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# **FOUR FUNERALS AND A WEDDING**

or

## **HOW THE GRINCHES STOLE "SCIENCE"**

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## FOUR FUNERALS AND A WEDDING or HOW THE GRINCHES STOLE "SCIENCE"

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I want to inter (i.e., bury symbolically) four concepts and their associated entities. The four are:

- Management Science
- Computer Science
- Systems Science
- Problem-Solving

In the same context, I want to announce the engagement (i.e., prelude to marriage) of Reasoning with Rhetoric, in the hopes that the wedding will take place sooner, rather than later.

**Early Inspiration.** Initial inspiration for this ambitious scenario came from the late Sir Geoffrey Vickers who deplored the coup whereby the word "system" became the personal property of computer-related people. Vickers said that he hoped to restore this word to its more general meaning, because it was needed in larger arenas. Alas, it is clear that he had no success in doing so. Since I believe that I cannot succeed where Vickers could not, I have adopted a less ambitious goal. I don't want to restore lost terms any more. But I do want to promote their funeral. Maybe I can become the "Dr. Kevorkian" of assisted suicide aimed at overcoming technological linguistic pollution.

**The Enemies of the Pejorative.** Arrayed against me is the modern university. Outsiders may not realize that with the demise of the "Dean of the Graduate School", the university as an institution of higher learning lost its traditional principal architect of institutional quality. I know of no research that shows that the ascendent use of the word "science" in conjunction with such modifiers as "management", "computer", and "systems" coincided with the demise of the Dean of the Graduate School position. However even the most casual student of university catalogs (are there any, casual or otherwise?) cannot help but discover that on the scale of centuries, or possibly even decades, the demise of the Dean of the Graduate School and the beginning of the use of the word "science" as a marketing tool of professional schools can be seen as coincident in time. If that coincidence is not viewed as convincing perhaps, at least, it might occur to the reader that there must be some explanation for the demise of the Dean of the Graduate School from what was a commanding position to a vacant slot, not even meriting a sham box on the university organization chart.

**Ideas for Supplemental Research.** For those straining to find an untouched topic to support academically-beneficial publishing, perhaps one could be convinced that a researchable idea lies in finding out why such terms as "education science", "English science", and "legal science" have not emerged (or, if they have, why they have not spread). Is it just because those denizens of the campus are not aware of the license to use the term irresponsibly?

**Has Philosophy Really Died?** Even the most resolute philosophical idealist (if any remain) nowadays would seemingly not be totally indifferent to the idea that at least some empirical evidence might be offered to support the use of the word "science" in its present-day vulgarized forms; but virtually nothing has come from the philosophical community. (I am trying to find out if a recent blast from Mario Bunge is more than simply a rejection of some common ideas.)

Perhaps they are immobilized by the chaotic condition of their own field in the wake of Jacques Derrida. Or perhaps their false assumption that Michel Foucault was a deconstructionist, instead of a voice in the wilderness crying for reconstruction along disciplined lines has engendered an intellectual illness, nurtured by Rorty from their own ranks. Perhaps there really is such a thing as "cat got your tongue!". (As a boy growing up in Missouri, I was often advised of that possibility.)

**Purpose.** In any case, the funeral of the four scarcely needs much to be symbolically announced (as opposed to *actually happening*, which would require some action in the university--i.e., deoxymoronization of academic decision-making). So the foregoing remarks may be seen by the reader as a self-induced cathartic, produced before leaping to the brief announcement.

**Why the Funerals?** The funerals are deserved for the following reasons.

- For *Management Science*, because there is no science there. Any science requires some corroboration from empirical evidence, applied to the field which is the topic of the science. But there is none. To attain it, it would be necessary to show that what is taught under the rubric demonstrably has caused organizations to be managed much better than would otherwise be the case. And one would expect that there would be a few "laws" of the science squeezed out of the empirical evidence. In their absence, the best we could hope to do in using the word science would be to make it a syllable in the word "metascience", by analogy with "metaphysics"; i.e., a body of assertions that seem reasonable, but do not respect or even solicit empirical testing.

A possible rejoinder to the foregoing could be to demonstrate that management science consists of a few algorithms that have found some limited applications in highly-specialized components of organizations. But if that standard were applied, we would have to call arithmetic a management science; something that is unlikely to appeal to the college-level.

- For *Computer Science*, because there is no science there. Any science requires some corroboration from empirical evidence, applied to the field which is the topic of the science. But there is none. To attain it, it would be necessary to show that what is taught under the rubric demonstrably has caused computers to be designed according to

articulatable standards, justified by empirical evidence. At first sight, one might suppose that the rapid emergence of computers and software is all the evidence that is needed. But, on more careful examination, one discovers things like this:

- (Chaired) Professor Fred Brooks of the University of North Carolina (and formerly with IBM Corporation), who chaired an investigation for the Department of Defense some years ago into matters related to software productivity, produced a report for the U. S. government stating essentially that science had nothing to offer to the software field (even though that field is typically described as a science!!!), and his view that there is "no silver bullet" for that field is widely quoted in the software community. (Talk about assisted suicide!!)

One would also expect that there would be a few "laws" of the science squeezed out of the empirical evidence. In their absence, the best we could hope to do in using the word science would be to make it a syllable in the word "metascience", by analogy with "metaphysics"; i.e., a body of assertions that seem reasonable, but do not respect or even solicit empirical testing.

- Strangely, the branch of knowledge that has been connected (very loosely) to the computer field from its early days is known as "formal logic". One of the leading companies in the computer field was notable for using the word "think" as a common method to stimulate its people to achieve. Later in this essay I will discuss *Seven Milestones in the History of Thought*. Try to find any connections between what is discussed there and today's software practices.
- For *Systems Science*, one notes that unlike the topics of the two funerals discussed so far, systems science, in a sense, does not need a funeral since, academically at least, it is virtually unborn, or at best is stillborn, lacking a coffin.

While it is true that a handful of programs have appeared in universities in which the words "systems science" appear in the titles, several have died an early death, and those that remain are constantly imperiled and have been forced to dilute their focus in order to survive. Note that the words "mass grave" could not, therefore, be relevant to this field, seen in terms of academia.

On the other hand, systems *societies* have proliferated. I listed many of them in an encyclopedia article a few years ago; and I feel pretty sure that new ones have started since then.

Any science requires some corroboration from empirical evidence, applied to the field which is the topic of the science. But there is very, very little that can be identified. What **can** be identified **cannot** be accurately described as "accepted" across the boundaries of systems science (if there be such). At least the management science and computer science people can point to some core of accepted material; and they could establish its existence by pointing to that resource called "university catalogs". But this possibility is not open to the systems community.

If, momentarily, we depart from focus on systems science to a focus on "systems engineering", we can begin to find some curricula. But wherever they exist, they typically make little pretense

to be supported by any science (unlike, for example, electrical engineering, which is supported extensively by empirical evidence and notable scientific experiments, carried out over more than a century). Instead, they focus energetically and single-mindedly on "methodology" or, more recently, "metamethodology". In retrospect, the Dean of the Graduate School historically required that in order to start an academic degree program an identified, accepted, rather rigorously supported, body of knowledge would have to be present; at least in the sciences. Methodology alone would not have been regarded as sufficient; because methodology, while part of science, is not in itself sufficient to constitute a science.

- What about "*problem-solving*"? Alone among the four funereal topics, problem-solving foregoes the use of the word "science" as an identifier. On the other hand, it also foregoes the distinctive adjective (e.g., management, computer, systems); suggesting that if you learn to solve problems, you have acquired a ubiquitous capability suitable for working in any arena.

In domains, such as liberal arts, discussions of such matters as academic formalisms seem to be adequate to relegate the discussions to what is called a "problem orientation"; so that the words "problem" and "applied mathematics" tend to be highly correlated. (Possibly the reverse situation, in which the use of formalisms such as formal logic is *non sine qua* [I don't know what it means, either] could then be described as "chat-oriented".)

In any case the sharp delineation of problem-solving occurs in terms of the way time is allocated to its activity. Very, very few of the problems that are actually solved in or around academia require more than 30 minutes of intense effort on the part of skilled problem-solvers.

A second way to delineate sharply academic problem-solving is in terms of the typical number of possible answers to a problem: one. Since many important "real-world" situations (a) require days, weeks, months, years, or an unknown long period for resolution, and (b) are unaccompanied by monolithic algorithms; any correlation between problem-solving and citizenship (for example) is accidental.

**The Wedding of Reason and Rhetoric.** Turning now from the four funerals to the hoped-for wedding, it seems clear that any resolution of the sour impact of the funerals will have to come about from a wedding of reason and rhetoric. Dr. Jonas Salk wrote an insightful, even desperately-sounding, book sometime ago which he called *Anatomy of Reality: Merging of Intuition and Reason*. I could have used his language for this discussion, but chose not to for a simple reason: there is too little ownership of the term "intuition" in the academic community or elsewhere (notwithstanding its presence) to attach the discussion to follow. On the other hand, the word "rhetoric" is quite popular in parts of the academic community and in the world at large. (There is probably also relatively little ownership of the word "reason", but it does have a long and distinguished literary history.)

To promote the marriage by announcing the engagement seems to require that one begin to review milestones in the history of thought. By offering a brief glance at such a review, I announce the theoretical feasibility (not the strong likelihood) of the wedding. Embracing would



have to precede the wedding.

**The Search for Sources.** For quite a long time, I have been trying to locate original sources for ideas that have gone into the development of Interactive Management, in general [1]; and for Interpretive Structural Modeling (ISM) [2], in particular. This search has been made difficult by many things, not the least of which is the relative lack of interest these days in what can be learned from the past; along with a rather resolute (even dominating) determination to regard almost everything that is being promoted as an original concept without any historically-relevant insights.

Now that this search has been going on for almost 30 years, I think it is time to highlight seven milestones in the history of thought. The seven have been chosen, in part, because there is a strong sequential linkage among them which seems undeniable.

**Linkage Forms.** This linkage takes at least two forms. The first can be described as a *linkage of formalism*; in the sense that the Milestones all reflect an ultimate aim to make very precise the way that the products of thought are represented. The second can be described as a *linkage of dependency*; because each depends on, and was sustained by, its temporal antecedents.

**Time Period Involved.** The period of linking time involved is two and one-half millenia; therefore to pinpoint exact dates seems to be largely irrelevant. In presenting these, the century that is used as the principal unit of time, although some of the milestones may cut across parts of two centuries. Where that occurs, I have chosen either the latest century, or the one in which the most essential contribution seems to have been made.

**The Milestones Tabulated.** Here is the tabulation of the seven milestones. Brief elaboration follows the tabulation.

*Milestone 1.* Articulation of Categories and Syllogisms. (Aristotle, Fourth Century, B. C.) in Categories and in the Prior Analytics.

*Milestone 2.* Abelard's Articulation of (but not naming of) Transitivity, Antecedents, and Succedents. Twelfth Century, A. D. (described in Bochenski's History of Formal Logic).

*Milestone 3.* Leibniz's Introduction of Graphical Symbolism to Portray Reasoning. Eighteenth Century, A. D. (described in Bochenski's History of Formal Logic). Notably, Leibniz was using "Venn Diagrams" well over a century before Venn (as was Euler).

*Milestone 4.* Boole's Propositional Calculus and De Morgan's Theory of Relations, Nineteenth Century, A. D. (key publications coming in the same year, 1847, with Boole crediting De Morgan as a source of inspiration).

*Milestone 5.* Peirce's connection of logic to science in general, his recognition of De Morgan's Theory of Relations, his popularization of the importance of transitivity, his discovery of the necessity and sufficiency of triadic relations to articulate all relationships, and his clarification of

flaws in previous philosophical writings. Nineteenth Century, extending into the Twentieth. (His published and non-published writings are today the subject of extensive analysis.)

*Milestone 6.* Harary's linkages among branches of mathematics, in which he establishes permanently the connection between formal logic of propositions, and graphical representations as digraphs. (Twentieth Century in his co-authored work titled Structural Modeling: The Theory of Directed Graphs).

*Milestone 7.* The articulation of ISM as the means of applying Harary's mathematics to the development of Structural Models. Twentieth Century, 1974, in *Structuring Complex Systems* [3].

**Connecting the End Milestones.** The direct connection between Milestones 1 and 7 occurs through the recognition that every Interpretive Structural Model is an array of linked syllogisms (and you can count the number of them in each instance). In other words, what ISM provides to groups of people is the capacity to create and link syllogisms into consistent logic patterns.

**Milestone 2 Contribution.** The contribution of Milestone 2 is to articulate initially the significance of transitivity and of antecedent and succedent concepts, furnishing the statements which, when replaced in a one-to-one way with symbols, fit perfectly into DeMorgan's Theory of Relations, and which provide the basis for Harary's focus upon transitive relations.

**Milestone 3 Contribution.** Milestone 3 reflects the introduction of geometry into logic visualization and interpretation of representation.

**Milestone 4 Key Formalisms.** Milestone 4 provided the formalisms needed to construct relational statements, and to apply the formalities of Boolean algebra to their manipulation and organization.

**Integrative Insights.** Milestone 5 put everything into perspective, facilitating the interpretation of previous and future developments in a way consistent with the best view of scientific thinking; divorcing such developments from incorrect thinking propagated by adherents of philosophers such as Bacon, Descartes, both of the Mills, and others. Milestone 6 placed the integrative insights into formalisms, making them operationally useful.

**Conclusions.** What key conclusions can be drawn that reflect the seven Milestones?

*Drift Toward Formalism.* First we can see, within the assiduous family of linked scholars, a pronounced, but very slow, drift toward formalism, occurring over a period of more than two millennia.

*Enabling Applications.* We can reflect on how this drift toward formalism has slowly established the basis for computer help in organizing products of human thought, thereby enabling applications previously not feasible.

*Pervasive Neglect.* We can observe the pervasive neglect of these seven Milestones in today's educational system, which remains largely content to work with ideologically-based language (in spite of the power made available through these Milestones); and which largely fails to make these Milestones known to the students.

*Breadth of Application.* Because of the outstanding work already done and continuing to be done by practitioners of Interactive Management, the astonishing breadth of application of ISM is becoming steadily more evident.

*The Battle for Attention.* Particularly in the realm of organizational activity, the high consulting fees being obtained by all of today's high-visibility management gurus, and the high stakes involved in promoting alternative concepts of complexity, makes clear that there is a battle for attention in application communities. If visibility were the main criterion to see who is winning this battle, it would seem clear that IM is losing the battle and that concepts espoused by the high-profile management gurus are carrying the day.

*Documented Results.* But if concrete results and clear documentation of them and their benefits is taken as the main criterion, it seems clear that these seven Milestones are winning the battle, and that over time even the universities will have to take note and begin to reshape their operations accordingly.

*The Search for Truth.* Things remain as Peirce said in 1877: "...every work of science great enough to be well-remembered for a few generations affords some exemplification of the defective state of the art of reasoning of the time when it was written; and each chief step in science has been a lesson in logic." [In "The Fixation of Belief", Popular Science Monthly, 1877].

**In Conclusion.** It is herewith announced that the funerals and the wedding described previously deserve to take place, possibly without fanfare, but with all due speed.

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## References

- [1] Warfield, J. N. and A. Roxana Cárdenas, **A Handbook of Interactive Management** (1994), Iowa State University Press, Ames, IA.
- [2] Warfield, J. N., **A Science of Generic Design: Managing Complexity Through Systems Design**, Salinas, CA: Intersystems, 1990 (two volume set); Second Edition published by Iowa State University Press, Ames, IA, 1994.
- [3] Warfield, J. N., **Structuring Complex Systems** (1974), Columbus: Battelle Memorial Institute Monograph No. 4, April.