THE UNIVERSE OF DESIGN

HORST RITTEL'S THEORIES OF DESIGN AND PLANNING

JEAN-PIERRE PROTZEN AND DAVID J. HARRIS

ROUTLEDGE

The Universe of Design

Design is the fundamental act of intelligence; it is the making of plans to shape the world to our needs. This book examines the theoretical foundations of the processes of planning and design.

Different types of design—creating an urban plan, drawing a floorplan, or drawing up a business plan—share characteristics; their reasoning, processes, and problems all have similarities. For a long time, the dominant theories in these areas have attempted to use objective, mathematical methods for design. But as researchers in many fields are beginning to discover, design problems are "wicked": they cannot be brought under control by rational or scientific means.

Forty years ago, as Herbert Simon was writing his classic work on design, *The Sciences of the Artificial*, which argued for the general applicability of rational methods, Horst Rittel, professor at the University of California, Berkeley, and former head of the Hochschule für Gestaltung, Ulm, was describing the characteristics of design problems that make such rational methods inappropriate. Best known for his idea of "wicked problems," Rittel, who was trained as a mathematician and systems analyst, studied the process by which designers in many different fields worked and pioneered a school of design theories and methods that attempted to rehabilitate the use of rationality by recognizing its limits and developing practices that did not depend on demonstrably false assumptions about rationality.

Rittel's work is of relevance to any field planning for the future. He recognized the central nature of human values, and explored how to design when these questions of value are of primary importance.

Jean-Pierre Protzen is Professor of the Graduate School at the University of California, Berkeley. He was Horst Rittel's colleague and collaborator for over twenty years and since Rittel's death in 1990 has continued teaching Rittel's work at Berkeley.

David J. Harris was Protzen's student at Berkeley, and his dissertation, "Design Theory: From Scientific Method to Humanist Practice," relied heavily on Rittel's work. He currently works as an editor and writing coach.

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Horst Rittel's Theories of Design and Planning

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To the memory of Horst Rittel

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Preface

In 1966 I obtained a research grant from the Swiss National Science Foundation to go to Berkeley to investigate cities as communication networks. My colleague at the Swiss Institute of Technology (Eidgenössische Technische Hochschule (ETH)) in Zurich, Lucius Burckhardt, exhorted me to introduce myself to Horst Rittel in Berkeley's Department of Architecture. Burckhardt had known Rittel at Ulm, where both had taught at the Hochschule für Gestaltung and therefore was well acquainted with Rittel's work in design and planning methodology. Burckhardt's recommendation proved to be one of the most consequential counsels I ever received.

Rittel, upon hearing about my project, not only took an immediate interest in it but also had many helpful suggestions with regard to literature to review, people to talk to, as well as of how I could go about the project. In short, he became my mentor.

Rittel, at the time, had established, among others, an introductory course to Design Theories and Methods, Architecture 130. This course was an outgrowth of a seminar, Science and Design, he held for the faculty at the time he joined the Department of Architecture in 1963. It was a revelation to me. Rittel's portrayal of the work of designers explained many of the frustrations I had experienced in my earlier career as a practicing architect. I became interested in the topic and soon Horst asked me to teach the course in his absence.

From there on we became colleagues and friends. Our children played together; together we traveled the world, taught and worked. At Berkeley we expanded the Design Theories and Methods curriculum of the Department and taught a variety of related courses, including design studios with an emphasis on the procedural aspects of design. And over the years we collaborated on numerous projects dealing with information systems for planners and government agencies at the Studiengruppe für Systemforschung in Heidelberg and at the University of Stuttgart.

When Horst died in 1990, a few days before his 60th birthday, I promised myself that I would assemble his innumerable lecture notes and other unpublished material and try to write a synopsis of his work. Although I continued to teach the Design Theories and Methods material and have done so until today, the project dragged on for a variety of reasons, not the least of which was my research on ancient architecture in South America. The project, however, came back into focus when, through the intermediary of the head librarian of Berkeley's College of Environmental Design, Elizabeth Byrne, I met Hugh Dubberly, who, at the time, was assembling the most extensive bibliography of Horst Rittel's work (Rith and Dubberly 2007).

Animated by Dubberly's efforts, I joined forces with Dr. David Harris, a former student and teaching assistant of mine in the Design Theories and Methods program at Berkeley. Although David never met Horst, he is thoroughly familiar with his writings and teachings and used Rittel's work in a prominent role in his doctoral dissertation (Harris 2002). From the start of our project, David and I discussed how and with which manuscripts and lesser-known publications of Rittel's we could best represent the scope of his work and the development of his theories of design and planning over time to an English-speaking audience. We kept this discussion alive throughout the project, which has taken many turns before it found its final form. We are confident that we have reached our goal. However, we should remind the reader that what we present is only one aspect, albeit perhaps the most significant, of Rittel's work. His life work was multifaceted, encompassing such fields as chemistry, artificial intelligence, theory of technology, and information theory. Needless to say, a complete synopsis of his work would require another book.

Berkeley, June 2009
Jean-Pierre Protzen

Acknowledgments

We would like to thank Elizabeth Byrne, head librarian of the College of Environmental Design at Berkeley, for supporting our project. She has been most helpful with all kinds of library-related issues. In addition, it was she who put us in contact with Hugh Dubberly of Dubberly Design Office in San Francisco.

Hugh Dubberly recognized the significance of Horst Rittel's work for designers and set out to compile a complete bibliography of his writings. Hugh's effort led not only to our collaboration, but also inspired us to assemble the present book. We thank him for both.

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Chapters 1.1 and 4.1 were originally published in German as *Uberlegungen zur wissenschaftlichen und politischen Bedeutung der Entscheidungstheorie*, (1963 Karlsruhe: Gesellschaft für Kernforschung) and *Technischer Wandel und Stadtstruktur*, (in "Stadt, Kultur, Natur. Chancen zukünftiger Lebensgestaltung", edited by Rudolf Wildenmann, Baden-Baden 1989) respectively. Both have been translated into English by Jean-Pierre Protzen.

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Prologue

The study of the activities of design or planning is a relatively new field, dating back to the middle of the twentieth century, yet one that has gained significant influence in the practice of planning and building. Horst W. J. Rittel, a pioneering design theorist, contributed significant theoretical and practical ideas that have shaped the field. Some of them, such as the notion of "wicked problems," have gained either fame or notoriety, depending on whom you ask;[1] others are less well known, mainly because they were never published, have appeared in publications with limited distribution, or were published in German only. It is the purpose of this publication to bring some of these lesser-known ideas to a wider audience.

Brief History of Design Theories and Methods

A comprehensive history of the discipline of Design Theories and Methods (DTM) has yet to be written, but there is no doubt that Horst W. J. Rittel played a pivotal role in its formulation and development. DTM arose out of an era in which scientific and purely rational methods were revered, not least for the tremendous changes that had been brought by technological development and industrialization. DTM was born from the assumption and hope that by studying the activity of design and developing rational methods one could improve the process and thereby bring about better designs. At the core of the discipline are such questions as what is design? How is design possible? What is the nature of design problems? How do designers reason? What kind of knowledge do they use and how is that knowledge structured and acquired? What procedures do designers follow and what is the logic of these procedures? Can design be taught, and if so how?

Design here is to be understood in a very broad sense. Horst Rittel defined it as "an activity that aims at the production of a plan, which plan—if implemented—is intended to bring about a situation with specific desired characteristics without creating unforeseen and undesired side and after effects."[2]

Design so defined is a purposeful activity which implies thinking before acting. The outcome of design is not a thing or an object, but a plan or a set of instructions, which in most cases are left to others to execute, if they are executed at all. Designers worry about the potential consequences of their planned actions. To anticipate the consequences, they vicariously manipulate the world in simulations and models, asking "what if" questions. Designers do not have any direct feedback from the real world until after their plans are implemented; they do not have the luxury of trial and error in the real world.

Design, so defined, covers a wide range of activities and is not limited to

any particular profession. The lawmaker drafting a new law, the city planner devising strategies to manage urban growth, the engineer proposing actions to reduce traffic jams, the scientist conceiving an experiment, the manager conjuring up a new advertising campaign—all are designing, but so is everybody else: we carry an agenda, plan our careers, establish college funds for the education of our children, and make shopping lists. Everybody designs at least some of the time; nobody designs all the time.

Some people hold that designing and planning are two distinct activities: an architect designs, a traffic engineer plans. Rittel made no such distinction; in fact, he considered the terms to be synonymous, which is consistent with common usage, both current and historical.[3] Rittel's use of the terms as synonymous is consistent with his general definition of design, and reveals his focus: he was looking at the nature of the problem and questions of how to solve the problems better.

Rittel always wondered why this human ability to plan for the future has not received the same attention as epistemology, that is, the study of the human ability to know, to know that we know, and to know what we know to be true, a field that has preoccupied philosophers since the dawn of time. In 1987, at a conference on Design Theories and Methods in Boston, Rittel mused that "[i]t is one of the mysteries of our civilization that the noble and prominent activity of design has found little scholarly attention until recently." Considering the real and practical impact of design on our world, and that it changes people's lives for better or worse, it is the more curious that design has not come under greater scrutiny.

The "activist" phase

In his book *Method in Architecture* (1984), Tom Heath argues that the discipline of Design Theories and Methods may have its origin in the recognition, perhaps first articulated by Viollet-le-Duc in 1872, that design problems are becoming so complicated that they escape the designer's intuitive grasp:

> It must needs be confessed that modern architects, surrounded as they are by prejudices and traditions and embarrassed by historical confusion in respect to their art, are neither inspired by original ideas or guided by definite and well understood principles; a fact the more plainly betrayed the more elaborate and complex are the monuments they are called upon to design and execute.
>
> (Heath 1984: 13)

Some 90 years later, Christopher Alexander, in his *Notes on the Synthesis of Form* (1964), echoes Viollet-le-Duc's concerns:

> Today functional problems are becoming less simple all the time. But designers rarely confess their inability to solve them. Instead, when a designer does not understand the problem clearly enough to find the order it really calls for, he falls back on some arbitrarily chosen formal order. The problem, because of its complexity, remains unsolved.
>
> (Alexander 1964: 1)

Alexander noted that, while there are "bounds to man's cognitive and creative capacity," it is also true that man has found means to overcome at least some of his limitations. He pointed to arithmetic, where we have developed algorithms that allow us quickly to perform operations on the back of an envelope that we could not do in our heads. We have devised means to represent the complication of, say, a long division, such that we can handle it. "But at present we have no corresponding way of simplifying design problems for ourselves" (Alexander 1964: 6).

In its modern form, the discipline may be traced back to World War II, when complex military logistical problems were in want of new planning and decision-making tools. For this purpose new mathematical procedures were developed that today are known by such names as *operations research*, *systems engineering*, and *systems analysis*. These new approaches owe much to the notion of "open systems," first formulated by the Austrian biologist Ludwig von Bertalanffy in the late 1920s and to Norbert Wiener's notion of "cybernetics" or the theory of feedback loops. As opposed to closed systems, open systems, as exemplified by biological systems, depend for their survival on the exchange of energy and information with their environment. Cybernetics provides the theoretical framework for studying and understanding how the interaction of an organism (or a mechanical system) with its environment affects its behavior.

After World War II these methods took hold of the field of design, as witnessed by such texts as *Introduction to Design* (1962), by Morris Asimow, Professor of Engineering at the University of California at Los Angeles; *Product Design and Decision Theory* (1963), by Kenneth Starr, Professor of Production Management at Columbia University; *The Sciences of the Artificial* (1969), by Herbert Simon, Professor of Political Science at Carnegie Mellon University; *Systematic Methods for Designers* (1965), by L. Bruce Archer, Professor of Design Research at the Royal College of Arts; *Vers une architecture scientifique* (1971), by the French architect Yona Friedman; and the already-mentioned *Notes on the Synthesis of Form* (1964), by Christopher Alexander. The emerging discourse on DTM crystallized and established itself as a discipline at the first conference on design methods, the "Conference on Systematic and Intuitive Methods in Engineering, Industrial Design, Architecture, and Communication," held in London in September 1962 (Jones and Thornley 1962). As the title of the conference suggests, design was then recognized as an activity that transcends professional boundaries.

The application of methods for design and planning, in fact, spread further than the conference would indicate. Other fields and professions had equally embraced the ideas and methods of systems thinking and operations research, most prominently City and Regional Planning, Education, and Public and Business Administration; such methods were applied to management techniques and organization design, and to concerns about the course of humanity.

In 1947 Herbert A. Simon first published his *Administrative Behavior: a study of decision-making processes in administrative organization*, which gave rise to what today is called management science. His work spawned other works, for example, Jacob Marschak's "Towards an Economic Theory of Organization and Information" (1954), or Horst W. J. Rittel's "Hierarchy vs. Team? Considerations on

the Organization of Research of R&D Co-operatives" (1965), both texts searching for the most efficient work organization given a particular task.

1954 saw the founding of the Regional Science Association International, a group of multi-disciplinary researchers under the leadership of Walter Isard, dedicated to the rigorous scientific analysis of the "regional impacts of national or global processes of economic and social change" (RSAI 2008). Within this field one finds the work of a colleague of Rittel's at Berkeley, William Alonso, best illustrated by his *Location and Land Use: Toward a General Theory of Land Rent* (1964).

In the early 1970s Andreas Faludi wrote *Planning Theory* (1973), which he described as "a venture in establishing planning theory as an intellectual endeavor aiming at solving some of a whole range of problems which planners face" (1973: ix).

A dramatic and controversial application of systems analysis and modeling was Jay W. Forrester's *World Dynamics* (1971), which tried to predict what would happen to world resources as the population continued to increase. This model, commissioned by the Club of Rome, formed the basis for its first report, *The Limits to Growth* (Meadows *et al.* 1972), which, since publication in 1972, has been translated into 30 languages and sold over 30 million copies. Much maligned at the time, with the current revived concern with climate change and environmental degradation, the report is gaining new significance: "in hindsight, the Club of Rome turned out to be right. We simply wasted 30 years by ignoring this work" (Simmons 2000: 72).

The reflective phase

The "activist" phase, in which professions across the board imported and applied these techniques on small and large scales, was soon to be followed by a reflective phase, in which practitioners and researchers alike took stock of the successes and failures of these techniques and started to question their basic underlying assumptions and theories.

Prominent among those who questioned the basic assumptions of the new methods were C. West Churchman and Ida R. Hoos. The former, in his *Challenge to Reason* (1968), tried to answer the question: "How can we design improvement in a large system without understanding the whole system, and if the answer is that we cannot, how is it possible to understand the whole system?" (Churchman 1968: 2). The latter, in her *Systems Analysis in Public Policy: a critique* (1969), challenged the evaluation methods prevailing in education, waste management, and healthcare. She saw in these methods a "kind of quantomania," or as she put it later: "What you could not count did not count. The social and human aspects were systematically avoided in the rush to be scientific" (Hoos 2009). More specifically, Horst Rittel and Melvin Webber, in "Dilemmas of a General Theory of Planning" (1973), called attention to some of the mistaken beliefs of the "scientification" of planning, and explained how planning problems differ from scientific problems. At the same time, Aaron Wildavsky, in his article "If Planning is Everything, Maybe it is Nothing" (1973), argued that planners have become victims of planning; their creation has overwhelmed them. In a similar vein, John Friedmann, in his *Retracking America* (1973), proclaimed, "[o]ur inherited notions of planning are dead" (xiii).

He traced those inherited notions back to Frederick W. Taylor and his scientific management, and into the present day under the name of operations research and systems analysis.

Rittel, in another article, one included here, "On the Planning Crisis: Systems Analysis of the First and Second Generations," went beyond critique to propose a different approach, a second generation. Independent of Rittel and some years later, Donald Schön, through his critique of what he called the epistemology of technical rationality, reached similar conclusions and proposed a new kind of planner, *The Reflective Practitioner* (1983).

The reflective phase spawned its own political activism in the form of advocacy planning and participatory or community design. Suspicious of technocratic elites and critical of the logical positivism that guided urban planning, Paul Davidoff, in his "Advocacy and Pluralism in Planning" (1965), argued that just as a defendant in a court of law is represented by an attorney knowledgeable in the law and legal procedures, urban communities, the poor in particular, should be represented by planners that would argue their case before planning bureaucracies. These movements have the merit of having recognized planning problems to be neither technical nor scientific, but political—"political" in the sense that they are about the allocation and distribution of resources and that they should be dealt with in the political arena.

Yet these movements ran afoul of bureaucracies once they were co-opted by government agencies and institutionalized. In his *After the Planners* (1971), Robert Goodman provides a rather scathing criticism of advocacy planners and the system in which they operate.

The reflective phase in DTM was influenced by parallel developments in the philosophy of science in which the prevailing assumption of positive objectivity came under tight scrutiny. Karl Popper challenged positivism in his *The Logic of Scientific Discovery* (1959). In *The Structure of Scientific Revolutions* (1962), Thomas Kuhn convincingly argued that prevailing worldviews, his "paradigms," channel scientists' work. Michael Polanyi, in his *Personal Knowledge* (1958), showed how the work of scientists is not a purely rational enterprise, but that it is guided by unspoken assumptions, or "tacit" knowledge and skills, and Paul Feyerabend disputed the notion that there was such a thing as a specific method, of whatever kind, for scientific discovery. In his *Against Method* (1975), he argued that truth emerges from many aspects of existence.

The current state

Critiques, reflections, and new proposals continue to inform the discourse about DTM. At least two books have purported to lay "a new foundation for design": Terry Winograd and Fernando Flores's *Understanding Computers and Cognition* (1986), and, more recently, Klaus Krippendorff's *The Semantic Turn* (2006). Winograd and Flores "want to break with the rationalistic tradition [of problem solving], proposing a different language for situations in which 'problems arise'" (77). They argue that design problems do not have an objective existence, but that, following Heidegger, people encounter problems whenever their "habitual, standard, comfortable

'being-in-the world'" is interrupted, that is, when they experience a "breakdown" and their practices and equipment become "present-to-hand" (Winograd and Flores 1986: 77).

In the introduction to *The Semantic Turn*, Bruce Archer writes that Krippendorff's axiom of human-centered design is "that *humans do not respond to the physical properties of things*—to their form, structure and function—*but to their individual and cultural meanings*" (Krippendorff 2006: xix, italics in original). Based on this assumption, Krippendorff, a former student of Rittel's at Ulm, outlines the tenets of what he calls a science *for* design, as opposed to a science *of* design.[4] The science *for* design is meant to directly assist designers in their daily practice.

Explorations in Planning Theory (1996), edited by S. Mandelbaum, L. Mazza, and R. W. Burchell, demonstrates that the discourse on planning theory and methods is not only alive and well, but also contentious. Here we will mention only two texts to illustrate the diversity of approaches: Niraj Verma's *Similarity, Connections and Systems: the search for a new rationality for planning and management* (1998) and *The Argumentative Turn in Policy Analysis and Planning* (1993), edited by Frank Fischer and John Forester. Verma explores new ground; he notes that as scientists we are probing for differences, but as planners and designers we are looking for similarities. Addressing C. West Churchman's challenge to reason mentioned above, Verma argues that "[b]ecoming critical about the similarities between ideas can help to make useful links between them" (Verma 1998: 83). Similarity may not help us understand the whole system, but it will help us think about and better understand the systems we try to improve. In an earlier article, "Pragamatic Rationality and Planning Theory" (1996), Verma argues that, unlike earlier notions of rationality, the pragmatic rationality works towards consequences rather than causes, integrates facts and values and rejects the search for ultimate foundations.

In the introduction to *The Argumentative Turn*, the editors state that the book "explores . . . a simple but profound insight: Policy analysis and planning are practical processes of argumentation" (Fischer and Forester 1993: 2). Neither in this book, nor in a subsequent text by John Forester, *The Deliberative Practitioner* (1999), which elaborates on *The Argumentative Turn*, does one find any references to Rittel. This is surprising, because, as the reader will see, the notion that planning is an argumentative process was proposed, explored, and developed by Rittel some 20 years earlier, and has been at the core of much of his work.

Another turn in the study of design is the emergence of ethnographic investigations into the workings of practicing architects and engineers as exemplified by *Architecture: the story of practice* (1991) by Dana Cuff or Louis L. Bucciarelli's "An Ethnographic Perspective on Engineering Design" (1988). Both these texts lend substantial support to Rittel's understanding of the nature of planning problems and the argumentative nature of the planning process. Thomas Moran and John Carroll, in their *Design Rationale: concepts, techniques, and use* (1996), summarize what emerges from such ethnographic studies as follows:

> Design problems are almost always too large for one person. Many different technical disciplines are required, as well as management

> discipline, in addition to creative and integrative skills. Design is a communication-intensive collaborative activity. The communication problem is heightened by the fact that the various stakeholders speak different disciplinary languages, are motivated by different values, see different issues when looking at the same design problem, and have different interests.
>
> (Moran and Carroll 1996: 5)

Texts by other cognitive and computer scientists, like Moran, have at their core the development of tools meant to facilitate collaborative design, for example *Visualizing Argumentation* (2003) by Paul A. Kirschner *et al.*, and most recently, Jeffrey Conklin's *Dialogue Mapping: building shared understanding of wicked problems* (2006). In all these texts, the Issue-based Information System (IBIS) developed by Rittel, (which is presented in this publication), plays a central role.

Horst W. J. Rittel (1932–1990)

Horst Willhelm Jakob Rittel was born on 14 July 1930 in Berlin, where he attended elementary school followed by the Gymnasium Adolfinum. In 1949 he began the study of mathematics and theoretical physics at the University of Göttingen, knowledge that he later applied when he was first hired as mathematician and physicist by the Maschinenfabrik Deutschland in Dortmund. There he developed design aids for mechanical engineers to control vibrations and deformations and built cost-prediction tools, among other things. In 1958 Rittel joined the Sozialforschungsstelle at the University of Münster, where he not only became involved in the theory of predicting socio-economic processes and in the planning and evaluation of sociological field research, but also devoted time to the study of sociology and mathematical logic. That same year he followed a call to join the faculty of the Hochschule für Gestaltung (HfG) at Ulm.

Horst Rittel at Ulm

Founded in 1953 by the siblings Hans and Sophie Scholl, the HfG was to become one of the most innovative and influential, albeit short-lived, design schools of the twentieth century. Its first director, the Swiss architect and artist Max Bill, a former student of the Bauhaus, envisioned the HfG as a reincarnation of the ideas and methods of the Bauhaus. Bill was soon to be ousted by rebellious teaching assistants who were clamoring for a more rigorous, not to say scientific, approach to design. As a consequence, the content of the so-called Foundation Course, modeled after the Bauhaus and required of all students, was changed from its original engagement with materials and tools to a set of courses that were to impart to design students so-called "operational knowledge," the knowledge instrumental to the success of all kinds of designers, product designers, architects, graphic designers etc.:

- Sociology: designers have to have an understanding of the workings of the society in which they live and practice.

- Economics: designers must understand the workings of the economic system (capitalism) and be able to appreciate their role and position in this system.
- Cultural history: designers need to be aware of the history of ideas and material objects, and must know how they themselves and their work are connected to the past.
- Psychology: designers must understand the basics of perception and human behavior.
- Mathematics: mathematics, being a universal language of form and structure, as well as a generative tool for new forms and ideas, is essential for all designers.

Within this framework, Rittel taught courses in design methodology, mathematical operations analysis, communication theory, and epistemology. Shortly after he moved to Ulm he also was elected to the membership in a triumvirate of directors that shaped and ran the school from 1959 to 1963. Rittel was prominently involved in formulating and implementing the premises on which the teaching of design at Ulm was based. These premises, or "working hypotheses" as Rittel called them, he described as follows:

1. There exists basic knowledge that is common to designers of all stripes. (The application of this hypothesis is, of course, illustrated by the "operational knowledge" mentioned above.)
2. Today, the formation of universal geniuses is unthinkable; therefore, different types of designers must also acquire domain specific knowledge and skills.
3. The ability to communicate and present one's ideas can be taught.
4. Methods of working and work organization are equally subject to teaching.
5. The designer's competence to make judgments can be enhanced and made more explicit.
6. Similarly, the designer's decision-making ability, especially the courage to commit oneself to a plan, is subject to exercise and practice.
7. Last but not least, the designer's imagination can be augmented and trained.

(Rittel 1961)

At Ulm, Rittel mingled with illustrious designers and design theorists. Among them, and to name but a few, were Charles Eames, Buckminster Fuller, Konrad Wachsmann, Tomás Maldonado, and Bruce Archer. It is safe to say that Rittel's understanding of design deepened at Ulm and that it was there that he developed a vision of a theory of design that would gel once he joined the faculty of the Department of Architecture at the University of California at Berkeley in 1963.

Horst Rittel at Berkeley

In 1959 the Department of City and Regional Planning, the Department of Landscape Architecture, and the College of Architecture at the University of California at Berkeley, which had hitherto been independent academic units, merged to form a single integrated college, the College of Environmental Design. This union was more than just an administrative move; it was the product of a vision, held by many of

the faculty in these departments, a view of interdisciplinary cooperation and interdependence among professional fields as the modern response to the complexity, even chaos, of the mechanized industrial world. As Dean William Wurster, who had suggested and engineered the merger, wrote in the first bulletin published for the combined college:

> In simpler times it was enough to be adept at one's own profession but in these complicated times it becomes necessary to be not only the master of one profession but also to have a real perception of other disciplines in order to know how these may be integrated with one's own to produce a harmonious result.
>
> (Wurster 1960)

To contribute to the formulation and implementation of the new vision, Berkeley invited, among others, Christopher Alexander, who had just graduated from Harvard, and Rittel out of Ulm to join the Architecture Faculty. Shortly after his arrival, Rittel was asked to give a seminar for the faculty outlining the assumptions, tenets, and methods of what today we may call a science of design. This seminar, presented for the first time in this volume, was crucial for the future course of the Department of Architecture. In 1966, the Department adopted a new curriculum with a strong option in DTM, which included courses and seminars on the psychology of perception and communication, problem-solving procedures and operations research models, program development and evaluation procedures, methods of architectural research, the integrated specification of environmental structures, and design methods for specific environmental problems. The affinity here with the Ulm notion of "operational knowledge" is unmistakable.

At Berkeley, Rittel's ideas not only fell on fertile ground; here he also found new colleagues and students who challenged and inspired him. Perhaps the most influential colleague was C. West Churchman, a philosopher and professor in the School of Business Administration,[5] and author of many texts on the systems approach. Churchman, as director of the Social Sciences Program of the Space Sciences Laboratories, had organized what became known simply as the "Churchman Seminar," a seminar on design. The premises for this seminar were that design is a ubiquitous activity practiced by almost everybody, at least some of the time, and that there may be some generalizable observations to be made about how people go about it. To this effect, the seminar assembled people from across the campus and across the disciplines: Music, Engineering, Political Science, Public Health, Business Administration, Art, Education, Architecture, City and Regional Planning, and more. It was in one of these seminars that Rittel first presented his notion of design and planning problems as "wicked" in contrast to problems of mathematics, chess, or puzzles, which he termed "tame" (Churchman 1967). Prodded by another colleague, Melvin Webber, professor of City and Regional Planning, Rittel elaborated the notion of "wicked problems," and jointly they published what arguably is the most influential and seminal paper in the field: "Dilemmas in a General Theory of Planning" (Rittel and Webber 1973).

The notion of "wicked problems" led Rittel to the formulation of what he called a "Second Generation Systems Approach." This approach signaled a departure from the earlier efforts to put design on a purely rational basis, which were based on the epistemology that Donald Schön later called "Technical Rationality" (Schön 1983). Already at Ulm, Rittel had

> argued that dichotomies purporting to distinguish systematic versus intuitive, and rational versus non-rational design are untenable. Rather, he asked, to what degree can and should design processes be made explicit, and to what extent can and should they be made communicable to others. For only communicable processes can be taught, and only explicitly formulated processes can be critically scrutinized and improved upon.
>
> (Churchman, Protzen, and Webber 1992)

The development of this second generation approach became the focus of Rittel's work and of the research and teaching agendas in the discipline at Berkeley. At the core of the second generation is the understanding of design as an argumentative, or deliberative, process. Designers are seen to argue with themselves and with others about the appropriateness of a course of action. Much research by both faculty and students concentrated on finding ways of making this deliberation explicit, on understanding its structure and its logic, on supporting it, and on strengthening the process in order to make it more powerful and more controllable. A significant outcome of this research agenda was the "Issue-Based Information System" (IBIS) and its related argumentation systems, which were used, for example, by German government agencies and the Organization for Economic Co-operation and Development (OECD).

Horst Rittel at Stuttgart

From 1973 on, Rittel commuted between Berkeley and the University of Stuttgart, where he was appointed Professor for the Foundations of Planning to the Faculty of Architecture and City Planning, and where he created and directed the Institut für Grundlagen der Planung. At that time serious efforts to reform higher education pervaded the Federal Republic of Germany, and new legislation was discussed and passed that called for, among other things, the reorganization of the entire system of architectural education. Thus, when elected Dean of the Faculty of Architecture and City Planning, Rittel, referring to an earlier article of his (Rittel 1966), remarked that "[t]his gave me the opportunity to involve myself another time in the 'design of an educational system for design.'" He feared that the reform would impose a rigid curriculum, which he compared to a mess hall with a single menu for everyone. Instead, he argued for an educational system that promotes the co-existence of competing ideas and which stimulates their rivalry, and in which students are invited to find their own standpoint in this field of positions.

How could such an educational philosophy be justified in the formation of state-certified, accredited professionals, Rittel asked? On the one hand, he invoked the great divergence among planners and architects about what are, or should be,

common qualifications. On the other hand, he saw such a great differentiation in the problems professionals were asked to solve that a standardized formation could no longer be justified: no curriculum could possibly impart all the knowledge and all the skills necessary for the whole spectrum of tasks in professional life. In departure from the "operational knowledge" notion of Ulm, Rittel now thought that one could not even define a "sufficient minimum for all [types of designers]." Furthermore, it is to be expected that the future problem-scape and the knowledge necessary to cope with it will continue to change. Under these circumstances, a curriculum can at most hope to transmit basic principles of how one copes with the inherent difficulties of planning and design, of how, in a sea of ever-changing knowledge and situations, one can keep informed, that is, of how one learns to learn.[6]

Horst Rittel at the Studiengruppe für Systemforschung

About the time Rittel joined the faculty at Ulm, he also linked up with the "Studiengruppe für Systemforschung" (Study Group for Systems Research) in Heidelberg. This group, at first a loose association of young scientists that later became institutionalized as a government-sponsored "think-tank," was inspired by the understanding "that science and technology achieve not only good ends, but also produce the horrors of war, the threat of nuclear conflict, and damage to the natural environment." With this insight the Studiengruppe strived "for an open, public democratic control of the development of research and technology" (Krauch 2006: 131–132). In the early 1960s the Studiengruppe counted among its members, and again to name but some, the sociologist Hans Paul Bahrdt, the psychiatrist Paul Matussek, the philosopher Jürgen Habermas, the chemists Helmut Krauch and Werner Kunz, the economist Walter Baur, and later the philosopher and systems analyst C. West Churchman. Rittel's collaboration with the Studiengruppe is of great significance because, as Wolf Reuter wrote, Rittel's work on DTM is embedded in a spectrum of activities and publications that far transcends that work. The Studiengruppe was the catalyst for many of his works that went against the grain of entrenched disciplinary boundaries (Reuter 1992: 4).

The Spectrum of Horst Rittel's Work

Though his work covered a wide range of specific fields, we can see it as revealing his interest in the nature of problems, and in how we think about and deal with them. By their very nature, Rittel's interests were focused on fundamental human activities: understanding problems and the processes by which people approach those problems are issues relevant across the span of human activity. Rittel's work spanned a large part of that spectrum.

Whatever the field, he focused on the structure, representation, and reasoning related to the problem—whether management of information, research in chemistry, or urban design. The unifying thread was the search for how people understood, reasoned about, learned about, and dealt with the real-world problems and issues they faced.

In its concern for research, the generation and management of knowledge and information, and the political aspects associated with knowledge, Rittel's

work necessarily encompassed the full range of human life, just as he believed that design became a part of most aspects of human life.

This wide scope of his vision can be seen in a single article, "The Reasoning of Designers" (which is included in this collection). Because design is a ubiquitous activity, Rittel's reasoning of the designer applies ubiquitously. The article reveals an unstated epistemology and moral system, recognizing that the questions of what is understood and what is valued are the ones important to one who intends to change the world. Rittel probably wouldn't have thought to state it in those terms: he wasn't interested in knowledge as knowledge; he would have simply focused on the project at hand—be it information systems, architecture and planning, chemistry—which may explain why the principles stated in "The Reasoning of Designers" were used, but not explicitly stated, in his work with IBIS.

"The Reasoning of Designers" presents a world dominated by different personal perspectives of what is, and what could and should be (not to mention the different perspectives of how to make those changes and how those changes came about). The IBIS and the systems derived from it were intended to capture and represent those perspectives so they could be shared and communicated. Of course, a world of differing perspectives is one of the fundamental ideas behind the idea of "wicked problems."

Rittel's vision of design shows a world where the important questions are what we should do, and what we want to do—where the deontic issues dominate the factual—in contrast to the world of the first generation, where the search for an objective truth prevailed.

Rittel was concerned not only with what could be determined "objectively," but also with values, especially personal values. This becomes the linchpin for many of his later concerns, such as the IBIS, wicked problems, and the reasoning of the designer.

One can see the influence of Karl Popper's theories of knowledge—science built on testing and rejecting hypotheses, and the truth and knowledge determined by the best-tested hypotheses. There is no objective truth to be found with certainty; we have, at best, theories that have not been proven wrong. Therefore, we must work with and manage the disparate ideas, and use them—though they do not always agree—to come to an overall decision.

It is this overarching vision that led Rittel's ideas to be appropriate in many fields—fields of great diversity with little obvious connection.

He did work that might be called practical epistemology—studies of how people did and could manage information, such as studies of research processes and research institutes, studies of how to know what is known.

He looked at the processes of research institutes, at knowledge in chemistry research, and at development of information systems, including his own development of the IBIS, which is included in this volume, and gives an alternate (but compatible) perspective of the argumentative process described in "The Reasoning of Designers." With Werner Kunz he wrote a series of articles looking at management of information and documentation both generally ("Training in the Information Sciences," and "Documentation and the Transfer of

Knowledge," both 1971), and in some specific fields (e.g. chemistry and foreign affairs). This volume does not look at these information management issues, focusing primarily on the theoretical issues that make such information systems so important.

Rittel was studying how people understand and solve different sorts of issues—how they plan, how they learn. The practical side of that was studying how they tried to track ideas, and how they could better track ideas, to facilitate design processes and research processes—which, as far as information management is concerned, share characteristics, for all that designers and researchers are involved in different tasks. The theoretical side of that was developing and explaining the issues and structures of knowledge and problems on a more general level, which is what his work on wicked problems and the reasoning of designers does.

One way to look at tame problems is that they require a specific perspective and framework. In a world of science like that described so variously by Popper, Kuhn, Feyerabend, Foucault, or Latour, one in which social factors determine the context and conceptual framework for science, one cannot easily reduce the practical issues of scientific research to tame problems, one must manage different research and personal agendas among the research scientists; one must manage differences in perspective among researchers (e.g. different views of what constitutes science, such as those different theories of science mentioned above). On a practical level, even the work of researchers is dominated by the wicked design questions of how to manage resources and design new studies. Tame problems require a specific perspective; Rittel's work revealed that real world problems, across fields, are not defined by single perspectives.

Evolution of Rittel's Work in Design Theories and Methods

There are two dimensions of particular note to the evolution of Rittel's work: the evolution of the tone and the evolution of the focus.

The tone of Rittel's earlier work—notably the "Science and Design" seminars—is one of optimism; it is a guarded optimism, but his focus is on the positive potential. He has a grand vision: near the beginning of the second seminar, he states: "At the end of this seminar series an overall innovating system, including an enquiring device and a direction-determining device as well, will be proposed." And, in this idea of an overall innovating system, it should be kept in mind that in the first seminar Rittel defines innovation as a concept that embraces both design and science. We have Rittel's handwritten notes (mostly in German) for the overall innovating system.

This optimism about the ability of the theoretician to develop an overarching theory begins to dwindle. Although Rittel's later work does present a fuller picture of the overall process of design—a maturity and confidence of statement and theory that contrasts with the more tentative nature of the early seminars—the fullness of the theory is not matched by a corresponding overarching system. As his understanding of the overall picture of the design process became more detailed and more mature, there was a diminution in his belief that it could be contained in a single system. By the end of his career, he could see the process from an overall perspective,

but from that perspective he could also see that the process could not be unified into a complete system, and the IBIS, though it could capture all of the argumentative structure of the design process, was a limited system: it was nothing more than a reflection of the ideas of the design participants; IBIS was not intended to synthesize, evaluate, or otherwise generate new information that was not put there by the users; it was not intended to be an expert system or any sort of artificial intelligence. Rittel was an insistent critic of artificial intelligence research which aims at simulating, or better yet, surpassing human intelligence. He saw in such efforts a direct parallel with Goethe's Faust and his homunculus. Rather than pursue artificial intelligence (AI), Rittel proposed that we focus on "natural intelligence-enhancement" (NIE) as a less ambitious, yet more promising strategy. He would say "as my eyeglasses don't see on my behalf but help me see better, one might use the computer not to think on one's behalf, but to reinforce and enhance one's ability to think."

With respect to the focus, we can see a shift from the attempt to create an overarching theory of design, based on the abstract view of the process, to a more personalized view—one where the abstract theory gets subordinated to the personal and political issues at the heart of the design process. This parallels the shift of focus, mentioned above, from the Ulm perspective of "operational knowledge" to the concern with the developing designers' ability to cope with the unknown and unexpected—the principle underlying his curriculum development at Stuttgart. Thus the search for the large-scale systems—which can be seen in the seminar series, and in the issues faced by "On the Planning Crisis"—gets replaced by a search for the understanding of an individual, and an attempt to record, understand, and work with the varying views of the different individuals.

Continued Relevance of Horst Rittel's Work

Design—as Rittel defined it, the making of plans to bring about desired situations in the world—is basically intertwined with the concept of intelligence. The chance creation of order or beauty is not design: snowflakes and other crystals are not designed—unless our beliefs suggest that all of creation was the act of an intelligent being. Design is purpose, intention, and plan; it is the precursor to intelligent action. Design is, if we look at it in this broad sense, one of the primary characteristics of the human race. It is the foundation of our adaptivity that we can learn about situations and plan for them in the future. It is the foundation of civilization, of art, of science. Rittel observes that everybody designs some of the time,[7] so the concern of his work can hardly be limited.

Rittel's work explored the fundamental issues of planned human endeavor—issues central to any vision for a future—whether to envision a single product or an entire city, or even, indeed, any world we can dream of creating. His work looked at the interplay of human needs and interests, at the basic logical conflicts that will plague our decision-making processes and complicate the ability to plan when many people are involved.

We can see Rittel's work as transcending all fields of human endeavor.[8] Though Rittel had a very specific definition of design, a great majority of Rittel's work has significance beyond the activities qualified under his definition. His definition