Why Horst W.J. Rittel Matters

Chanpory Rith and Hugh Dubberly

Acknowledgments

Many people contributed to this project. We are grateful for their help.

The project grew out of research for a book written by Peter Esmonde and published by Paul Pangaro for Sun Microsystems, *Notes on the Role of Leadership and Language in Regenerating Organizations*. While writing *Notes*, Peter was also working with Hugh Dubberly to research the origins of the Design Methods Movement. Peter first located a number of works by Rittel and introduced some of Rittel's ideas into *Notes*.

Later, Paul and Hugh included *Notes* as well as some of Rittel's articles in a Stanford design course. After participating in the course, Chanpory Rith suggested reprinting Rittel's complete works. We began by compiling a bibliography.

Many people participated. Juan Quiles searched the stacks at Berkeley and made copies. Justus Brown and Martin Thormann helped translate the German titles into English. Philip Foeckler helped obtain works from Germany.

We have been especially fortunate to have help from two of Rittel's colleagues in the College of Environmental Design at UC Berkeley. Elizabeth Byrne, head of the college's library, provided many excellent references and much practical advice. Professor of Architecture Jean-Pierre Protzen provided much background information as well as his own database of Rittel's work and Rittel's final CV. Their spouses, Chuck Byrne and Elsbeth Protzen, have been very patient with our frequent intrusions.

Horst Willhelm Jakob Rittel taught design and architecture for over 30 years, yet he never designed a building or otherwise practiced as an architect. (We might now recognize him as a design planner.) Even so, Rittel changed the field of design—linking design and politics—and started a line of inquiry which continues today in the field of computer programming and information science—design rationale.

What Rittel did

Rittel served as a sort of funnel transferring knowledge (developed during and just after World War II) from the sciences and engineering to the design professions. At the Hochschule für Gestaltung (HfG) Ulm, Rittel taught courses in operations research (OR) and cybernetics. At the University of California Berkeley, he also introduced ideas from cybernetics into his teaching. For example, his course notes show explicit references to feedback models and to Ashby's models of requisite variety. In his writing, Rittel also explicitly linked cybernetics, feedback, and the design process. If anything, the systems models of OR and cybernetics are more relevant to the practice of design today than they were when Rittel first introduced them.

Rittel was recruited to Berkeley in 1963 by William Wurster, Dean of the College of Environmental Design. The same year, Wurster also recruited Christopher Alexander. Together with Christopher Alexander, Bruce Archer, and John Chris Jones, Horst Rittel helped found the Design Methods Movement. He taught design methods courses at both Ulm and Berkeley, helped found the Design Methods Group (DMG) at Berkeley, and the DMG Journal.

The movement flourished from approximately 1962 to 1972. Its members advocated a systems view of design projects and introduced a range of methods emphasizing a rigorous, rational or scientific approach to designing. (Most models of the design process—for example: define, prototype, evaluate—trace their roots back to the Design Methods Movement.) Within just a few years, the movement found its assumptions under attack—particularly its claims of rationality and objectivity—and two founders, Alexander and Jones, both publicly repudiated the

movement. Rittel also offered serious criticism of "first generation" design methods and proposed a set of principles for "second generation" design methods.

What Rittel teaches us

Rittel introduced several fundamental ideas:

- Simple problems (problems which are already defined) are easy to solve, because defining a problem inherently defines a solution.
- The definition of a problem is subjective; it comes from a point of view. Thus, when defining problems, all stake-holders, experts, and designers are equally knowledgeable (or unknowledgeable).
- Some problems cannot be solved, because stake-holders cannot agree on the definition. These problems are called wicked, but sometimes they can be tamed.
- Solving simple problems may lead to improvement—but not innovation. For innovation, we need to re-frame wicked problems.
- Because one person cannot possibly remember or keep track of all the variables (of both existing and desired states) in a wicked problem, taming wicked problems requires many people.
- These people have to talk to each other; they have to deliberate; they have to argue.
- To tame a wicked problem, they have to agree on goals and actions for reaching them. This requires knowledge about actions, not just facts.
- Science is concerned with factual knowledge (what-is); design is concerned with instrumental knowledge (how what-is relates to what-ought-to-be), how actions can meet goals.
- The process of argumentation is the key and perhaps the only method of taming wicked problems.
- This process is political.
- Design is political.

Having become convinced design is argument, Rittel set out to develop ways to support and enhance the development and tracking of arguments during the design process. (He hoped these systems might also make both the design process and the political process more transparent.) He introduced Issues Based

Information Systems (IBIS) first in analog (paper) form and later in digital (computer) form. His efforts, while cumbersome, form the basis of an on-going line of inquiry within computer science known as design rationale. To date, over 1000 papers have been written on this subject. Many reference Rittel, and he is widely regarded as a seminal figure in the field.

In sum, Rittel remains significant to designers for two reasons. First, he articulated the relationship between science and design, specifically the limitations of design processes based on the 19th century rational view of science. (Never-the-less, the rationalist "problem-solving" view of design remains a widely held popular belief.) Second, he proposed principles for dealing with these limitations. (Unfortunately, these principles are not widely taught.)

One goal of this bibliography is to help preserve Rittel's ideas and to introduce (or re-introduce) Rittel, second-generation design methods, and design rationale to a wide audience of design practitioners, researchers, and educators. We hope others will see value in Rittel's ideas and carry them forward.

As Rittel might have said: It is optimistic, perhaps futile, but worth trying.

Horst W.J. Rittel's Writings on Design: Select Annotations

Chanpory Rith and Hugh Dubberly

Rittel's bibliography contains over 100 unique entries on many subjects. The following annotations are for works which we will feel are most relevant to designers. This is a very subjective and arbitrary list. In choosing works to annotate, we considered how often a work was cited, its date of publication, and its uniqueness in relation to other works. These works are presented in chronological order.

The Universe of Design: Faculty Seminar, College of Environmental Design, Spring 1964.
Berkeley: Institute of Urban and Regional Development, University of California, 1964.

The Universe of Design: Faculty Seminar, College of Environmental Design, Spring 1964.
Surveys existing methodologies for creating "innovation" and related notions such as "image", "model", and "problem/solution" in relationship to institutionalized science. Finds these methodologies—and the 19th century view of science in which they are rooted—insufficient for innovation and design which are inherently political and subjective, rather than neutral and objective. Rather than a single definition, proposes some properties of design. Concludes that "any theory of innovation including a theory of design must be based on a theory of action, not a theory of knowledge (epistemology) alone." Lays the ground for later concepts such as "wicked problems", "design rationale", and "instrumental knowledge".

"Instrumentelles Wissen in der Politik." *Beiträge zum Verhältnis von Wissenschaften und Politk.* Ed. Krauch, Helmut. Heidelberg: Studiengruppe Für Systemforschung, 1966. 183–209.

Instrumental Knowledge in Politics.
Presents the ineffectiveness of political decision-making systems as a symptom of a limited model of knowledge. Suggests that improving these systems requires an expanded model which, in addition to factual knowledge, includes "instrumental knowledge" or knowledge about actions that meet goals. Also emphasizes that improvements entail political involvement in contrast to the cherished neutrality of traditional science. Thus, implies a new type of science which is rigorous but sheds objectivity in its goal to generate useful instrumental knowledge. Concludes by countering attitudes of defeatism to this idea, advocating a search for better political decision systems despite formidable obstacles, seeming futility, and potential abuse.

"Some Principles for the Design of an Educational System for Design." *Education for Architectural Technology.* Ed. Passonneau, J. St. Louis: Washington University and the AIA Educational Research Projects, 1966. 103–151.

"Some Principles for the Design of an Educational System for Design."
Criticizes existing design curricula as poor preparation for tackling planning problems and proposes a goal-oriented approach to design education that focuses on the difficulties of designing. Also argues that the master-apprentice tradition is inflexible and that the common debate of "breadth" versus "depth" is simplistic. Advocates teaching general theoretical principles to reduce, but not eliminate, the reliance on more specific, shorter-lasting "rules of thumb". Also urges designers to be aware that design is political and to continue learning how to design better despite "difficulties, paradoxes, and dilemmas".

"Dilemmas in a General Theory of Planning." *Panel on Policy Sciences, American Association for the Advancement of Science.* 4 (1969): 155–169.

"Dilemmas in a General Theory of Planning."
Introduces the notion of "wicked problems", emphasizing its social and political context. In addition, criticizes the inadequacy of existing Newtonian-based scientific and professional processes, because wicked problems cannot be solved by traditional and formulaic processes. Suggests that the ideal planning model is a cybernetic—goal-oriented and involving feedback—process.

Issues as Elements of Information Systems. Working Paper No. 131. Berkeley: Institute of Urban and Regional Development, University of California, 1970.

***Issues as Elements of Information Systems*.**
Outlines Issue-Based Information Systems (IBIS), providing an early model of design rationale systems that aim to explicitly capture, structure, and represent the deliberations and reasonings that occur during planning processes. Specifies that these systems center around issues, questions of fact, positions, arguments, and model problems. Considers these systems beneficial because they make the design process transparent, provide a history of previous and existing states of discourse, and are adaptable to rapidly changing language.

"Information Science: On the Structure of its Problems." *Information Storage and Retrieval.* 8.2 (1972): 95–98.

"Information Science: On the Structure of its Problems."
Compares first and second generation design methods in relation to the evolving discipline of information science. Specifically finds the discipline's heritage in traditional science and factual knowledge as an obstacle for growth. Identifies organizing the discourse during the planning process as its central issue.

"On the Planning Crisis: Systems Analysis of the 'First and Second Generations'."
Bedrifts Økonomen. 8 (1972): 390–396.

"On the Planning Crisis: Systems Analysis of the 'First and Second Generations'."
Summarizes characteristics of the first and second generation of system approaches to design, underscoring the limits of a sequential, scientific, and rational approach (first generation) to tackling "wicked" problems. Notes the "symmetry of ignorance" in defining wicked problems. Posits expertise and ignorance as "distributed over all participants." And thus presents the second generation approach as an argumentative process that is inherently collaborative and political.

"Son of Rittelthink: The State of the Art in Design Methods."
The DMG 5th Anniversary Report. DMG Occasional Paper No. 1. 7.2 (1972): 143–147.

"Son of Rittelthink: The State of the Art in Design Methods."
In interview form, summarizes the origins of first generation design methods and presents second generation methods as better suited for addressing the shortcomings of the first generation. Identifies the theoretical and practical applications of the argumentative model of the design process as areas for further development.

"How to Know What is Known: Designing Crutches for Communication."
Representation and exchange of knowledge as a basis of information processes. Proceedings of the Fifth International Research Forum in Information Science (IRFIPS), Heidelberg Sept. 1983. Ed. Dietschmann, Hans J. Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 1984.

"How to Know What is Known: Designing Crutches for Communication."
Presents a theory of information science that views information as a knowledge changing event rather than as stored data. Criticizes attempts by artificial intelligence researchers to mimic the brain, and instead proposes research to find tools or "mental crutches" that enhance "natural intelligence". Finds, however, that most existing tools and information systems are limited because they merely confirm knowledge. Provides guidelines for more "natural intelligence-reinforcement" systems that cast doubt, point out ignorance, and thus are more useful because they open up new possibilities.

The Reasoning of Designers.
Arbeitspapier A-88-4. Stuttgart: Institut für Grundlagen der Planung, Universität Stuttgart, 1988.

The Reasoning of Designers.
Encapsulates Rittel's own design philosophy. Argues that design is a planning activity that involves models, that the reasoning of designers is a process of argumentation unlike problem solving, and that design is political and associated with power. Also asserts that design is subjective and that designers are responsible for their judgments. Maintains that advancement of the design field requires a new science of design, and proposes three tasks: to develop "theories of design," to inquire empirically into "how plans come about," and to look for "tools to support designers."

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In Memoriam: Horst W.J. Rittel

C. West. Churchman, Jean-Pierre Protzen, and Melvin M. Webber

Timeline of Rittel's Life

We compiled this timeline from information in Rittel's Curiculum Vitae as printed in December 1988. The CV was provided by Jean-Pierre Protzen.

1930
Born in Berlin, July 14

1936–1940
4.Volksschule, Berlin (elementary school)

1940–1943
Scharnhorstschule, Berlin–Schoeneberg (gymnasium)

1946–1949
Gymnasium Adolfinum, Bückeburg

1947–1954
Private tutor in English, French, Latin, mathematics, and physics
Worker (aluminum factory, precision scales factory)
Insurance agent
Interviewer for survey institute

1949–1954
University of Göttigen
Studied mathematics and theoretical physics
Auxiliary Assistant in astronomical observatory
(analysis of stellar spectra)
Auxiliary Assistant in geophysical observatory
(analysis of geomagnetic fields)
Manager of student dormitory

1953–1958
Maschinenfabrik Deutschland, Dortmund
Cost predictions, development of design aids, operations research*

Horst W.J. Rittel, a pioneering theorist of design and planning died of lymphatic cancer on July 8, 1990 in Heidelberg, Germany. He was born in 1930 and grew up in Berlin, where he attended the Gymnasium Adolfinum. Upon graduation he enrolled at the University of Göttingen to study mathematics and theoretical physics. In 1953, fresh out of school, he found employment in the Maschinenfabrik Deutschland in Dortmund as an operations researcher. There Horst first became fascinated with the concepts that later became the focus of his career: the activities of design and planning. Before pursuing these topics, however, he joined the Sozialforschungsstelle of the University of Münster in Dortmund in 1958. His role was that of mathematician and statistician, developing socioeconomic prediction models and evaluating sociological field research. Simultaneously, he pursued the study of sociology and mathematical logic at the university.

Rittel's writings are as varied as his educational background. They are difficult to classify, because they are scattered in the professional journals of disciplines as disparate as chemistry and law, computer science and policy science, or architecture and information science. The writings, however do have a common core. Horst saw the theme of his work to be the reasoning of designers: the nature of their problems, the kinds and structures of the knowledge they use, the formation of judgment, their logics of procedure. He called it the science of design.

As he said, he had the good fortune to participate in the development of the science of design from its beginning. He laid the cornerstones of his work at the Hochschule für Gestaltung at Ulm where he was both teacher and director from 1958 to 1963. At Ulm he argued that dichotomies purporting to distinguish systematic versus intuitive, and rational versus nonrational 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.

In 1963 Rittel was called to Berkeley. Of this event he said "my special luck was the invitation to join the faculty at Berkeley: I

1958
University of Münster, Dortmund
Studied mathematical logic and sociology

Sozialforschungsstelle an der Universität Münster, Dortmund
Mathematician and Statistician: theory of predicting socio-economic processes, planning, and evaluating sociological research

1958–1963
Hochschule für Gestaltung Ulm
Festdozent (tenured docent) for design methodology, mathematical operations analysis, communications theory, and epistemology

1959–1963
Elected for 4 terms to the three-member College of Rectors, HfG Ulm (the administrative body of the school)

1960?
Married Karin in Ulm†

1963
Daughter Caroline born

1963–1967
University of California, Berkeley
Department of Architecture
Lecturer

1965
Son David born

1965-1967
University of California, Berkeley
Space Science Lab and Center for Planning and Development Research
Associate Research Mathematician: Project TAUM (Technology and Urban Management)

1967–1969
University of California, Berkeley
Department of Architecture
Associate Professor

1967
Washington University, School of Architecture, St. Louis
Visiting Associate Professor of Architecture and Operations Research

could not have found a livelier, more stimulating and resourceful place in the world." And indeed, Rittel often talked about how he was challenged by his new colleagues and students here. He always acknowledged how their thinking had influenced his own; he considered them to have been the pioneers of the idea that design and planning are most important subjects of scientific inquiry.

His *Dilemmas in a General Theory of Planning* proved to be a seminal treatise. There he expounds on the inherently intractable nature of design and planning problems which he termed "wicked" to contrast with the tame problems of mathematics, chess, or puzzle solving.

The notion of wicked problems led Rittel to a radically new conception of design and planning processes and of methods appropriate to their resolution. He described the design process as inherently argumentative, in which the designer continually raises questions and argues with himself and others over the advantages and disadvantages of alternative responses. Methods that support argumentation and facilitate the identification of questions, responses, and arguments, he called methods of the second generation to distinguish them from their earlier methods of operations research.

In 1973 Rittel received a call to join the architecture faculty at the University of Stuttgart. There, he founded the Institut für Grundlagen der Planung, which he directed until his last days. Yet, he had not abandoned Berkeley for Stuttgart; he simply became an international commuter splitting his time between the two institutions.

In more recent times Horst was involved with what he termed natural intelligence-enhancement. He had been a stubborn skeptic of the ambitions of artificial intelligence researchers, who seek to create computer programs that simulate intelligent behavior, or better yet, that surpass human intellectual capabilities. To him this was the story of the Golem, or of Faust and his homunculus, all over again. He was specifically critical of today's widespread attempts at constructing expert systems. He contended that the expert knowledge embodied in such systems would become nothing more than "freeze-dried prejudices." Instead of pursuing the aims of artificial intelligence, he proposed what he saw to be a less ambitious but more promising strategy. In his words, "as my eyeglasses don't see on my behalf but help me to see better, one might use the computer not to think on one's behalf but to reinforce and enhance one's own ability to think."

Before his premature death, Rittel was working on a general theory of technology, that is the description, analysis, and theory of instrumental knowledge. He was asking how we might more effectively trace the consequences of applying a technology, and how we might construct a combination of technologies in

1968–1973
Studiengruppe für Systemforschung, Heidelberg
Co-director

1970–1990
University of California, Berkeley
Department of Architecture
Professor of the Science of Design

1973–1990
Universität Stuttgart Fakultaet für Architektur und Stadtplanung
Universitaetsprofessor für Grundlagen der Planung und
Direktor des Institutes für Grundlagen der Planung

1977–1979
Universität Stuttgart Fachbereich Bauplanung
(Department of Building Planning)
Elected Dean

1977–1981
Universität Stuttgart Fakultaet für Architektur und Stadtplanung
Elected Dean for three terms

1974?
Divorced†

1977?
Married Anita†

1986–1988
Katolieke Universität Leuven
Fakulteit Toegepaste Wetenschapen
Guest Professor in School of Engineering
Department of Architecture, Planning, and Urban Design

1990
Died in Heidelberg, July 8

pursuit of desired results without also generating unforeseen and undesirable side- and after-effects, the nightmares of designers. Horst considered his work in chemistry, for which he received international recognition, to be a special case of this general theory. Over the years he had developed an algebra of chemistry which allowed him to trace the outcomes of chemical reactions over as many steps as desired. Chemical engineers are typically interested in the "yield" of a reaction, that is, the percentage of a desired compound produced by a reaction, not the residues of that reaction. But, typically for Horst, he was interested in what others discarded. He wanted to find what happens when residues get thrown together as in the effluents of sewage plants. These residues or nondescript aggregates he called "mishmashes." He often apologized for the term but said that even distinguished chemists could not find a less vulgar word for this important concept. He had outlined a theory of mishmashes, but it will fall to others to elaborate it.

Incomplete as it is, the rich and innovative work of Horst Rittel, even if it is not yet fully recognized, has opened new directions and has already stamped many generations of students. Because, as he once said, innovative ideas need lengthy incubation before they become integrated into the course of "normal" research and into professional practice, the full impact of his work will not be appreciated for many years.

He is survived by his wife, Anita; a son, David, and a daughter, Caroline.

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* While the CV does not list operations research, Jean-Pierre Protzen suggests that was a part of Rittel's work at Maschinenfabrik Deutschland.

† Provided by Jean-Pierre Protzen—not in original C.V.