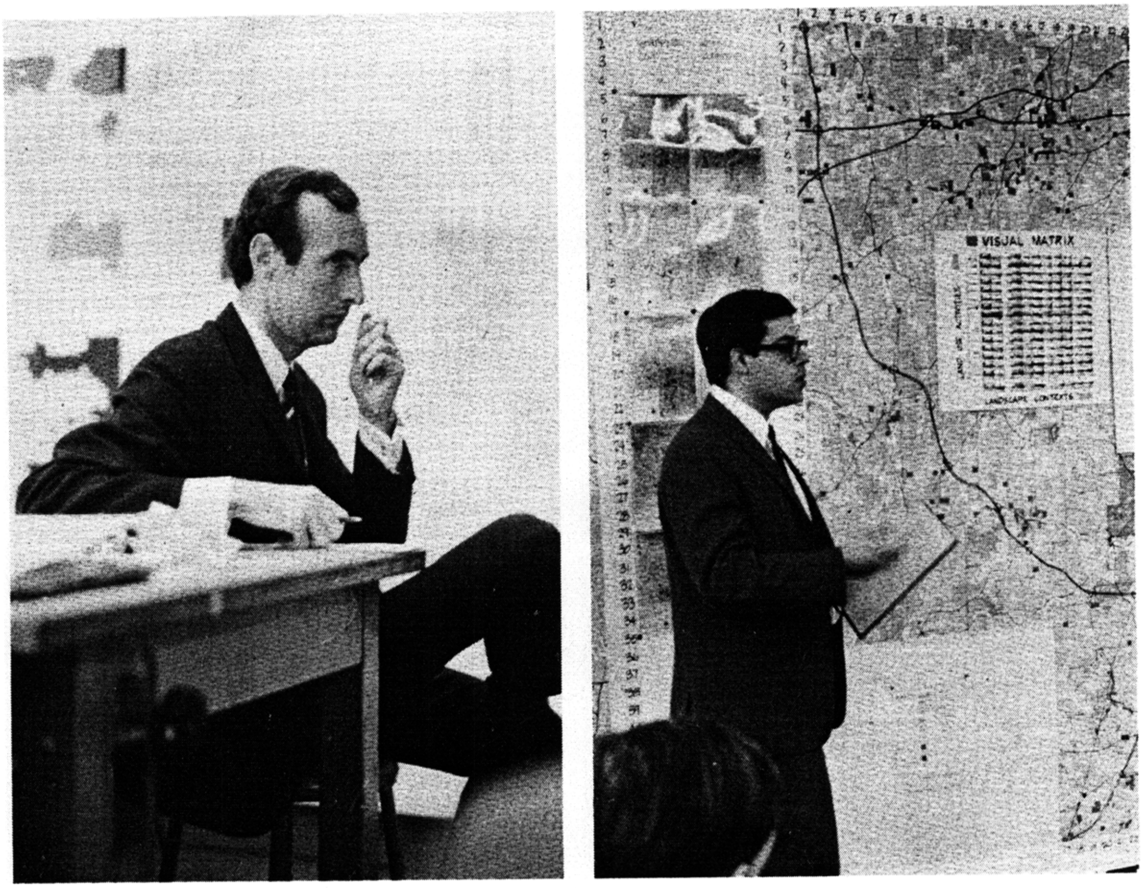


Image: Playing the Game, *A Systems Analysis Model of Urbanization and Change* (Cambridge: MIT Press, 1970)

A reading of the *Comparative Study* against the grain of the discourse of landscape architecture at this time reveals the way in which an imagination of landscape was being developed into a notational- and representational system; moreover, an analysis of the *Experiment in Interdisciplinary Education,* allows one to expand the line of question to the problem of locating the role of the designer or architect within the mechanisms of a representational system.

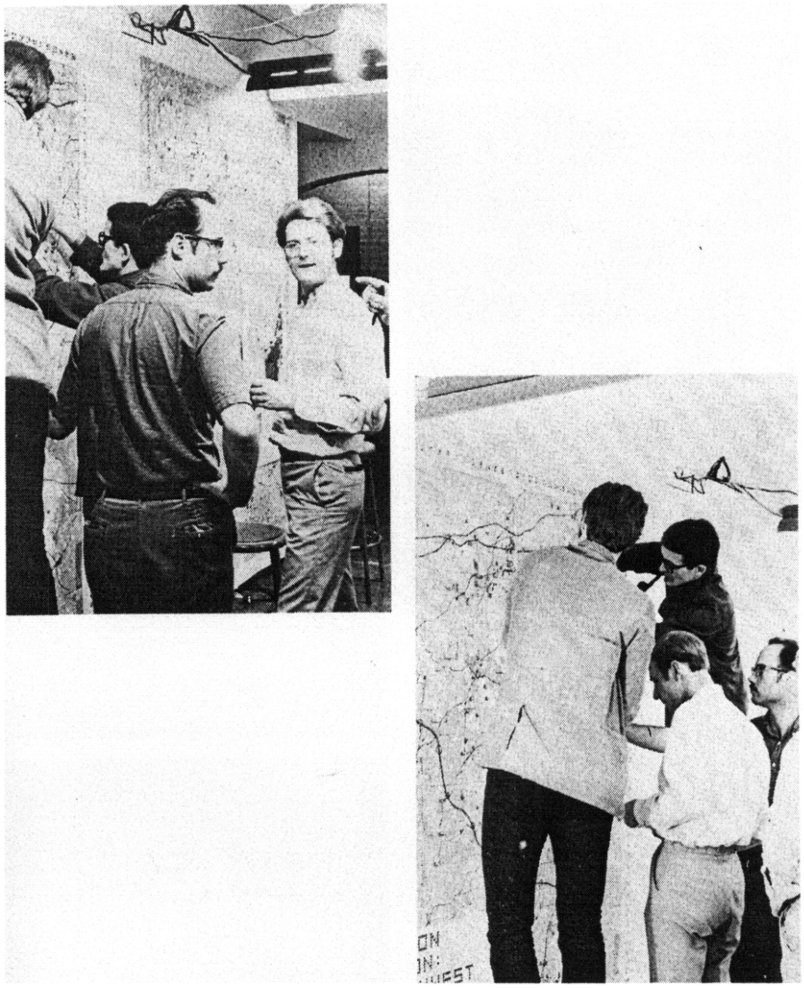


Image: Playing the Game, *A Systems Analysis Model of Urbanization and Change* (Cambridge: MIT Press, 1970)

The Interaction between Urbanization and Land:
Quality and Quantity in Environmental Planning and Design

After the publication of *An Experiment in Interdisciplinary Education,* LARO managed to secure enough funding from the National Science Foundation to begin to operate independently from the lab.[54] Building upon these first analogue attempts, the research office would eventually embark on a six-year project of studios, intensive research, and model building to create a multi-faceted computer simulation of urbanization and change. The study was titled, *The Interaction between Urbanization and Land: Quality and Quantity in*

[54] Chrisman, p.49

Environmental Planning and Design, and was documented in a number of volumes, representing each separate modeling exercise, authored by individuals from multiple disciplinary realms. The author of the first report, Steinitz, explains:

> "The major premises which underlie the research are that it is feasible to develop a series of major model components that analyze the possesses of urban development in a region, the social, fiscal, and environmental evaluations of these changes and the legal constraints upon them. In addition, it is presumed that these components can be organized to share a technical infrastructure consisting of a data base, a computer data-processing system which includes a variety of spatial and other analysis programs, and a series of graphic and other output devices. It is further assumed that these component models can be organized in such a way as to be linked into a variety of "modes." These modes correspond to the range of tasks to which the models can be applied by their various users. This is, in other words, not a single model, but a set of discrete yet interrelated models that can be combined in a wide variety of ways (as will be described) depending on the kinds of information desired or the type of policy question being addressed."[55]

The processes of the landscape are then categorized as follows:

> Commercial model, industrial model, housing model, conservation model, historical resources model, recreation model, public fiscal model, public expenditure model, legal implementation model, land-use descriptions, air quality model, water quantity and quality model, soils model, solid waste management model, vegetation-wildlife model, transportation model, public institutions model, visual model, and a data base model

The desire on the part of the researchers was for a total picture, though this ideal quickly disassembled as the researchers struggled with framing the problems of building each topical model. Often times they were reduced to identifying the "spatially significant" aspects of a problem, at the cost of leaving out the issues that could not be measured through those metrics.[56]

---

[55] Steinitz, *The Interaction between Urbanization and Land: Quality and Quantity in Environmental Planning and Design,* (Cambridge: Harvard University and The Landscape Architecture Research Office, 1973), p.15

[56] This can be seen when the author writes out the objectives for the educational model: "Ideally a model of an educational system would incorporate a coherent notion of educational quality. Unfortunately, educators disagree (on a philosophical level) about what constitutes a quality education and (on a practical level) about how quality should be measured. It seems necessary, however, that educational quality depends heavily on factors like motivation, teacher quality, and the dynamics of the learning process--none of which have spatial aspects relevant at the scale of a regional allocation model. This being the case, an attempt was made to focus on aspects of school building that are spatially significant, and considered important by local and state personnel charged with building schools and by

The computer work was funded by the National Science Foundation and the RANN program (Research Applied to National Needs). In the first volume the author sets up a description of the work using the terms that the patron provides, he writes:

> "The national need to which this research program is directed can be most simply expressed in terms of the questions that we are pursuing. These questions, and–importantly–their interrelations, are common ones. They are typical of those facing the major growth areas of our nation–the rapidly suburbanizing edges of our cities and metropolitan areas. These questions are faced daily by lay citizens, planning boards and public agencies, elected representatives, and decision makers. Collectively, they relate the uses of the land to its environmental, social, and fiscal consequences–relationships that are defined by numerous complex sets of individual events. Lacking a framework for analysis, these questions can be only partially answered. Yet they must be resolvable if urbanization and the issues accompanying it are to be satisfactorily managed."[57]

The early effects of suburbanization in the 1950s and '60s, while not often mentioned, underpin much of the work LARO was engaged in, with questions of what shape the landscape, rapidly changing from agriculture to real-estate development, should take, and what style, whether a pastoral, wilderness, or urban trope, etc., it should subscribe to. The pictorial and organizational imagination of the land was being remade in order to commodity it to meet a new set of expectations. These models were in many ways an attempt to find a method for quantifying intangibles for making both long and short-term gambles in the landscape. Steinitz writes:

> "Thus, in the proper combinations, the models may be used for such modes as planning / simulation, projection, plan evaluation, project evaluation, gaming, "optimizing," and legal testing."[58]

Following the notion of the game one can see that the question of what ideals (in the citation above), qualify the 'satisfactory management' of the environment is left open for manipulation.

In this vein, one can see that in part, the reason LARO was focused on carving out an interdisciplinary space within the university, in order to bring these disparate modes of

---

purchaser of public educational services, parents and taxpayers. " (Steinitz, *The Interaction between Urbanization and Land: Quality and Quantity in Environmental Planning and Design*, p.60)

[57] Steinitz, *The Interaction between Urbanization and Land: Quality and Quantity in Environmental Planning and Design*, (Cambridge: Harvard University and The Landscape Architecture Research Office, 1973) p. 16

[58] Steinitz, *The Interaction between Urbanization and Land: Quality and Quantity in Environmental Planning and Design*, p.16

thought into relation with one another, was the desire to expose the landscape architect to a new strategic terrain. At the same time, as landscape architects, they were also trying to find their way to the top of the disciplinary hierarchy in order to assert some degree of control over issues of urbanization. Interdisciplinarity would be consolidated under the rubric of "landscape planning," and specifically, what they term in this case, as "environmental planning." If the ideal subject of landscape planning is the natural landscape, a shift to environmental planning reframes the ideal through notions of the interaction between the natural and social worlds. The idea of interrelationship took multiple forms, from ecological science to environmental psychology, putting emphasis on different subjects of the environment.

Chapter 2: What is the Object of Landscape?

The usage of "landscape," as a descriptive category, acts as a representational or discursive strategy to apprehend objects in their spatial relations, and as such has been claimed by a broad array of disciplines, from geographers, to scientists, to historians, artists and designers. It is a slippery term but this slipperiness can be just as productive, as problematic.

The program in Landscape Architecture was formed at Harvard in 1900 and was the first of its kind. It did not begin within a school of art or architecture, but rather was begun within the Scientific School. Historian Melanie Simo writes, "That year [Frederick Law Olmstead] and his assistant, Arthur A. Shurtleff [...], were charged with developing a complete degree program in landscape architecture at Harvard. They could not do that alone. Nor did they try to shape their new program along some conveniently narrow, manageable lines. Aspects of geology, botany, horticulture, fine arts, history, architecture, engineering, and town planning—all were to be included."[59] She goes on to note that, "They had no model for shaping the new curriculum." She further describes Olmstead and his colleagues as "[...] expert[s], yet not [...] specialist[s]," and calls the result of their efforts a "Hybrid Profession."

This sense of hybridity has historically rendered landscape architecture a weakly delimited discipline with permeable boundaries, and one could argue necessarily so, if landscape is to be understood as a practice that stakes out the territory between things. The discipline was described in these terms by landscape architect Garrett Eckbo in 1950:

> "Planning provides a diagrammatic control of land use and circulation; architecture and engineering provide the structural network of buildings, utilities, and traffic ways which house the most detailed and refined social processes; landscape architecture organizes all the open space between and immediately around these structural elements, ties up the loose functional ends trailing from them, completes the three-

[59] Simo, Melanie L., *The Coalescing of Different Forces and Ideas: A History of Landscape Architecture at Harvard, 1900-1999*, (Cambridge: Harvard University Graduate School of Design, 2000), p.2

> dimensional pattern and continuity of our physical surroundings, and establishes a direct re-creational [*sic*] relationship between man and nature."[60]

Eckbo delimits the discipline of landscape architecture through the notion that its practices establish spatial "continuity" by addressing the unfinished edges or residual spaces left over from other endeavors—the site of projection is here defined by the actions of external actors. In the citation above, the role of the landscape architect is subservient to the ambitions of planning, architecture, and engineering. In this scenario, a notion of landscape is ordered from the outside, and its role in creating "continuity" is to "complete" or close the gap between other logics. The permeability of the discipline, through a necessary reliance on outside actors, creates difficulties for its institutionalization within the academy and as a profession, where demand exists for the delimitation of a clear boundary against which one constructs expertise, authority, and claims to jurisdiction.

By the 1960s landscape architecture, at Harvard, was responding to the collapse of modern architecture—and the disciplinary free-for-all that ensued. The disintegration of CIAM and the verdict of failure for urban renewal within architectural discourse, were two symptoms of the overall collapse of the modern movement and were leveraged in the subsequent struggles for territorial control over urban and land-use problems between departments of architecture, planning, and landscape. One episode in the formation of new territorial limits unfolded inside the Graduate School of Design at Harvard; the dissolution of CIAM proved problematic for dean of the design school Josep Lluís Sert, who was simultaneously acting as both dean and president of the European organization. Politically Sert had to negotiate a new ground for himself; his relationships he had built with other professionals and attitudes towards design, had served to establish him as the dean of a prestigious design school, on the other hand, in order to maintain relevance in the new condition he would have to find ways to address the "crisis of the city" within the school.[61] His development of the interdisciplinary program in Urban Design (in 1960) for post-professional study was one such outcome; Urban Design was to provide a venue to focus specifically on issues of the city and to foster the integration of the three disciplines of

---

[60] Eckbo, Garrett, *Landscape for Living*, (New York: Architectural Record with Duell, Sloan, & Pearce, 1950) p.98

[61] Alofsin, Anthony, *The Struggle for Modernism: Architecture, Landscape Architecture, and City Planning at Harvard*, (New York: W.W. Norton and Company, 2002), P.257

architecture, landscape architecture, and planning, in solving urban problems. After a few years, the program solidified its own domain of disciplinary expertise and as historian Anthony Alofsin notes, "Its creation also added a fourth department to the school and signaled an increasing movement away from the unification of the design arts at a basic level."[62] Upsetting the basic trinity of professions, the formation of Urban Design was (and is) symptomatic of the continually shifting boundaries between disciplines. In response to pressures from configurations such as Urban Design, Landscape Architecture had to clearly delineate the site of its operation, with a representational language and particular emphasis on forms that would allow it to distinguish itself from its competitors.

One figure from the Department of Landscape Architecture, Professor Norman T. Newton, lectured on landscape architectural history in the United States from 1840-1950.[63] His lectures visited the changes in the structures of patronage for the profession, related to both economic and social change occurring in the US. He published an article along these lines in the *Landscape Architecture Quarterly* (official organ of the American Society of Landscape Architects), in 1964. The ASLA had declared that 1965 would be the "Centennial Year of Landscape Architecture," and asked Newton to reconstructs an historical schema of the discipline by tracking shifts in patronage across a hundred year period. Newton, and the editors at *Landscape Architecture Quarterly* reveal their hand at the outset of the article. The editor prefaces Newton's article, writing that as a consequence of the dominance of the modern movement:

"[...] ignorance of landscape architecture as a profession, and insensitivity to landscape values as a part of the total environment, have pervaded both schools and the practice of architecture in the US during the past 30 years. The author suggests that architectural students of the new generation are aware of these gaps in their training, and have become alert to the necessity for collaboration among design professionals."[64]

The editor's (and Newton's) anxiety over the marginal status of landscape architecture and the pointed remarks about "gaps in [architect's] training," paired with an appeal to the "necessity for collaboration," leads to a narration of history where the failure of the modern movement offers a potential boon for the landscape architect—nonetheless, in Newton's

[62] Alofsin, p.258

[63] Simo, p.48

[64] Newton, Norman T.,"100 Years of Landscape History," *Landscape Architecture Quarterly,* Spring, 1964, p.264

story the landscape architect still finds himself warding off other disciplinary formations for control over territory.

The article does not emphasize changes in the conceptual basis of the discipline, or look at shifting ideas of nature, nor is it necessarily a complete survey of all of the fluxuations in the types of patrons the profession garnered, but attempts to erect a narrative whereby the landscape architect possesses a historically consistent strain of expertise. The schema he constructs begins with the collaboration of architects and landscape architects in the "Epoch of Big Residential Work," epitomized by Olmstead's office at the turn of the twentieth century—until, he explains, the crash in 1929 and the subsequent decline in the number of large estates. In Newton's narration, this era was followed by an increase in home ownership, creating a "problem of the small residence," where the pixilation of territory forced the landscape architect to cede authority to grass seed manufacturers, makers of elixirs for plant growth and pest control, and "landscape nurserymen." Newton then argues that this necessitated a change in the way the landscape architect positioned himself, whereby he became involved in town planning and real estate development projects. This type of work intersected with the already existing strain of work in the discipline directed towards issues of city and regional planning. In the article's "centennial" framework, landscape architecture's engagement with planning marked a move away from the large private office to the individual designer, or planner, working with, or for, the state. The author laments the fact that the move towards working in the governmental register, has caused the landscape architect to focus to heavily on, "statistical analysis, [the] formulation of broad programs, legislation, administration, and political science in general," as opposed to the aesthetic priorities of the "visible," constituting design. In the '50s and '60s there are attempts to bridge this gap by quantifying and systematizing visual values as well, such that they can be drawn into relation with other forms of data. Always present in the discipline is the struggle between these two modes of thought, the visual and statistical, and uncertainty about where greatest authority lies. For Newton, "design" is the place from which the landscape architect can claim his expertise. Again, this site was threatened by the formation of Urban Design at Harvard in 1960, Newton writes, "Now, what of Urban Design? Anyone with a memory longer than three feet will find sardonic amusement in the current fashionability of this "new" field of collaborative endeavor—truly a phoenix risen from its own ashes."[65] He claims that urban design was really just a recycled term for "urban landscape architecture," and the fin-de-siècle City Beautiful Movement.[66] Perhaps it was the crisis urban design provoked, with its emphasis on the figure-ground relations within the city (those that landscape architecture desired to claim over after the disintegration of CIAM) that triggered the author's schematization of one hundred years worth of landscape history in 1964. The article represents a kind of disciplinary re-grouping, in an attempt to shore up a contiguous narrative that would serve to reinforce an imagination of the landscape architect's core of specialized knowledge and authority.

From a contemporary perspective, what appears conspicuously absent in Newton's schema is any direct indication of the growing ecological or environmental movement. This suggests that the specific modes of thought that characterized the concerns of the ecological and environmental movements at this time, psychology, biology, physiology, metabolic, and systems thinking, were still outliers from the mainstream of landscape theory. While they may have been outside the norm, they were not unknown. In the issue of *Landscape Architecture Quarterly* published prior to the issue that carried Newton's article, Ian McHarg writes of "A New Role for Landscape Architects." To his mind, the Landscape Architect becomes a kind of agent for the organic, he asks, "When administrators and planners convene to examine and resolve problems of regional, metropolitan, and urban scale, who is the spokesman for physical and biological processes?"[67] In speaking for these processes, McHarg suggests that the Landscape Architect will have the ability to stake out a realm of "enlarged professional competence."[68] The physical and biological allow for an expansion in the size of the project site, due to the territorial breadth of large-scale ecological processes, he writes that, "Regional land planning offers the possibility of assuming professional leadership for the conservation movement. In turn, conservation movement can provide an explicit philosophical and ethical basis fundamental to those professionals who wish to act as social consciences."[69] In the two-fold movement of attempting to assume leadership, while simultaneously relying on the existing principles of the "conservation movement" the

---

[65] Newton, p.264
[66] Newton, p.265
[67] McHarg, Ian, "School News: A New Role for Landscape Architects," *Landscape Architecture Quarterly*, Winter, 1963-1964, p.227-228
[68] McHarg, "School News," p.227
[69] McHarg, "School News," p.228

Landscape Architect is able to naturalize his "ethical basis," establishing grounds that are difficult to challenge, in the struggle for broader jurisdictional influence. Unlike the parallel (or even subservient) role for landscape architecture suggested by the earlier citation of Eckbo, McHarg envisions grander schemes for the role of the landscape architect, he writes, "The alliance between landscape architecture and the natural sciences, particularly ecology, is planned to produce regional land planning as a primary product, but also to provide a bridge between the natural sciences and the professions concerned with the physical environment."[70] The notion of the "primary product," is key in that it not only repositions the landscape architect in a hierarchal chain, it also raises the question of method as the mode through which this will happen. The 1950s and 60s witnessed the rise of scientism (emphasizing not only the natural sciences, but also the social sciences) across multiple realms of design. In some ways this was an attempt to capture some of the authority that existed at those registers.

The New Landscape:

The GSD's first annual conference in Urban Design was held in April 1956.[71] The conference focused on interdisciplinary, and many speakers addressed the need to focus on the relations between things, and the need to seek new forms of measure for these relations. Among the speakers were Richard Neutra, Charles Abrams, Garrett Eckbo, Jane Jacobs, Lewis Mumford, Sert, Sasaki, Jacqueline Tyrwhitt, and Grygöry Kepes. In 1953, Kepes curated an exhibit of scientific photographs and artworks at MIT entitled *The New Landscape of Art and Science* and in 1956 published a book of images and writings with the same title. The photos, scientific evidence, indexical traces, together constructed a new condition of "landscape." These photos exposed the interlocking mechanisms on the underside of a snail's tongue, the cartiligeous and moist relations amongst the cellular chambers of a tree branch, or the geodesic structure in a snowflake; they made visible the previously invisible, phenomena such as the differences in barking patterns between various breeds of dogs, to the elusive forces that structure a typhoon–implicit throughout was the idea that mere minutia when arrayed or accumulated could assume a degree of large-scale transformation

[70] McHarg, "School News," p.228
[71] Simo, p.46

and vice versa. The new forms of measure present in these images suggest that, entry points for an intervention into, or design with, "nature" had multiplied. Landscape, when described in terms of scale and phenomena, lays a path towards constructing an ontology of the environment; one that questions the previous borders between interior and exterior logics of being, and in some instances, reveals the extension of the human being into the surrounding things. A scalar understanding of nature was expanded as humans used new tools to extend their reach into both the very large and the very small, and Kepes expresses concern that as a society, "We try and cope with the exploded scale of things without the standards which would enable us to evaluate them."[72] The collection of indexical traces in the text aim to pin the ephemeral to the page in such a way that it can then be measured; the images suggest ways that, across many domains, attempts were being made to visualize, systematize, and regulate newly understood aspects of the physical environment. For Kepes the notion of landscape offers a mode of mental organization, which interposes in front of the abyss of nature, he writes, "Our natural "environment" –whatever impinges on us from outside–becomes our human "landscape" –a segment of nature fathomed by us and made our home."[73] He expands this into the realm of constructed imagery, when he writes, "If we are to understand the new landscape, we need to touch it with our senses and build images that will make it ours. For this we must remake our vision."[74]

Landscape and Research:

In 1959 *Landscape Architecture Quarterly*, published a multi-authored article titled "Research: An Almost Untapped Field of Deep Significance"; in the article research is put forth as a novel idea for the profession of landscape architecture. Yet, for one the authors, Campbell E. Miller, a southern landscape architect and Chairman of the Committee on Research of the ASLA, it is a necessary endeavor:

> "For there can be no doubt that change is the central fact of our age, affecting our physical environment and man's relationship to it. Perhaps the key factor is man's expanding ability and power to shape and control his

[72] Kepes, Grygöry, *The New Landscape*, (Chicago: Paul Theobald and Co., 1956), p.18
[73] Kepes, *The New Landscape*, p.18
[74] Kepes, *The New Landscape*, p.20

physical environment—to move and model the earth; to accelerate the process of plant life; to carry out prodigious constructions; to influence weather and control climate."[75]

As Miller outlines, it is the relation between humans and nature that necessitates rigorous study, because humans wield a "power [for change, that] still seems to exceed our knowledge of how to use it."[76] He calls for a course of field experimentation that would test these relations, loosely based on the principles of agricultural experiments. Therefore, positioning research as a supplemental process to established methods. The article that followed Miller's in the series, by landscape architect David Dobereiner, suggest two points of departure for research, a "low" and "high" approach. The "low" approach begins by "look[ing] for trouble [...then] analyze it quantitatively, qualitatively, and historically. Look for cures. [...] Analyze the cures in the same way. Make recommendation."[77] This analytical approach begins with the assumption of an object, a field of conditions defined in terms of identifiable symptoms and proscribed cures, and can therefore be methodologically constructed independent from the designer. The "high" approach begins by "Forget[ing] all the actual problems. [then] Project[ing] all trends in technology, science, and human ideals as far into the future as seems predictable. Out of these probable needs and techniques construct an imaginary ideal world as completely as possible. Examine the existing world in the light of the ideal one to chart the best and most economical sequence of changes in the predetermined direction."[78] This synthetic projective approach begins with the assumption of an empty site, pure representational space, and its processes are integrated with the internal mechanisms of the imagination, as such it cannot be separated from the designer.[79] A comparison between each of these author's conceptions of what research consists of reveals the split between an empirical approach that produces factual returns, information, and new technical innovations that can be fed into the existing practice of the discipline (Miller), and a methodological approach that produces exploratory design results in parallel to existing

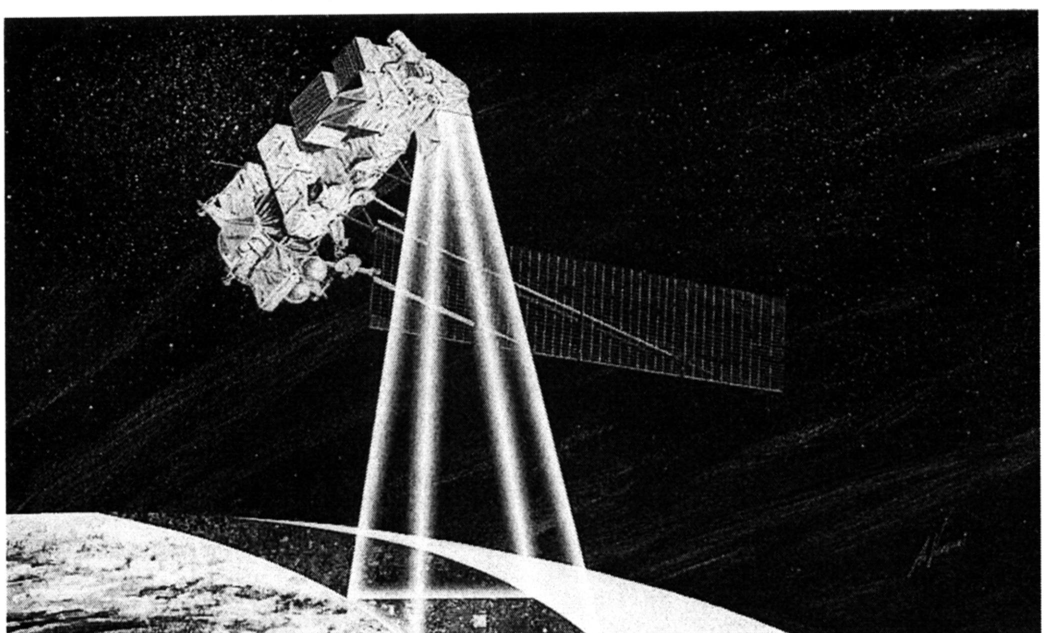
---

[75] Miller, Campbell E., "Research: An Almost Untapped Field of Deep Significance," *Landscape Architecture Quarterly,* (Winter, 1959-1960), p.100
[76] Miller, p.100
[77] Dobereiner, David, "Research: An Almost Untapped Field of Deep Significance," *Landscape Architecture Quarterly,* (Winter, 1959-1960), p.104
[78] Dobereiner, p.104
[79] In a recent lecture given by Steinitz, he frames this as a split between inductive and deductive reasoning.

practices (Dobereiner). A third stage in a design research paradigm occurs when method for-itself becomes both the ends and the object of study—this will be seen in the discussion of research that follows in the next chapter.

Outer-Space:

In the same article, Campbell E. Miller reveals the landscape architect's changing conception of landscape with the advent of endeavors into outer-space, when he writes, "Let us look at the floor of space—the land, which is the source of environment, the basis of life."[80] The vertical imagination of the landscape as the "floor of space," challenges an earlier pictorial understanding of landscape that was organized with reference to the datum of the horizon. With the change in directionality, one losses that referent and must replace it with a new coordinate system in order to establish a sense of continuity. Miller's article was written in 1959, two years after the launch of Sputnik. The technological reordering of the bodies in space, created a new field of referents, and altered an understanding of the relation between the metrics of time and the extents of the physical geography.



On October 4, 1957, a small, dense metallic ball, with the fragile legs of an arachnid, was dropped into the cold vacuum of space; that is, dropped amidst the ferocity and white heat of a five hundred and nineteen thousand pound R-7 launch rocket. At the correct

[80] Miller, p.100

moment, the sharply pointed nose of the rocket would have split open, its pieces falling into oblivion, releasing *Sputnik 1,* and allowing it to catch hold of an invisible orbit. Sputnik beeped. Sending signals, the satellite called out a simple message to a network of ground radios in the USSR as it circled the earth in a rapid ninety-six minute orbit. A minimal technological organism, the satellite was merely a sounding device; not only did it test the depths of the ionosphere, but it also gauged the reactions of those on the ground to the coming occupation of space. Soviet news agency Tass, reported, "Its flight, [...] will be observed in the rays of the rising and setting sun with the aid of the simplest optical instruments, such as binoculars and spyglasses."[81] With a reflective chrome exoskeleton its visibility was of primary import to the Soviets, who wished to exhibit their technological prowess as people all over the globe looked to the sky to try and catch sight of the swiftly passing spacecraft.[82] No longer could one be certain that a distant light in the sky was merely a piece of space debris, star, or visible planet, Sputnik had engendered a new understanding of artifice.

Prior to the launch of Sputnik, in 1946 the first images of earth from space were made with a camera attached to a V-2 missile launched from the desert of New Mexico. When the missile landed everything was destroyed, except for the protective cassette carrying the film. The grainy black and white photos that were recovered captured the curvature of the earth and the black depths of space meeting at the horizon, and were revelations to the scientists that took them.[83] Yet, if an event like the launch of Sputnik made a bigger impact on the historical register, it was perhaps because it was not merely the view of the earth from space that excited the imagination, but the suspension of an artificial body in the upper reaches of the atmosphere, generating the image of man's ability to effect large-scale change on the cosmos from an embodied place on the ground.[84]

---

[81] Jordan, William J. "Soviet Fires Earth Satellite Into Space; It Is Circling the Globe at 18,000 M.P.H.; Sphere Tracked in 4 Crossings Over U.S." *The New York Times*, October 5, 1957.

[82] In contrast spy satellites are painted black so as to remain undetectable.

[83] Taken from web article: (http://www.airspacemag.com/space-exploration/FEATURE-FirstPhoto.html)

[84] This is a sharply curtailed narrative of the uses of space, not touching upon the vast array of events that occurred and the complexities in politics, ideology, technological innovation, commerce in that technology, the sharing of information, and the collaborative versus

In the July of 1969, Neil Armstrong's boot landing in the soft soil of history symbolically broke the ground sustaining the fevered activities of 1960s space race. While competition was still a reality, once the goal of landing on the moon was met, the push towards outward exploration slackened and new modes of research had to be located that would occupy the efforts of the enormous institutional edifices dedicated to space.[85] The ERTS program (quickly renamed LANDSAT) launched its first remote-sensing satellite in 1972, representing a pragmatic turn in NASA's efforts. Its goal was to inaugurate a system for the continual production of data: an endless flow of images of the earth, produced by satellites. The first satellite launched orbited the earth on an eighteen-day rotation of image taking–today, imagining this and looking out the window, the sun moving across the face of a building becomes destabilized as I realize that if its degree of distance had been different it would have metered the environment in a different scale of measure. LANDSAT claims to be able to capture change on the earth, suggesting the making of a new calendar of knowledge.

On the movie screen an image of the earth hangs in the blue ink of space—amidst quavering music an animated rocket launches from the surface and towards the viewer as the narrator intones, "Thrusting out into space we gain new perspective on ourselves."[86] What follows in this promotional video about the Earth Resources Technology Satellite (ERTS) produced by NASA in 1973, is the predictable litany of scenic images of varying landscapes, evoking now well-worn arguments about the need to "safeguard" limited resources on "our cloud-wreathed spaceship, planet earth." Celebrated are images of productive landscapes, from cotton field to strip mine, as well as natural landscapes devoid of human and building alike, from ocean surf crashing under cyan sky to a clichéd ice-capped mountain scene, and set against these are the expected images of overpopulation, teeming crowds pressed to the edges of the frame to views of skyscrapers, sun glinting off the edges of their towering

---

agonistic aspects of outer space's extra-territorial status, or the large literature of fictive imaginations for the possibilities inherent in the exploration of space.
It does not aim to be comprehensive, but rather provide a few anchor points in the developments of the era in order to sketch out an outline of events that were in dialogue with the eventual development of LANDSAT.

[85] Mack, Pamela E.,"LANDSAT and the Rise of Earth Resources Monitoring," (http://history.nasa.gov/SP-4219/Chapter10.html)

[86] Earth Resources Technology Satellite (ERTS), (US National Archives and Records Administration: 1973)

modular figures. If the film were merely awash in this type of banal imagery, it would not be worth mentioning, yet, it goes on to illustrate the way in which data about the earth's surface was being methodically captured by the ERTS-1 remote-sensing satellite, laboriously processed, distributed, and put to use by various actors, from oil-prospecting geologist to urban planner preoccupied with the ills of the city.

As an animation describing the satellite's operation fills the screen, the narrator declares, "ERTS is a flying observatory."[87] He then explains the function of the two types of sensors on-board, the first set of three cameras, each sensitive to a different color band in the electromagnetic spectrum, the second a line scanning device sensitive to four spectral bands–all the devices together captured an image of one hundred nautical miles square with each metaphorical click of the shutter. As the animated globe rotates, the satellite painstakingly tracks forward, taking image after image in an orbital loop; as the narrator explains that due to the earth's rotation each orbital path is offset by 15,000 miles to the west at the equator–such that it makes three passes over North America daily and fourteen around the globe. The screen shows the earth accumulating bands of semi-transparent tape (representing each orbit)–slowly wrapping it in a surveillant shroud. The narrator promises the exacting totality of this process, explaining that the planet is "completely covered every eighteen days," that is, "except for small areas near the two poles."[88] This admission of a gap in the system reflects an inability to achieve total closure–due to the irreducible materiality of the technological apparatus. These gaps become more apparent each time the data is translated from one instrument to another, undergoing transmutation each time.

In the next scene we see a bank of human operators wearing headsets and short shirtsleeves; the narrator explains over the noise of whirring tapes and the clacking sound of information being transmitted, "At Goddard Space Flight Center at Greenbelt Maryland, the operations control center monitors the space craft's flight night and day watching every element of its operation and issuing orders that control its performance."[89] Again, the narrator is reinforcing a kind of temporal totality that can be achieved by the system. The view shifts to a technician in a light-blue lab coat, manually rolling tape from one reel to

[87] Earth Resources Technology Satellite (ERTS), (US National Archives and Records Administration: 1973)
[88] Earth Resources Technology Satellite (ERTS), (US National Archives and Records Administration: 1973)
[89] Ibid.

another as he stands at a massive grey machine. The film then cuts back to the drawn animation, showing the satellite as it emits penned radar beams aimed at the earth, while the narrator explains that each time the spacecraft comes over the artic horizon it sends its stored data to the nearest of three ground stations whereby the tapes produced are then shipped by "fast mail" to Goddard for central processing. At the Goddard station the film shows room after room of technicians working in stages to transcribe, translate, and re-order the different forms of data–eventually aerial images begin to emerge from a photo processor on a conveyor belt, one following another. The LANDSAT program represents an attempt at creating an integrated system that combines, sensory equipment (cameras, satellites, ground-relay stations), analogue and computational instruments for processing data (punch card machines, etc.), distributional networks (the US Postal Service), and human operators as live regulatory points in the system. The narrator concludes the scene by explaining that from the Goddard facility is shipped, "a daily stream of images and tapes," to their subscribers.[90]

In another montage from the film, narrator tells the viewer that the satellite offers an "ideal means to monitor change," and that these images have the ability to reveal, "an ocean chewing away at the edge of a continent, a desert's advance, a volcano's fury, a glacier's creep, the dynamics of land-use, and the growth and decay of cities."[91] Following this recitation of uncertainties and instabilities, a globe appears on the screen, slowly spinning. The narrator announces, "We can map the world from space and we can update the map as the world changes. There is no end to the variety of ways space imagery may help us."[92] Idealized in the suggestion of the "updateable" map, is the concept of the perpetual management of contingency in a systematic way–an ideal that was taken up across many realms at the time, specifically (for the story being recounted in this thesis) in the realm of city and regional planning.

---

[90] The recipients of the data are described as "more than 300 principle investigators, over 100 of whom are in some 35 countries throughout the world."
Earth Resources Technology Satellite (ERTS), (US National Archives and Records Administration: 1973)

[91] Earth Resources Technology Satellite (ERTS), (US National Archives and Records Administration: 1973)

[92] Ibid.

The parallels with urban planning were noted by the historian, Jennifer Light, who explained that the use of "aerospace techniques and technologies as a means to achieve "continuous master planning" for cities and even entire regions," was a cause championed by NASA.[93] But at play was not just the technology, but also the imaginary space of inquiry that was opened up by streams of images providing reams of instantaneous updates. The conceptual mechanism of this type of "continuous master planning," also has roots in Norbert Wiener's cybernetic theories, specifically those of feedback, which he describes as, "[...] the property of being able to adjust future conduct by past performance. Feedback may be as simple as that of the common reflex, or it may be a higher order feedback, in which past experience is used not only to regulate specific movements, but also whole policies of behavior."[94] With a feedback loop, the system is responsive to the change it effects when it enters the environment–absorbing the change back into its matrix, the system then adapts to the change while still maintaining its basic architecture of control and regulation. The plan, in this instance, is not a singular representational moment, but an adaptive mechanism and can be understood as what Wiener describes as an "apparently purposive organism" which, as it adjusts to inputs maintains its basic directionality, he writes, "It moves ahead from a known past into an unknown future and this future is not interchangeable with that past."[95]

---

[93] Light, Jennifer S., *From Warfare to Welfare: Defense Intellectuals and Urban Problems in Cold War America*, (Baltimore: John Hopkins University Press, 2003), p.118

[94] Wiener, Norbert, *The Human Use of Human Beings* (1950), (Cambridge: Da Capo Press, 1988), p.33

[95] Wiener, p.49

Chapter 3: The Science of Space

A document produced as a result of faculty discussion at a meeting held on September 26, 1956 in the Department of City and Regional Planning at MIT offers a potential insight into the way in which institutionalized research began inside of departments of architecture and planning. The document charts the terms laid out both in relation to the course of work to be pursued but also in terms of the object of study, the city. Under a subheading on "scope" the author of the report writes:

> "Studies, whether comprehensive or partial, of the function of the city as an artificial construction, and of the human objectives that might be served by such a construction, are inevitably involved. The central question might be put as follows: "What should be the physical form of the metropolitan region in the future, and what can we do to bring it about?" Studies of the historical development of the city, are of its present arrangement, therefore, would only be undertaken if they promised to throw light on this future-directed question. The research products should be not only of value within the general field of planning, but also of such a kind as can put to use by planners, in their performance of the planning function as professional operation."[96]

This citation clearly identifies the friction points that would later be the locus for struggle and exploitation by researchers. This is exemplified in last line in which "research products" are defined in terms of "use" indicating tools or instruments, and the planner as subject is defined in terms of "performance" and "function" calculated and accounted for as one part in the machine of "professional operation," explicitly constructing the desire for disciplinary circumference while destabilizing the subjective status of the designer.

The report constructs a discourse of the role research can play in the university, by invoking the need for a policy guiding, and more importantly, formalizing the research objectives within the department. Giving the broad outlines for policy directing research objectives, it states:

> "The term "research policy" suggests advance decisions on a number of aspects of a research program. These include:

[96] MIT Archives, Collection A400, Box 6, Folder "City Planning Misc."

(1) The scope of subject matter in terms of outer limits.
(2) The level of research.
(3) The magnitude of the desired program.
(4) The relationship to teaching. "[97]

The first three objectives, which address, latitude, intensity, and scale, are all aimed at bounding the research to establish and ensure an end product with a well-defined use-value. The posing of a limit, or in this case a rule to guide the limit creates a double movement of disciplinary control. On the one hand the reach for new forms of knowledge allows for an expansion (or maintenance) of expertise that keeps abreast of external change. While on the other hand, this reach must be contained in some way so as to maintain a clear boundary that the establishment of expertise hinges on. In this way, the expert's position is defined as much by what it is not, as by what it is. The meeting summary goes on to further define a program for research whereby, "[...] "program" is meant a coordinated group of projects aimed at coherent objectives."[98] The targeting of "coherent objectives" or a kind of consumable ends reveals a shift in the imagination of the form the products of design could take. The document goes on to explain that, "Such a program is far more likely to achieve a research "breakthrough" of worth and value than an equal quantity of uncoordinated effort." This statement further exposes the desire that clearly defined ends and means should be expressed in a program of research, and "breakthrough" indicates an imagined edge that pre-exists and can be broken past, recasting methods of planning into the mold of testing or experimentation. The last stipulation on the list above refers to the delineation of the relationship of research to teaching. It takes two inflections, one in terms of the heuristic function of participating research as a means of teaching a systematic way of working, and the other as a means to distinguish it from teaching in terms of its end result. The report clearly states, "We should not choose research for whose products we cannot identify a significant utility."[99] If process, or working method is the resultant product of a research program, as opposed to the development of a particular solution to a design problem, it can be argued that the critical difference the entry of the research model injects into schools of planning and urbanism is that method as a detached and transferable product becomes the exportable end. This can be seen in opposition to the education of the figure of the

[97] MIT Archives, Collection A400, Box 6, Folder "City Planning Misc."
[98] MIT Archives, Collection A400, Box 6, Folder "City Planning Misc."
[99] MIT Archives, Collection A400, Box 6, Folder "City Planning Misc."

architect or planners who will, they themselves, embody knowledge and carry it forth from the university and into practice as professional beings.

In this sense, design is dislocated from the designer as a process that can be intervened upon, itself the subject of inquiry, and it was imagined that its elements could be identified and restructured in a manner that was independent from the thinking subject. This dislocation was made possible by an epistemic shift in psychology and cognitive science that apprehended mental processes as that which could be studied and understood through biological, mechanical, or systematic means. Organizational theories such as notational systems, systems analysis approaches, operations research, and cybernetic theory, enter this gap that the designer as subject previously occupied. Studying design in-itself, as a way to standardize and systematize practice, was taken up by the architects of the Design Methods movement.[100] Figures such as Serge Chermayeff, Christopher Alexander, Constantinos Doxiadis, worked on ways to both organize designers working on problems, to design actual places themselves using these methods, and to disseminate these practices around the globe.

Today, the products of the design methods movement are often cast in the role of failures because they are historicized in terms of use or implementation. It can be argued instead that the techniques developed can be understood as having been absorbed into the bloodstream of practice in another way, by linking them to the rise of particular technologies for design, rather than attempting to think them as ending in a direct overlay onto an object, taking the form of a "project" or site of execution. If framed in this way, one can begin to question the location and role of the designer and schematize changes within the process of design. Instead of isolating the designer as the sole generator of process, one can look to the methodological artifice that represents a play of power between the designer and established method. Here one can return to the research group as a site of experimentation for the mediation technology makes between the designer and the project. The attempt to identify and qualify the location of the designer within the process of design and even augment aspects of the designer with new tools is critical to the way in which the research group correlates with technological innovation. In 1969 Nicolas Negroponte, working to develop "architecture machines," describes the split as occurring between "computer-aided

---

[100] Bayazit, Nigan, "Investigating Design: A Review of Forty Years of Design Research," *Design Issues: Vol. 20*, No. 1 (MIT, 2004).

architecture," and "robot architects."[101] The difference between the two is not always a firm line; he writes that there is an "[...] intimate association of two dissimilar species (man and machine), two dissimilar processes (design and computation), and two intelligent systems (the architect and the architecture machine)." He goes on to say, "By virtue of ascribing intelligence to an artifact or the artificial, the partnership is not one of master and slave but rather of two associates that have a potential and a desire for self-improvement."[102]

IBM 7094:

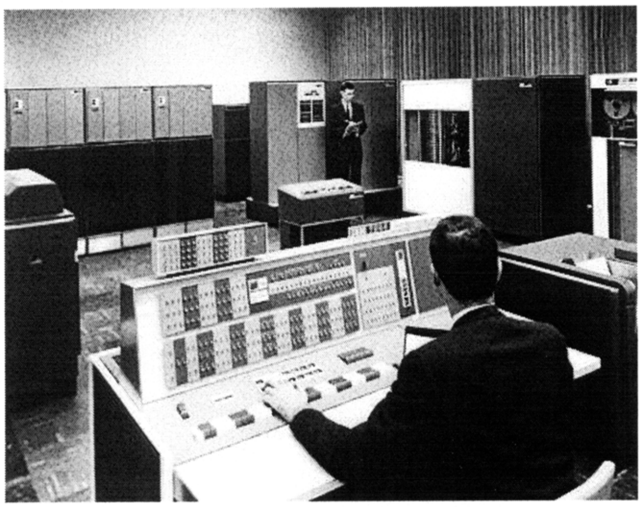


Image: (http://www-03.ibm.com/ibm/history/exhibits/mainframe/mainframe_PP7094.html)

The oft used, time-share computer at this time was the IBM 7094. Much of LARO's work was run on such a computer. Located within its own space, with its own bank of experts running it at Harvard, each group within the university needing computing power came to the 7094 to run their programs. In this sense, the artificially cooled room holding the time-share machine brought together many bizarre and disparate projects as researchers sought new ways to measure the world and the people in it.

Simulation:

Simulation, as one author recounts, "involves the use of a large number of techniques in a structured way."[103] This citation was taken from a text published in 1968, edited by political scientist from Wayne State University, William D. Coplin, titled *Simulation*

---

[101] Negroponte, Nicholas, *The Architecture Machine* (Cambridge: MIT Press, 1970).
[102] Ibid.
[103] Coplin, p.1

in the Study of Politics. This text was encountered in the endnotes of an article on urban simulation published in the *Journal of the American Planning Association* that featured LARO's *Experiment in Interdisciplinary Education.* The authors of this article explain that, "Social scientists need a laboratory, similar to those available to physical and natural scientists, with which to analyze man's urban environment and experiment with change. Operational simulation shows promise as a way to develop an urban laboratory."[104] They go on to explain, "A highly compact capsulization, social science simulation may offer its lessons faster to the participant than firsthand field observation can provide to the observer. It can also provide a common vocabulary and mutual frame of reference for all disciplines."[105] *Simulation in the Study of Politics,* reveals just how varied the exploration into simulation could be. The text features models from election simulations to simulations of complex geopolitical realities. The model pictured below, TEMPER: Technical, Economic, Military, and Political Evaluation Routine, was a Cold War analysis model designed in 1961 by Clark Abt, of Abt Associates in Cambridge. It was an attempt to use behavioral science to make the personality profiles of world leaders knowable, thus rendering them manipulatable or at the very least predictable. One can see the reconstitution of the subject across a multitude of realms at this time, using new tools of measure and relation to navigate a new reality of risk.

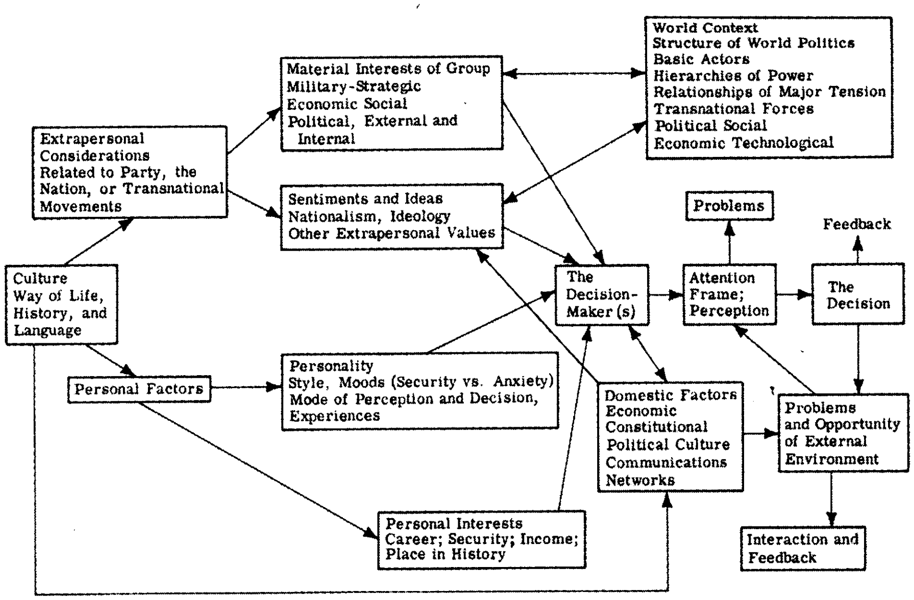


FIGURE 2. Outline of factors conditioning foreign policy decisions.

Image: Coplin, William, *Simulation in the Study of Politics*, (Chicago: Markham, 1968).

104 House and Patterson, p.383
105 House and Patterson, p.384

Conclusion

In *The Sciences of the Artificial,* Simon develops a subheading in his section on the science of design, by asking, "Who is the Client?" He writes, "It may seem peculiar to ask, "Who is the client?" when speaking of the design of large social systems. This question need not be raised about smaller-scale design tasks, since the answer is built into the definitions of the professional role of designers."[106] For smaller scale design projects, "this definition of the professional role," that of meeting a single client's specific needs, "greatly facilitates the development of technologies for each of the professions, for it means that consequences going beyond the client's goals don't have to enter into design calculations. The architect need not decide if the funds his client wants to spend for a house would be better spent, from society's standpoint, on housing for low-income families. The physician need not ask whether society would be better off if his patient were dead."[107] Simon further explains that, "[...] the traditional definition of the professional's role is highly compatible with bounded rationality, which is most compatible with bounded rationality, which is most comfortable with problems having clear-cut and limited goals." He writes, "[...] as knowledge grows, the role of the professional comes under questioning. Developments in technology give professionals the power to produce larger and broader effects at the same time that they become more clearly aware of the remote consequences of their prescriptions." Simon, writing from this moment, on the verge of the 1970s, explains that, "Almost all of the professions today are undergoing self-examination as they experience the pressures generated by these complications in their roles."

Simon singles out the architecture as a profession particularly susceptible to this stress. He writes that, "Architects are especially conflicted for several reasons. First, they have always assigned themselves the dual role of artist and professional, two roles that often

---

[106] Simon, p.173
[107] Simon, p.173

make inconsistent demands."[108] In other words, Simon's observations point to the problematics of the question: Who is the architect responsible to? Between the roles of the artist and the professional, Simon explains that there is a kind of continuum along which one slides, from aesthetics to legality. *The Sciences of the Artificial* represents an attempt to redefine notions of who engages design, be they in the realm of "engineering, medicine, business, architecture, [or] painting," and how they negotiate change or innovation within the limits of their professional or disciplinary roles.[109] At this time, this line of questioning is coupled with Simon's advocacy for the use of the principles of science as a way to systematically to study the effects of both new technologies (computers, simulations, robots, etc.), and social configurations (corporations, market innovations, new planning bodies, etc.). As he notes above, these developments in technology and organization offer the designer more control, but often bring along a set of unintended consequences. He proposes a science of the artificial as a way to study this problem. Simon is one of many figures at this time who were attempting to use behavioral science and social science to locate the subject within new technologies and social configurations. While working to define the subject through these means, he notes that, "These same developments cause the professional to redefine the concept of the client."[110]

By looking at this moment in history through the lens of people like Simon, and designers, like those working at the Landscape Architecture Research Office, one can see the struggle to apprehend the subject being designed for. At this moment in the 1960s and 70s, the universal subject of modernist discourse was destabilized, if not gone, and one can see the attempt being made to find a new subject, using the measuring tools of demographics, statistics, and social sciences. Furthermore, in looking at the discipline of landscape architecture specifically, it is possible to see the subject imagined through architectural discourse changing radically. Emerging concepts of the environment, as the space that speaks to the relation between man and nature, and new concerns as to the importance and fragility of this relation opened up the question of the architect's responsibility to further debate.

---

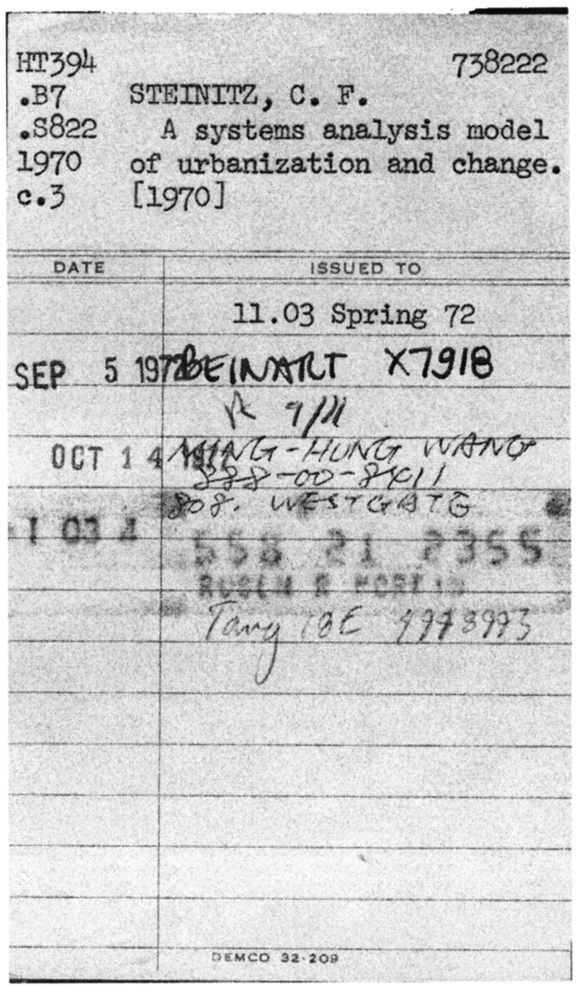
[108] Simon, p.175

[109] Simon, p.xi

[110] Simon, p.174

The *Comparative Study* reveals the attempt to render a portrait of the subject of the environment through maps. The ability to combine and compute multiple sets of data allowed one to test and visualize multiple hypotheses of cause and effect. Developments in space and remote-sensing imagery reveal that change that Simon identifies as the professional's ability not only to "produce larger and broader effects," but to " become more clearly aware of the remote consequences of their prescriptions." *An Experiment in Interdisciplinary Education* along with the other simulation studies produced by LARO, attempt to take this line of inquiry to the next level. These experiments tested the relation between the architect and his subject, by allowing one to see the impacts of multiple outcomes of a string of decisions through a representational system. The researchers were attempting to remake this moment as a game of strategy, teaching the architect or the planner how to negotiate the often-irrational logics of a more complex world. Beyond a vague and ill-defined sense of responsibility towards the global environment hovering on the horizon, and occasionally creeping into the work, LARO's project for developing new methods of working, and new instruments for design, left open the question of subject. This is not to say that a subject was not produced through their work, but rather that they reflexively avoided such a question by attempting to array a series of options, or to create a machine with many moving parts.

In many ways this thesis is an excavation of my own history as an architecture student. Opening to the last page of *An Experiment in Interdisciplinary Education,* I pull out the now antiquated card in the back that records all people that have borrowed the text from the library. The first person to have checked out this book was Julian Bienart, in 1972. I felt a small jolt of surprise as I realized that this was the same Bienart whose class I had sat in three semesters ago. This shouldn't have come as a shock, as I knew quite well I was working on a not so distant history of MIT and Harvard, but it made me realize just how present the legacy of these early technologies and techniques are within the school today, even as they change. This was further reinforced when I looked at the booklet that was produced for the impending SMarchS thesis defense, compiling abstracts and reflections on student projects. The opening pages explain that SMarchS is a course in advanced research, and then rhetorically asks, What is research for? The projects that follow explore ask a range of questions from those that examine uncertainty principles in computation, to those that ask how digital design and fabrication can be integrated with craft production, to those that create simulation models, such as one that attempts to optimize delivery times through an urban bicycle network. These projects, which operate through the logic of advanced research, resonate with those of LARO and the other research groups formed in the '60s and '70s in their search for a new subject of design outside existing disciplinary limits.


HT394 738222
.B7 STEINITZ, C. F.
.S822 A systems analysis model
1970 of urbanization and change.
c.3 [1970]

DATE	ISSUED TO
	11.03 Spring 72
SEP 5 1972	BEINART X7918
OCT 1 4	MING-HUNG WANG
	808. WESTGATE
	558 21 2355

DEMCO 32-209

Bibliography

Alofsin, Anthony, *The Struggle for Modernism: Architecture, Landscape Architecture, and City Planning at Harvard*, (2002)

Belknap, Raymond K. and John G. Furtado, *Three Approaches to Resource Analysis Methods*, (Cambridge: Harvard University and The Landscape Architecture Research Office, 1967)

Bayazit, Nigan, "Investigating Design: A Review of Forty Years of Design Research," *Design Issues: Vol. 20*, No. 1 (MIT, 2004)

Chrisman, Nicholas, *Charting the Unknown: How Computer Mapping at Harvard Became GIS* (ESRI Press: Redlands California, 2006

Coplin, William D., *Simulation in the Study of Politics*, (Chicago: Markham Publishing Company, 1968)
Chapter 3: A propositional Analysis of the International Relations Theory in Temper- A Computer Simulation of Cold War Conflict, Walter C. Clemens, Jr.
Chapter 6: The Environment of Decision-Makers in Urban Gaming Simulations, Paul H.Ray and Richard D. Duke

Cosgrove, Dennis, *Else/Where Mapping- New Cartographies of Networks and Territories,* Janet Abrams and Peter Hall, eds., (Minneapolis: U. of Minnesota Design Institute, 2006)

Dutton, Geoffrey, and Jacqueline Cohen, *The Laboratory: An Historical Overview (1965-81)* (http://lcgsa.mannlib.cornell.edu/lcgsa/uploads/lcghist22all.pdf)

Earth Resources Technology Satellite (Erts) 1973, [Film], January 1st, 1973, ARC ID: 649405, National Archives and Records Administration, [http://video.google.com/videoplay?docid=-8504268492805084986]

Foresman, Timothy W., ed., *The History of Geographic Information Systems: Perspectives from the Pioneers*, (Baltimore: University of Maryland, 1998)

Haglund, Karl, *Inventing the Charles River*, (Cambridge: MIT Press, 2002)

House, Peter and Phillip d. Patterson, "An Environmental Gaming-Simulation Laboratory", *Journal of the American Planning Association*, (November, 1969)

Kepes, Grygöry, *The New Landscape*, (Chicago: Paul Theobald and Co., 1956)

Light, Jennifer S., *From Warfare to Welfare: Defense Intellectuals and Urban Problems in Cold War America*, (Baltimore: John Hopkins University Press, 2003)

Lynch, Kevin, *The Image of The City* (Cambridge: MIT Press, 1960)

Mack, Pamela E.,"LANDSAT and the Rise of Earth Resources Monitoring," (http://history.nasa.gov/SP-4219/Chapter10.html)

Mack, Pamela E., *Viewing the Earth: The Social Construction of the Landsat Satellite System*, (The MIT Press: Cambridge, 1990).

Martin, Reinhold, *The Organizational Complex: Architecture, Media, Corporate Space* (Cambridge: MIT Press, 2003)

Martin, Reinhold, *The Organizational Complex: Architecture, Media, Corporate Space* (Cambridge: MIT Press, 2003)

Martin, Reinhold, "Environment c.1973," *Grey Room* Winter 2004, No 14: 78-101

McHarg, Ian, "School News: A New Role for Landscape Architects," *Landscape Architecture Quarterly*, Winter, 1963-1964, p.227-228

McHarg, Ian L., *Design with Nature*, (The Natural History Press: Garden City, New York: 1969).

Miller, Campbell E., "Research: An Almost Untapped Field of Deep Significance," *Landscape Architecture Quarterly*, (Winter, 1959-1960)

Negroponte, Nicholas, *The Architecture Machine* (Cambridge: MIT Press, 1970)

Pickles, John, *Ground Truth: The Social Implications of Geographic Information Systems*, (1995).

Simo, Melanie L., *The Coalescing of Different Forces and Ideas: A History of Landscape Architecture at Harvard, 1900-1999*, (Cambridge: Harvard University Graduate School of Design, 2000)

Simon, Herbert, *The Sciences of the Artificial*, (Cambridge: MIT Press, 1969)

Sutton, Francis X., "The Ford Foundation and Columbia," University Seminar on Columbia University, 16 November 1999. (http://beatl.barnard.columbia.edu/cuhistory/fordfoundation.htm).

Steinitz, Carl, *Congruence and Meaning: The Influence of Consistency Between Urban Form and Activity upon Enviromental Knowledge*, PhD. Thesis, Massachusetts Institute of Technology, (1967).

Steinitz, Carl, Timothy Murray, David Sinton, and Douglas Way, eds., *A Comparitive Study of Resource Analysis Methods*, [Under Contract with the Department of the Army New England Division, Corps of Engineers, Waltham, Mass.] (Department of Landscape Architecture Research Office, Graduate School of Design Harvard University: Cambridge, 1969).

Steinitz, Carl, and Peter Rogers, *A Systems Analysis Model of Urbanization and Change: An Experiment in Interdisciplinary Education*, MIT Report No.20, (Cambridge: MIT Press, 1970)

Steinitz, *The Interaction between Urbanization and Land: Quality and Quantity in Environmental Planning and Design*, (Cambridge: Harvard University and The Landscape Architecture Research Office, 1973)

United States Army Corps of Engineers (New England Division), *Charles River Watershed Massachusetts: Main Report and Attachments*, (1972)

United States Army Corps of Engineers (New England Division), *Charles River Watershed Study*, (1967)

Upitis, Alise, *Natural Normative: The Design Methods Movement, 1944-1967*, unpublished thesis

Wiener, Norbert, *The Human Use of Human Beings* (1950), (Cambridge: Da Capo Press, 1988)