Journal of the Operational Research Society (2004) 55, 1123–1129

www.palgrave-journals.com/jors

Obituary: C West Churchman, 1913–2004

W Ulrich*

University of Fribourg, Fribourg, Switzerland

C(harles) West Churchman, the grand old man of the 'systems approach', has passed away. Born on 29 August 1913 in Philadelphia, Pennsylvania, he was 90 years of age. After a rich and significant life of scholarship, he died on 21 March 2004 in Bolinas, California. A former student and collaborator of Professor Churchman offers this commemorative essay. The paper offers a short biography of CW Churchman; an introduction to some central themes of his thinking; and some reflections on what remains of his work and how we might carry it forward today.
Journal of the Operational Research Society (2004) **55,** 1123–1129. doi:10.1057/palgrave.jors.2601825

Keywords: CW Churchman—obituary; CW Churchman—biography; management science; operations research; systems approach; history of OR; philosophy of OR

CW Churchman (ca. 1970)

Photograph first published on the jacket flap of *The Design of Inquiring Systems* (Basic Books: New York, 1971). The present, edited version is taken from the author's home page at http://www.geocities.com/csh_home/cwc.html.

*Correspondence: *W Ulrich, Sichelweg 41, CH-3098 Schliern, Switzerland*
E-mail: wulrich@gmx.ch

Introduction

We are mourning the loss of one of the founding fathers of the fields of operations research (OR) and management science (MS) and, at the same time, one of the outstanding pioneers of a 'systems approach' for the solution of societal problems.[1,a] To West Churchman pursuing a systems approach meant much more than looking for a unifying approach in the sense of a general systems theory; it implied a deeply ethical stance regarding the ways we manage (and mismanage) our human affairs. His ambition was not only to increase our capabilities of handling complex problems but also to increase our understanding of the ways our 'scientific' solutions may fail to be appropriate, that is, to bring about desirable change. If there is any single quotation from his writings that captures the hopes he associated with the systems approach, it must be this: 'Thought likes solutions, wisdom abhors them.'[2]

Another way to capture what made West Churchman so special is this. He was a true pioneer, but he resisted the temptation of becoming a 'true believer' of the fields he had helped to establish. He did not fall into the trap into which so many academics tend to fall, of taking the basic assumptions and conventions of their fields of expertise for granted. Such independence from the mainstream did not make academic life easier for him. He felt at times lonely and misunderstood by his academic environment, despite the recognition and fame he won himself and the many distinctions he received, including several prestigious editorships, two 'best book of the year' awards, three honorary doctorates and a nomination for the Nobel Prize. Those who studied and worked with him know that such fame did not blow up his ego. He remained the man he was—always searching, doubting, unpretentious, and at times deeply disillusioned, if not despairing, about the failure of Academe—along with governmental and commercial orga-

nizations—to face major contemporary problems such as worldwide malnutrition and poverty, violence and war, environmental degradation, lack of education, and many others.

As a third and last initial characterization, West was a powerful teacher. He made students feel different. He knew how to move them and awake their intellectual curiosity. He raised their ethical awareness in ways that made them reflect on the meaning of their academic education and set new goals for themselves. He attracted students from all fields and from many parts of the world. His weekly 'informal seminar' sessions were proverbial. In the late 1970s, when I was his student, he used these Wednesday afternoon seminars to present newly drafted or revised chapters of his book in progress, *The Systems Approach and Its Enemies*.[3] Patiently he listened to everyone who wished to comment and accepted what they had to say. In other sessions, he left the topics entirely to the participants and was mainly listening. With his head bent over a piece of knitting to which he seemed to dedicate all his attention, he would only now and then throw in a short question or comment. These seminars may have meant different things to different people, but I suspect West's small office in Barrows Hall where they took place was for many a place of worship; they adored their teacher so much. He radiated something that few could define clearly, but clearly they had been missing it in their studies before!

A short biography of CW Churchman

After studying philosophy at the University of Pennsylvania in Philadelphia (BA in Philosophy, 1935; MA in Philosophy, 1936; PhD, 1938), Churchman began a career of half a century of academic teaching and writing. Already before completing his dissertation,[4] in 1937, he became Assistant Instructor of Philosophy; in 1939, he was appointed Assistant Professor.

During World War II he was a mathematical statistician at the Frankford Arsenal of the US Army in Philadelphia, working on experimental methods of testing small arms and ammunition. In 1945, back at the University of Pennsylvania, the young Assistant Professor was elected Chairman of the Department of Philosophy—partly because he was brilliant and partly because the philosophical faculty was split into two contending pragmatic and analytical factions that could not agree on any other candidate.

In the years 1945 till 1948, Churchman, together with his first doctoral student and close collaborator Russell L Ackoff, tried to establish in the Philosophy Department an 'Institute of Experimental Method'. It would develop the philosophical basis of much of their work, Singer's[5–8] 'experimentalist' philosophy, and would appliy it to societal issues in areas such as city planning, business management, education, and others. However, the Department did not appreciate the idea of practising philosophy as an applied discipline. The Institute could not be founded formally. Ackoff's teaching appointment was not renewed.

In 1948, Churchman consequently resigned his chairmanship of the Department and accepted an appointment as Associate Professor of Philosophy at Wayne University (now Wayne State University) in Detroit, where Ackoff had gone the year before as an assistant professor. Again the Institute could not be founded, however, despite earlier promises of support. Churchman and Ackoff had to realize that they could not do what they wanted to do within philosophy departments. No wonder, then, that these early efforts were soon to be followed by academic appointments and mandates outside philosophical faculties.

But 1948 was also the year in which West's main philosophical book of those years, *Theory of Experimental Inference*,[9] was published. His recognition grew so much in the philosophical community that when in the same year the first editor of *Philosophy of Science* suddenly died, he was appointed as successor. From 1948 to 1958, Churchman served as the journal's second editor-in-chief.

In 1951, Churchman became Professor of Engineering Administration at the Case Institute of Technology in Cleveland, Ohio (now Case Western Reserve University). Ackoff moved to Case along with him and together, they immediately set up the first OR group. By 1957, the group had increased to a strong multi-disciplinary team of 30 faculty members. They also started a series of major annual OR conferences (1951–1957) and began to teach the first short OR courses for industry practitioners (1952). The success of these initiatives (see Dean[10] for a detailed account) led in 1954–1955 to the establishment of the first MS and PhD programs in operations research. For the first time, opportunities were plentiful and Churchman and Ackoff were able to do what they had wanted to do.

During these years, the new fields of OR/MS were really taking off. In the United Kingdom, the Operational Research Society (initially called Operational Research Club) was created in 1948; in the United States, the Operations Research Society of America (ORSA) was founded in 1952 and the Institute of Management Science (TIMS) followed in December 1953. Its mission should be 'to design a science of management that lived up to the standards of good science, whereas OR would be the practical application of that science'.[11] Note that the founders of TIMS used 'Management Science' as a convenient label for 'science of management' rather than as a mere synonym for operations research, as it is usually understood today.

To promote the new vision, TIMS quickly set up the journal *Management Science*. In 1954, Churchman became its first editor and managed to bring out the first issue by October of that year. Under his editorship until 1961, when RM Thrall succeeded him as editor-in-chief, the journal rapidly became the field's most prestigious journal and was

of paramount importance for the development of OR/MS to a recognized academic and professional discipline. Cooper[12] and Hopp[13] provide useful historical accounts.

In 1957, Churchman *et al*[14] published the field's first internationally recognized textbook, *Introduction to Operations Research*, which brought them new fame. Churchman was offered a visiting professorship in the Graduate School of Business Administration of the University of California, Berkeley, and a year after became Professor of Business Administration there. Thus ended what must have been one of the most exciting and happiest times of his life, the years at Case.

At UC Berkeley, Churchman established Berkeley's graduate program in OR and co-founded the Center for Research in Management Science. Many additional appointments outside the Business School made sure he remained in touch with contemporary management issues. Just to mention a few, from 1962 to 1963 he served as a Research Director of System Development Corporation. In 1963, consultations with NASA Director James Webb concerning the need to apply the tools of the space age to the society's problems led to a decision by NASA to fund a Social Sciences Program at the Space Sciences Laboratory of the University of California at Berkeley; Churchman was appointed Research Philosopher and Associate Director of the Laboratory and until 1971 directed its Social Sciences Program. Other engagements included teaching mandates in the Interdisciplinary PhD Program of the Graduate Division of UCB and in other universities, as well as consulting mandates with many commercial corporations, non-profit organizations, and government agencies. Among the latter were, in addition to the National Aeronautical and Space Administration (NASA), the National Science Foundation, the US Office of Education, the Educational Testing Service Research Committee in Princeton, New Jersey, the US Department of Energy, the Texas Energy Council, the US Public Health Service's National Advisory Allergy and Infectious Diseases Council, the US Fish and Wildlife Service, and others. After retiring, in 1981, from his professorship in the Business School, he continued to teach at UCB as a Professor of Peace and Conflict Studies until 1996.

Churchman's philosophy: central themes

I would like to introduce the reader to some central themes of Churchman's work that I find particularly relevant for understanding its continuing importance. Among these I count his philosophical roots in American pragmatism, his specific notion of the nature and aims of science, the way he associated scientific inquiry with (social) systems design, his conception of ethics in terms of an 'ethics of whole systems', and finally, resulting from all these notions, his understanding of the systems approach as a form of rational inquiry and practice that would live up to all the concerns he associated with these concepts. Table 1 gives an overview.

Churchman's thinking had its roots in the philosophical tradition of American *pragmatism* (CS Peirce, W James, J Dewey). Pragmatism is a philosophical stance that sees purposeful action as an essential expression of human nature. Accordingly, it stipulates that the meaning and value of all human endeavours, including philosophy and science, is to be measured by the way it serves the practice of human life. This pragmatic orientation sets Churchman's system's philosophy apart from the mainstream of systems thinking, which is rooted in analytical philosophy and biology (L Bertalanffy, KE Boulding, A Rapoport, N Wiener, and others) and which, as far as I can see, continues today to pursue a naturalistic idea of 'systems science'.

I already mentioned the philosopher who most influenced Churchman's understanding of pragmatism, his teacher Edgar A Singer, Jr.[5–8,15] Another major influence was his second main teacher at the University of Pennsylvania, Henry Bradford Smith,[16] with whom he wrote his doctoral dissertation in mathematical logic and who himself had been a student of Singer. We can recognize these two influences throughout Churchman's writings; Smith represents the analytical pole and Singer the humanist pole in his pragmatic thinking.

Singer had studied with William James at Harvard but had developed a somewhat different version of pragmatism. He sought to avoid the relativistic implications of pragmatism (esp. in James' version) by associating it with the *pursuit of ideals*. An ideal is an ultimate intended outcome and as such is an absolute good that we cannot usually obtain; but we can try to approximate it ever more, without any predefined limit. Singer and Churchman held that every human being will at all times pursue a number of basic, invariant ideals. Everyone desires to be happy, or in Singer's language, to progress towards the ideal of 'contentment'. Consequently, everyone also desires the 'knowledge' (education, information) and the 'power' (competence, control) necessary to promote one's contentment. Likewise, everyone desires 'plenty' of resources and opportunities to attain this end, and so on. Since we will always seek to get closer to these ideals, they provide us with orientation for purposeful action; because they are absolute, they provide us with anchor points, as it were, for judging the merits of an action, namely, in terms of its progress towards the ideal. For both Singer and Churchman, the pursuit of ideals constituted a core element of rational action. This is why the concepts of 'ideal planning' and 'idealized design' were later to be so important for the systems approaches of Churchman[17] and Ackoff.[18,19]

Two related core concepts were Churchman's understanding of inquiry as a rational approach to *securing improvement,* and the importance he consequently gave to a *teleological theory of measurement*. All defining and calibrating of adequate measures depends on pragmatic assump-

Table 1 Some central themes of C West Churchman's philosophy of social systems design

Core concerns	*Major concepts*	*Major reflections*
American pragmatism (Peirce, James, Dewey, Singer)	Pursuit of ideals	Scientific inquiry, like all human activity, is of an ideal-seeking nature; hence, a proper understanding and practice of science requires us to understand the implications of this pursuit of ideals for our notions of truth, knowledge, science, and so on
	Improvement	Improvement is a never-ending process of approaching ideals that as such cannot be achieved. One way to analyse the process is in terms of alternatively wide conceptions of purposeful activity in terms of the pursuit of goals, ends, and ultimately, ideals ('ideal planning')
	'Teleological' or purposeful nature of all inquiry and practice	The rationality of inquiry and practice is to be measured by the purposes (goals, ends, ideals) they serve and by the degree to which they approximate them (teleological measurement)
Ethics of inquiry	Inquiry in the 'imperative mood'	Whether the purposes served by some inquiry are adequate can only be understood by asking what *ought* to be the purposes; hence, well-understood inquiry is always conducted in an 'ought' mood, whatever the conventional concept of science says to the contrary and although most questions are asked in an indicative ('is') rather than imperative ('ought') mood
	'Whole systems ethics'	Purposes can be properly chosen and evaluated only in terms of an ethics of whole systems, for improvement is a property of the whole system. Any system's improvement has to be assessed in terms of the improvement of the respective larger system
Science	'Experimentalism'	Science is a model of inquiry based on the core ideas of empirical control of assertions (prototype: laboratory experiment), teleological measurement, and careful inference. Experimentalism combines the requirements of scientific control with the insights of pragmatism so as to achieve a non-relativistic pragmatism
	Teleological theory of measurement	Adequate and accurate measurement is crucial for experimental control but is impossible without pragmatic assumptions as to what is to be achieved by the inquiry (purposes)
	Pragmatic–dialectical theory of experimental inference	Experimentally controlled observations always allow for different interpretations and inferences; which ones are 'true' depends on pragmatic assumptions on the purposes (goals, ends, ideals) to be pursued
	Inquiry as systems design and 'sweeping in'	Since the adequacy of pragmatic assumptions can only be understood and justified in terms of their whole-systems implications, well-understood inquiry is to be considered a form of systems design
	Design of 'inquiring systems'	Designing adequate approaches to inquiry amounts to the design of inquiring systems, that is, forms of inquiry that have a built-in capability of exploring ('sweeping in') their own whole-systems implications
Social systems design	OR, MS, 'systems approach'	OR/MS and the systems approach should be forms of science that do justice to the insights of pragmatism and thereby extend the tools of classical experimental science to society's problems
	'Enemies' of the systems approach	There are approaches to social problem-solving that do not respect the rationality criteria of a scientific approach but merely seek to achieve their own particular rationalities (eg of a political or religious nature). Although they are the 'deadly enemies' of the inquirer's conceptualization of rationality in terms of whole-systems design, they cannot be ignored
	The 'systems approach and its enemies'	Although the 'enemies' subvert the inquirer's indispensable quest for comprehensiveness, sound inquiry cannot avoid listening to them and trying to do justice to them without abandoning the quest for comprehensiveness—the ultimate paradox of all search for rational inquiry and practice

tions about the purposes to be served. But this poses a serious problem: How do we know that our individual purposes (the specific goals and ends by which we try to approximate ideals) are adequate? How can we avoid a total relativism of individual purposes in favour of a rational quest for improvement?

This is where two other core concepts of Churchman's come in, his understanding of *rational inquiry as systems*

design, and his search for an *ethics of whole systems*. For the answer to the above question is: we cannot, except by examining what our individual goals and ends mean for the whole of humanity. Kant had reached a similar conclusion before; but Churchman gave it a different, systems-theoretic twist. While all ethical approaches thus far had identified ethical action with individually good action, as measured either by the agent's good will (Kant) or responsibility for the consequences (Weber), Churchman accepted that the meaning and merit of ends could only be understood by identifying their whole-systems implications (I have discussed the implications of this systems-theoretic shift of ethics a little further in Ulrich[20]). The idea of an 'ethics of whole systems' thus became a major concern of Churchman's systems thinking.[21] But of course, we can never be certain to have identified the relevant whole system; hence, this ethical requirement translated into a never-ending process of '*sweeping in*' ever more aspects of any considered system's environment. Consequently, designing rational inquiry, too, gained a new sense; it now amounted to the design of *inquiring systems* (Compare for a short discussion[22]), that is, forms of inquiry that would have a built-in capability of exploring ('sweeping in') their own whole-systems implications.

The last of Churchman's central concerns that I want to discuss briefly is his notion of *science*. It results from all the previously mentioned considerations. Churchman did not reject the classical notion of science as an empirical and analytical method for controlling assertions, but he sought to enrich it so that it could be applied to society's problems. To this end, the pragmatic core concepts just discussed needed to be translated into a practical framework. Following Singer, Churchman and Ackoff initially called this framework 'experimentalist philosophy' or 'experimentalism'. They sought to develop it in many publications (see among many others Churchman and Ackoff,[24] also for a helpful review, see Britton and McCallion[25]). The name of the framework was subsequently to change; first to *operations research,* then to *management science,* later to *systems approach*[26] and in the end, to *social systems design* (Churchman) or 'social systems science' (Ackoff). Each change of name stood for a renewed attempt to revive the original ambition and hence, to resist the eternal tendency of being absorbed into the mainstream of the professional fields that developed under these names. Each of these subsequent efforts was once again intended to demonstrate how the pursuit of ideals was possible in a rational manner, or in other words, how we can use science to better manage our human problems.

What at first may look inconsistent and disturbing to many a reader, namely, Churchman's seemingly technocratic faith in science and systems design as tools for securing improvement in the human condition, thus becomes understandable as a consistent expression of his far-reaching notion of rational inquiry. I do not know of any corresponding formulation in his writings, but I suspect 'science' as he understands it embodies the sum total of all it takes to achieve a rational pursuit of ideals. Science, then, is itself an absolute ideal; which in turn explains why it ultimately led him to a dialectical conception of inquiry in terms of the *systems approach and its enemies*,[27] a conception that most professionals in the fields he had helped to establish found difficult to accept. He took the ideal of a scientific approach to managing human affairs seriously enough to follow it through to its ultimate consequence.

Some concluding reflections: what remains?

I would like to conclude this commemorative essay with a few reflections on what remains of West Churchman's work and what it may take to carry it forward. Looking back on the development of his thought, from its origins in American pragmatism and mathematical logic, through his early efforts to develop an 'experimentalist' philosophy of science, to his work on operations research, management science, and the systems approach, and ultimately to his mature thought on social systems design in terms of 'inquiring systems' and the 'enemies', a central theme becomes visible in the variety of his writings. All these efforts consistently aimed at his life-long ambition of expanding the application of science to the realm of organizational transformation and social change.

His perseverance in pursuing this effort, but also his occasional despair, become understandable if one considers that the more he opened his notion of scientific inquiry up and adapted it to the requirements of his ambition, the more his methodological core principle of 'sweeping in' was bound to lead him into a fundamental, unresolved dilemma of his philosophy of science: On the one hand, science, if it was to live up to his ambition, needed to be practised as a systems approach that would, in each specific application, consider the whole system that might be relevant to a problem; on the other hand, science had no conceivable method for achieving this. I think this dilemma became the core difficulty with which he was struggling in much of his work since (at latest) the 1970s.

His way out of the dilemma was, ultimately, the concept of the 'enemies'. Enemies, as I understand West Churchman, are those viewpoints, which contest and undermine the system designer's quest for whole-systems rationality—and with it, for whole-systems ethics—by elevating their own partial rationality to the status of the only arbiter of rationality. The systems approach must not commit the same error but must take the enemies seriously, for otherwise it betrays its own quest for comprehensiveness. West suggested that the four most important sources of such unholy particularism were to be found in politics, morality, religion, and aesthetics. A proper notion of systemic inquiry thus needed to find ways of incorporating these enemies, in

the dialectical sense suggested above. This ultimately meant to him that his hero, the systems designer, had to heed the biblical message: 'love your enemy', and ultimately, '*be* your enemy'.[28] That is to say, a systems designer should sympathize and identify with the enemies so much that he or she could understand their objections authentically and could then scrutinize his or her systems maps and designs in the light of these objections.

Churchman, of course, wants us all to become systems designers, whenever we do a piece of inquiry or otherwise engage in purposeful action. If we understand ourselves as systems designers, we will ultimately have to see ourselves as our own enemies, that is, become self-reflective:

> If you *are* your enemy, you can begin to learn what you yourself are like, as you look on yourself from the vantage point of the enemy: how foolishly you push one point of view, of model building, statistical analysis, game theory, ethics, or holism.[29]

I believe this idea embodies a significant revision of contemporary notions of 'sound science' and sound professional practice. However, as Britton and McCallion observe in their overview of the Singer–Churchman–Ackoff school of thought (it is rather actually an overview of the 'experimentalist' framework underpinning it):

> When one becomes one's own enemy, the scientific strategy will be seen in a new light, and can be modified accordingly. Churchman discusses the nature of the enemies but provides no guide on how to be your own enemy.[30]

Churchman was the first philosopher to take the systems idea seriously enough to examine its ultimate epistemological implications; but in the end, these implications were so overwhelming that his inquirer, the systems designer, had to become a hero who was fighting a lonely struggle. The struggle turned out to be too heroic to have a chance of being taken up by the academic community at large. The trouble was, Churchman pursued his epistemological insights so consistently and relentlessly that in the end, his understanding of the task he had set himself left him no room for translating these insights into a practicable, yet philosophically tenable, framework for critical inquiry and practice. Insofar his 'systems approach' ended up being a sceptical rather than a critical approach as I would understand it.

Another reason why Churchman's system designer had to become a somewhat hopeless hero was probably that this hero grew up in the world of the 1950s and 1960s, when pursuing a rational approach to society's problems meant to apply the tools which were available and *en vogue* at that time and to which West himself had contributed so much. To a large extent, these tools were based on a goal-seeking model of human behaviour and an engineering view of planning that both appear rather narrow, if not naïve, to us today. From today's viewpoint, with the benefit of historical distance and of complementary 'soft' and 'critical' approaches being available, we refer to this perspective as 'hard systems thinking' and have a better grasp of its limitations (which is not to say it does not have its proper applications); but when West Churchman was developing his ideas, he did not have these advantages.

We have to be all the more grateful to West Churchman that he, like no other scholar of his epoch, was working at the limits of the fields he had co-founded and thus helped us become aware of their limitations. But does that mean that in order to remain faithful to his intentions, we must stay within those limitations? I do not think so. As I know West, he would have been the first to get rid of them, had he enjoyed the distance and the additional approaches available to us today. After West Churchman, the systems approach cannot be what it was before. As Peter Checkland concluded in a review of the importance that Churchman's work had to him:

> Churchman demonstrates in all his work, but especially in *The Design of Inquiring Systems,* that the epistemology of a systems approach, as embodied in systems engineering, systems analysis, and 1960s management science and operations research, contains many subtle traps for the unwary. His body of work makes it impossible subsequently to display the naïve hubris with which a systems approach was advocated at that time. His method is to adopt the epistemology of 'hard' systems thinking and then to reveal its problems. This approach makes that revelation cogent, but by basing itself upon the hard paradigm of the assumption of a systemic world and the need to design goal-seeking systems within it, it cannot transcend that *Weltanschauung*.[31]

I would argue that any attempt to take West Churchman's work seriously today and to bring it to bear on our contemporary notions of 'sound science' and sound professional practice, will require us to deal with the methodological implications of his unresolved dilemma. As Churchman himself concluded in the *Systems Approach and Its Enemies:*

> The choices for the hero-planner seem clear. One option is to maintain the spirit of the classical laboratory by collecting just those data that appear relevant and can be obtained objectively…. The other option, the harder one, is to recognize that the unpredictable human is an essential aspect, and to begin to invent a methodology in which human bias is a central aspect. Will this methodology be 'scientific'? No, if we doggedly stick to the assumption that the classical laboratory *is* the basis of science. Yes, if 'science' means the creation of relevant knowledge about the human condition.[32]

Looking back on my years with West at UC Berkeley, I see more clearly than I did at the time what was motivating my work on critical systems heuristics (CSH)[33] and why its methodological core concept became the idea of promoting a systematic, discursive process of boundary critique.[b] The principle of boundary critique had to replace the sweep-in principle in the role of a methodological core concept since it

embodies a methodological pragmatization of precisely this hope of West Churchman: that we should 'begin to invent a methodology in which human bias is a central aspect.'

Endnotes

[a]This obituary is a revised short version of Ulrich.[1]

[b]By 'boundary critique' I mean a critical employment of boundary judgments, that is, the way we delimit the relevant 'whole system' that we effectively consider in professional intervention or inquiry, whether consciously or not. There are two basic applications of boundary critique: handling boundary judgments in a reflecting, transparent way, and using them for emancipatory purposes against those who may not handle them so. The term is a convenient short label for what I earlier preferred to call 'the critical employment of boundary judgments'.

References

1 Ulrich W (2004). In memory of C West Churchman (1913–2004): reminiscences, retrospectives, and reflections. *Int J Org Transform Social Change* **1**: 199–219.
2 Churchman CW (1982). *Thought and Wisdom*. Intersystems Publications: Seaside, CA, p 20.
3 Churchman CW (1979). *The Systems Approach and Its Enemies*. Basic Books: New York.
4 Churchman CW (1938). Towards a general logic of propositions. PhD Dissertation, Department of Philosophy, University of Pennsylvania: Philadelphia, PA.
5 Singer Jr EA (1923). *Modern Thinkers and Present Problems*. Henry Holt & Co.: New York.
6 Singer Jr EA (1936). *On the Contented Life*. Henry Holt & Co.: New York.
7 Singer Jr EA (1945). *In Search of a Way of Life*. Columbia University Press: New York.
8 Singer Jr EA (1959). In: Churchman CW (ed). *Experience and Reflection*. University of Pennsylvania Press: Philadelphia, PA.
9 Churchman CW (1948). *Theory of Experimental Inference*. Macmillan: New York.
10 Dean BV (1994). West Churchman and operations research: Case Institute of Technology, 1951–1957. *Interfaces* **24**(4): 5–15.
11 Churchman CW (1994). Management science: science of managing and managing of science. *Interfaces* **24**(4): 99–110 (see p 107); compare Churchman CW (1955). Management Science, the journal. *Mngt Sci* **1**: 187–188.
12 Cooper WW (2002). The founding of TIMS. *Interfaces web site,* Section 'OR/MS History, http://www.interfaces.smeal.psu.edu/.
13 Hopp WJ (2004). Fifty years of Management Science. *Mngt Sci* **50**: 1–7.
14 Churchman CW, Ackoff RL and Arnoff LE (1957). *Introduction to Operations Research*. Wiley: New York.
15 Churchman CW (1982). An appreciation of Edgar Arthur Singer, Jr. In: Churchman CW (ed). *Thought and Wisdom*. Intersystems Publications, Seaside, CA, pp 116–135.
16 Smith HB (1923). *How the Mind Falls Into Error*. Harper & Brothers: New York.
17 Churchman CW (1979). *The Systems Approach and Its Enemies*. Basic Books: New York.
18 Ackoff RL (1974). *Redesigning the Future*. Wiley: New York. Compare Ackoff RL and Emery FE (1972). *On Purposeful Systems*. Tavistock Publications: London (see esp. Chapter 14).
19 Ackoff RL (1981). *Creating the Corporate Future*. Wiley: New York.
20 Ulrich W (1994). Can we secure future-responsive management through systems thinking and design? *Interfaces* **24**(4): 26–37 (see pp 32–34).
21 Churchman CW (1968). *Challenge to Reason*. McGraw-Hill: New York.
22 Churchman CW (1971). *The Design of Inquiring Systems: Basic Concepts of Systems and Organization*. Basic Books: New York.
23 Ulrich W (1985). The way of inquiring systems, review of 'The Design of Inquiring Systems' by CW Churchman. *J Opl Res Soc* **36**: 873–876.
24 Churchman CW and Ackoff RL (1946). *Psychologistics*. Mimeographed, University of Pennsylvania Press: Philadelphia, PA. Revised ed., mimeographed, University of Pennsylvania Faculty Research Fund, Philadelphia, PA, 1947; Churchman CW and Ackoff RL (1947). An experimental definition of personality. *Philosophy of Science* **14**: 304–332; Churchman CW (1948). *Theory of Experimental Inference*. Macmillan: New York; Churchman CW and Ackoff RL (1950). *Methods of Inquiry: An Introduction to Philosophy and Scientific Method*. Educational Publishers: St. Louis, MO; Churchman CW and Ackoff RL (1950). Purposive behaviour and cybernetics. *Social Forces* **29**: 32–39; Ackoff RL (1953). *The Design of Social Research*. University of Chicago Press: Chicago, IL; Churchman CW (1961). *Prediction and Optimal Decision: Philosophical Issues of a Science of Values*. Prentice-Hall: Englewood Cliffs, NJ; Ackoff RL (1962). *Scientific Method: Optimizing Applied Research Decisions*. Wiley: New York; Ackoff RL and Emery FE (1972). *On Purposeful Systems*. Tavistock Publications: London.
25 Britton GA and McCallion H (1994). An overview of the Singer/Churchman/Ackoff school of thought. *Syst Pract* **7**: 487–521.
26 Churchman CW (1968). *The Systems Approach*. Delacorte Press: New York. Paperback edition Dell Publishing: New York, 1969; second rev. ed. 1979.
27 Churchman CW (1979). *The Systems Approach and Its Enemies*. Basic Books: New York.
28 Churchman CW (1979). *The Systems Approach and Its Enemies*. Basic Books: New York (see pp 149–151 and 204–214).
29 Churchman CW (1979). *The Systems Approach and Its Enemies*. Basic Books: New York (see p 214).
30 Britton GA and McCallion H (1994). An overview of the Singer/Churchman/Ackoff school of thought. *Syst Pract* **7**: 487–521 (see p 498).
31 Checkland PB (1988). Churchman's 'anatomy of systems teleology' revisited. *Syst Pract* **1**: 377–384 (see p 383).
32 Churchman CW (1979). *The Systems Approach and Its Enemies*. Basic Books: New York (see p 62).
33 Ulrich W (1983). *Critical Heuristics of Social Planning: A New Approach to Practical Philosophy*. Haupt: Bern, Switzerland. Unchanged reprint edition, Wiley: Chichester, 1994.