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Cognitive Map – Hall Chp 2
Due 5/8/8

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From:

Hall, A.D., *Metasystems Methodology, A new Synthesis and Unification*, Chp 2 Basic Percepts, Concepts, and Precepts. pp. 53-124 Pergamon Press, NY, 1989.

1. Definitions of Terms and Concepts:

System – p 54 – set of objects or elements with relations between them and between their attributes embedded in an environment containing other inter-related objects.

Hierarchical Order – pg 57 – Idea that system, environment, and universe can be divided into further subsystems; constraints between subsystems cause properties-of-the-whole.

Transferable v. Non-transferable – pg 59 – T, attributes that transfer directly across subsystems at a level, Non-T, do not, but transfer vertically.

Supremal v. Infimal Units – pg 62 – In hierarchical structure, there is a right of intervention between supremal (above) and infimal (below) levels.

Control v. Adaptive Systems – pg 66-69 – Control, closed and open loop systems with feedback control at the same level in the system, Adaptive, contain homeostatic mechanisms contained in a metalevel supremal system.

Information properties of messages and signals – pg 76 – Information content, language, redundancy, information rate, and average rate, information loss.

Complexity of messages and signals – pg 76 – When the space-time and physical descriptions of communication systems are considered, complexity becomes important.

Crosspoint Array – pg 79 – Single node communication system; one way of considering complexity of communication systems.

Law of Parsimony v. Law of Requisite Variety – pg 82 – LRV, requires matching quantities of information, LP, requires matching rates of information.

Progressive factorization, systematization, and centralization – pg 86-69 – PF, transition from wholeness to independence, can happen from decay or from growth, PS, transition to wholeness, PC, as the system evolves, one part emerges as a central or controlling agency.

Need & Intentions – pg 90 – Need, a state of stress, tension, instability, in environment which tends to discharge in behavior aimed at relieving tension of restoring stability. Intentions are decisions to acquire satisfiers under given terms and conditions.

Metasystem – pg 97 – The product of the value system design and problem definition phases, a metasystem uses a set of value sentences to describe the wanted physical system, and which imply

or comprise the parts and relationships of the metasystem.

Plan – pg 107 – A projected course of action, can be operational, tactical, strategic, or directive; must consider the time horizon and be comprised of definite content (given on pg 108).

Precepts of Team building – pg 119 – Research done on teams has led to guidelines for building successful teams; those guidelines are determined by types of members, goals of team, and relationships between the different types of members.

2. Statement of Author's Message:

The best way to define systems methodology is through analyzing the basic concepts, percepts, and precepts which are used to design models of the processes to be studied. By presenting an array of instruments to be used in each of the dimensions we can begin to converge upon an idea of what systems methodology is. That is to say we are given a variety of tools and statements on their use and it is for us to create the metasystem that they reside in, and through proper use of these tools and others at our disposal we can begin to create systems solutions to our problems.

3. & 4 Identification & Discussion of Major Themes and Subtopics:

Introductory Concepts:

To begin, we must understand that systems theory has almost as many definitions for systems, as it does methodologies for dealing with them. Primarily though, we are concerned with the system as a whole, and its parts only insomuch as they relate to the whole. From this we get a verbal description of a set being comprised of elements, with relations between their attributes, embedded in an environment. This is bound within a universe, which we should consider the complete, closed whole. Two questions arise, (1) how do we separate the system from its environment and (2) how we separate the universe from the rest of the universe. Through the process of reticulation we decompose the system with the knowledge that this decomposition is dependent upon the needs, interests and values, the planners, designers, makers, and users.

Hierarchies:

This notion of reticulation leads us to the notion of hierarchical order, in which we have different levels in our system, through and across which we must consider the transfer of attributes, and the interventions of supremal and infimal units. There are several ways to model these hierarchies, many of which can be considered in the realm of graph theory, binary subordination matrices, objective trees, or verbal models. We must develop ideas of coordination and integration between the levels, particularly regarding interventions and temporal operations.

Communication and Control (including complexity):

The ideas of communication and control within a hierarchical model are necessary to understand how control between levels is addressed. The ideas of cybernetics are particularly relevant here as we begin to discuss the role of open loop and closed loop systems (and their feedback control systems). Central to this idea is the idea of regulation, whether it is cause controlled or error

controlled, and stability in a system and how the feedback control loop operates in a closed loop system. Adaptive systems are similar to the closed and open loop situations above, but their regulation comes not from a feedback loop on the same level, but rather from a homeostatic mechanism on a supremal level in the system. Feedback control systems are static in their design and adaptive systems adjust due to environmental factors. So now we are left to understand the ideas and roles information plays in our control theory. Shannon entropy and bits of information are introduced, but with the caveat that these are not measures of the semantic content of a message. The channels of communication this information is sent along are subject to noise that prevents its accurate reception. We are not as interested in the technical properties of these cybernetic systems as we are in the analogies between their properties and operations and those in the SM.

With these tools of communication and control we begin to understand the transfer of ideas, information, and action throughout our hierarchical system. However, the ideas of complexity, and the space-time and physical limitations of this theory need also be addressed. The requirements of the matching theorem and the effects of the Laws of Requisite Variety and Parsimony, place some limitations on how effectively complex our communication systems can be. Through the consideration of a simple subsystem, the crosspoint array, we begin to see the effects of both space and physical size on the temporal aspects of communication. Through greater organization we can address these limits in larger organizations but they will still necessarily be present.

Wholeness, centralization, and decomposability:

These ideas of wholeness and centralization begin with the idea of a state determined system. Within this type of system we can address the ideas of progress factorization, systematization, and centrality. Each of these issues needs to be addressed as the size and nature of our systems change. Next we can begin to consider the idea of decomposability, the benefits of it and the limits to it. Breaking a system into parts allows for greater understanding, but only insofar as we can still see the components which create the properties we are interested in at the system level. Since the forces between subsystems may be weak, but not absent, we cannot decompose the system too far as this results in a loss of information due to the constraint between the systems.

Needs and Value Systems

These last sets of ideas, hierarchies, communication and control, complexity, and wholeness, all are perceived by me to be elements of the time, logic, and knowledge dimensions and we have not really discussed the human side. Why am I writing this paper? Why are we solving problems? What are the needs of the agents involved, and how are those needs manifested in their intentions. Hall refers a great deal to the psychologists and sociologists in this section and we are left rehashing Maslow's hierarchy of needs and the behavioral school of psychology. This is combined with business research into the needs research methodologies and we can begin to see how these ideas may affect the SM, and at what phases we should consider these needs.

The value system which we create during our problem definition and value system design, the metasystem, is SM's response to the needs of its human agents. Understanding the role of this value system means understanding the differences in the types of sentences humans deal with. These value statements that comprise the system are subjective and non-transferable, and the value stems from how it is manifested in our intentions (is it a means or an end). There is no unique method of validating these value statements, so we must look at the justifications that qualifies these statements as a basis for decision and action.

These value systems help us to create the vision of the ideal system. This vision will never be

achieved, but the process of refining our alternatives to approach this ideal system is what is important. This value system is the logical basis for the concrete system design we are engaging our selves in.

Plans and Planning:

At this point we have an idea of the structure of our universe and the tools available to us to create effects within it; we have an understanding of our needs and how they create a value system and so now we must begin to plan how our concrete system can be created within our unverse with these values. Of great importance is understanding the time horizons within which our plans operate and the concrete details associated with its titles, descriptive scenarios, normative scenarios, transition scenarios, and the overt and internal actions associated with it. We can garner help from technologies and artificial intelligences but for many cases the lack of the human dimension is a hindrance. In fact, planning can also be a hindrance as it requires resources to implement and can also lend an element of inflexibility to a project. Intermixing planning with action, theory, and experience is thus a necessary skill.

Teamwork

To deal with complex problems, the capacity of a single human being is rarely enough. We must begin to address the basic idea of a team, the single level task force. These teams have an optimal size, a job to do, a process to manage, and a task of self-maintanance. Within the macroscope of the team, we must also consider the attributes, the roles, of each of the human elements humans involved. There is a large body of research describing the possible personalities involved, and the ways in which they should be mixed with the end result being to maximize the output of the team.

Questions to stimulate dialogue:

How does this information apply to our class structure? What are the communication and control elements? What about the personalities involved?

What is the use of this framework in solving small scale problems?

How do we create a vocabulary for this framework that is more easy to assimilate into our daily activities?

5. Integration of material with other knowledge:

Ashby: It was eye opening to see the Cybernetics of Ashby discussed in a larger context, with a framework in which we can use this as just one of many tools in the problem solving process.

Lendaris: The definitions given by Lendaris, are very similar to those given by Hall, but I felt that they addressed the role of perceptual filters in much greater detail.

Senge: When Hall begins to discuss the tensions that create our needs it brought to mind Senge's discussion of creative tension. I think that Hall's is a more general discussion of a need, but in both cases it is this tension that drives us to action.

Linstone: It seems that methods Linstone and Hall espouse are the least similar in our discussions. At the beginning of the chapter Hall leans towards a verbal definition of a system, not as rigorous as the set theoretic definitions, but still a definition. I don't feel that Linstone has provided anything as rigorous as in his readings. Yet, I love Linstone's perspectives and I think they are the most readily integrated into my conceptual framework for this class. I think Hall's methods are much more prescriptive and help to arrive at a concrete design, but there is so much in his writing to integrate I have difficulty grasping the whole of his message.

6. Application of Material:

Imagine if you will a world where learning is embraced and every morning the day is embraced as an opportunity to live well. The dread that faces many of my students every day at the prospect of school is only slightly outweighed by the threats of missing school and the joy of seeing their friends. By equipping myself with these tools I hope to be able to reach a deeper understanding of what the education system is and how it could be made better. Simply analyzing the hierarchical levels in terms of communication and control theory would make one yearn for a better model. By stepping back and re-evaluating the problem statement in terms of human needs and personality models would create a better vision of what a school system is ~~trying~~ to create. The beauty of this is I can take these tools to my classroom and begin to look at the structure of the classroom and the output that I expect (desire?) from my students. Am I giving them complex problems that require teamwork to solve? How am I acting as the team leader, or central element of the classroom system?

In the end I hope that rational systems techniques will begin to be put to use in redefining and redesigning a system that meets the addresses the issues facing humanity, rather than addressing the need to occupy the time of our youth.

7. Evaluation of Author's Presentation:

This chapter should not have been just one chapter; it was a small book on possibilities. I am enjoying the depth of the material, but I think I would prefer working my way through a brief synopsis of this book before addressing the book itself. After this chapter I really am curious about what is coming next (beyond the table of contents information)?

(We don't have time to cover the whole book.)

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Hall, Ch 8
Due: May 22, 2008

Hall, Arthur D. (1989). Ch.8 The Basis of Systems Methodology in Casuistry Metasystems Methodology, A New Synthesis and Unification (pp 360-376). Oxford: Pergamon Press.

Step 1: *Definition of Terms and Concepts:*

- Casuistry: the art and science of using past decisions to make present ones.
- Casuistic method: a line of reasoning to direct casuistry.
- Impartiality: equality or fairness
- Stare decisis: let the prior decision stand.
- Anathema: something or someone that one vehemently dislikes.

Step 2: *Statement of Author's Message:*

Rather than looking forward to anticipate consequences of a system, a methodologist can also look backward, using the art and science of casuistry. This approach is accepted by many: ministers, theologians, historians, judges, lawyers, accountants, geologists, arbitrators, anthropologists, executives in the role of judges, etc. Casuistry remains all but ignored by systems science. One approach to studying casuistry is like with innovation generally, using the multiphasic SM as a framework. Here, we will approach casuistry via the law and legalism in its operational phase.

Step 3 & 4: *Identification and Discussion of Major Themes and Sub-topics:*

The Theory and the Method

If we assume that values are independent of time, and if one looks back and finds a rule or a law, preferably interpreted with examples or cases identical to the present problem, the decision that was made then can be made now because the values that pertain now are implied by the decision made then. This raises three problems: 1) how to find and select the rule that applies, 2) how to ascertain the true facts of the case, and 3) how to find and to establish equivalence between the instant case and the prior case? One approach is through a rigorous checklist of questions.

SM is beginning to show the trends characteristic of legalism: the move toward complex distinctions and clarity of detail.

The legal process is used by judges and lawyers when they try to prevent or to resolve problems using rules made by the state as a starting point. These are layered as statutes, common law, and administrative regulations are combined to find a ruling on a matter.

*** Question for dialog ***
Do values really stand independent of time, though? Understanding the classics is difficult because many of the stoic perspectives invert our better judgment.

Judicial Methodology

Under the Fifth Amendment, life, liberty, or property cannot be denied a person without due process of law. This process is then applied to the states as well as to persons. The civil and criminal courts have their levels of proof that the methodology will either produce or fail to produce. That is, either beyond a reasonable doubt, or through a preponderance of the evidence. When a decision is appealed. there is still a basis of law called stare decisis, which is let the prior decision stand. This adds stability, reliance, efficiency, and equality to the methods. Sometimes, legalism even takes into account a future state of affairs. The value of legalism is in the process itself.

Evidence to prove a case are classed as: oral testimony by those uninvolved, testimony of those directly involved, expert evidence, and documentary evidence. Only expert witnesses can submit hearsay evidence. The standard for allowing expert advice requires that widely accepted practices are being used.

Comparing Scientific Method with the Judicial Method

Correlation between the judicial system and the scientific system are apparent with:

- Axioms are like unto conclusive presumptions
- Rebuttable presumptions shift the burden of proof onto the other party as the theoretical status quo requires the new researcher to prove a revision is justified.
- Both systems are grounded in events.
- Direct knowledge testimony is like an experiment.
- Corroborating testimony supports an argument as a repeatable experiment.
- Estoppel ensures consistency, a scientific claim requires that a system is consistent with its objectives.
- In both cases, trivial discrepancies are ignored.

In the legal system, only expert witnesses may use heresay. In the scientific method, the process of becoming an expert witness allows for reliance on the literature, which is something the researcher has not directly experienced. In terms of bias, there is more emphasis on unbiased opinion in the judicial system than in the scientific method. Subjective measures such as mathematical beauty, simplicity, or elegance are often used as choosing criteria in the scientific community.

*** Question for dialog ***
I've had issue with finding of fact being unbiased in a personal case. Has anybody seen the legal system's finding of fact truly executed impartially? In essence, the judge merely asks if the prosecution has had a finding of fact, rather than a de facto examination of that process, and whether it was truly unbiased.

Summary and Conclusions

Casuistry often goes wrong because it is backward looking: it has no method to apply itself in anticipation of the future. Casuistry is often misused to debunk proposals for new laws, plans, or new systems, on the grounds that they do not conform with conditions, standards, or precedents. This further grounds those that less imaginative avenues. There is further a logical fallacy of argumentum ad verecundium: where the rich or famous have a halo effect.

The judicial system and the scientific method are both process driven. Indeed, the process is the center

of their value. One efficiency measure is available here: in program and project planning, results from earlier planning and other projects often can be used to avoid starting from scratch. Authoritatively established standards often can be invoked as working hypotheses for new systems, such as building codes.

The heritage from casuistry should condition our attitudes towards systems work: trust your senses, be objective, render opinions only when the facts are close at hand, be skeptical of opinions from non-experts, accord equal treatment to all, and observe the best evidence rule. These and many other values are as useful when looking ahead as when looking back.

✓ *** Question for dialog ***
Did anybody else's feathers get ruffled with the idea that SM must move more towards process and away from people? I didn't hear this one in class.

Step 5: *Integration of Material with Other Knowledge:*

In last night's Philosophy Talk, they discussed the ideas of Karl Popper who said: an hypothesis, proposition, or theory is only science if it is falsifiable. This is a higher standard of proof than is usually required in science. More directly, the literature and prior art are not sufficient evidence to support sound scientific conclusions. True science is best generated by great leaps of intuition. This suggests that casuistry in the scientific method reduces science's productivity and dependability.
would reduce?

Informally, Robert Pirsig takes issue with scientific advancement in Zen and the Art of Motorcycle Maintenance. Basically, the cause-effect process of experimentation loses track of the gestalt of a thing, and the "theories" of modern man are disproved or refined at an increasingly fast rate. This suggests that the casuistic approach of the scientific method isn't the more productive part of the scientific method. I would say it provides (only) a starting point.

Hall claims that "it is time to move toward a system of accepted systems methodology rather than a system of people." This is in direct conflict with the way Senge teaches a methodology through developing a learning organization. Both would want to be well-rooted in process, but Senge sees the great avenues of insight embedded in the masterful person, rather than an elegant process.

✓ But to be fair much of Senge's material is embedded in process.

Step 6: *Application of Material:*

Understanding the legal process in moderated terms gives me greater respect for the good it achieves, even when my personal experiences with the system have not always been up to my wanting. Likewise with the scientific method.

Please get your application in it.

I aspire to acceptance into the Systems Science Ph.D. program at PSU this summer and fall. I tend to think about the process of writing and defending my dissertation. The back-channel murmurings I've heard about this process is that it really only serves to get into the minds of the dissertation board and do what they want, instead of truly researching a project. With this chapter, however, I can see that there could be a methodology of gathering and presenting the literature, of reacting to the board's questions and insights. This, then, is becoming a learning opportunity instead of a process that frustrates creativity and research. The difference is a respect for how casuistry will round out my thinking and ground my contribution in a way that is useful for future research.

I hope not.

Here in SySc at least, we view the Dissertation Committee as an intellectual resource for the student.

Further, the difference between the use of heresay in the courts and the use of the literature in the scientific method makes the latter a more inviting system. The legal system is designed to make clear decisions. The scientific method is designed to find new science. However, the scientific method, by

allowing mere amateurs to cite the literature, is also in the process of creating new scientists. In other words, the process of research and publication is the process of becoming a contributing member of the academic and scientific community, a process the system itself embraces. ✓

Step 7: *Evaluation of Author's Presentation:*

The author did a good job of presenting one theme in a chapter. Since this is the generally accepted use of a chapter, that is fulfilling. As we discussed in class last night, however, there are other levels to the book: that the book diverges and converges as it practices the methods it preaches. Being willing to take each chapter as an example of the topic and not just a discussion of the topic is insightful. So, liking this chapter and not liking other chapters has dealt with seeing the book in a new light. ✓