

Structural Cognition: 60 Skills

The Role of Structure in High Performer Cognition-- People Who Apply Ordinary Cognitive Operators Not to 1 or a Few Ideas at Once but to Structured Patterns of 60 to 100 Ideas with the Same Quality and Time

Research Question 1 BASIS OF HIGH MENTAL PERFORMANCES: What does either talent or professional practice generate that causes high mental performance?

Research Question 2 WHAT DOES NON-LINEAR AMPLIFICATION OF INITIAL DIFFERENCES PRODUCE: When slight initial differences in ability via use produce slightly better rewards which constitutes practice of use increasing ability slightly increasing rewards slight---what does this positive feedback of escalating investment/rewards produce that enables great mental performance?

Psychology research on abilities and competencies has diverged into two competing approaches--the innate talent approach and the professional practice approach. Non-linear system dynamics phenomena have been used as bridges between those two, recently, for example, suggesting a rich get richer exponential growth link between slight initial differences in talent amplified by slight recognition and reward differences into larger efforts, producing larger recognition and reward, and so on (and a Simonton thesis about non-linear combinations of genes). This article adds a fourth factor--structure--among talent, professional practice, and non-linear amplification. Non-linear amplification, more rewards causing more practice causing more rewards, seems to work, when actual transcripts are reviewed, by layered automation of operations--lists of mental operations in sequence, turned into hierarchies having conscious lists of categories under each of which are sequence-lists of operation practiced into unconscious operation, such hierarchies made fractal by ordering patterns copied across levels, then the fractal hierarchies regularized in branch factor and naming conventions within/across levels.

Method 1 BROAD SURVEY OF DIVERSE MENTAL HIGH PERFORMERS FOR MENTAL PROTOCOL CONTENTS: Transcripts of many diverse experts handling tough and creativity-requiring cases reviewed for common mental growth between novice and expert levels of performance on specific tasks.

177 transcripts of 77 experts in 42 different fields were reviewed for this paper to produce a categorical model of 60 domains of cognitive high performance where a particular structure (of ideas or actions) produced significantly better cognitive performance than average (both the structure, the cognitive high performance attained via it, and the disorder reduced or removed by the structure are presented in the model for each of the 60 domains). Replacing disorder with order seems to lubricate, speed up, make more comprehensive and accurate lists, hierarchies of lists, fractalized hierarchies, regularized fractal hierarchies, multiplied regularized fractalized hierarchies--allowing more items of great diversity to be considered in relation to each other in the same amount of time and effort.

Result 1 FIVE ROLES OF STRUCTURE IN HIGH COGNITIVE PERFORMANCE: 1) lists, 2) hierarchies of categorized lists, 3) fractal-ized hierarchies, 4) regularized fractal hierarchies, 5) with such hierarchies multiplied to form tables and matrices---in sequence emerge as novice-hood gives way to expert performance.

Result 2 TWO HYPOTHESES--THE ULTIMATE STRUCTURE AND THE VOLUME-DIVERSITY DRIVE:

a. the multiplied-regularized-indexed-lists form will be found in the highest performers of all major cognitive functions as key to their achievement of that performance.

b. the ultimate structure--multiplied-regularized-fractalized-indexed-lists--emerges from professional practice because high performers achieve high cognitive performance in any cognitive function via handling more items/ideas/actions and more diversity of items/ideas/actions than average performers, "chunking" now made-by-practice unconscious contents under still conscious categories which categories are themselves later made by practice unconscious similarly.

Result 3 AMBIGUOUS ROLE OF REGULARIZATION--regularizing a structure decreases attention it draws and holds while making it better liked because easy to process = easy access easy ignoring.

The initial provisional result is a structure-performance hypothesis including trade-offs among factors and four roles of structure in attaining high cognitive performance. Ambiguities in the role of structure in cognitive high performance are discussed. One particular ambiguity, whether more topologically regular structure improves or hinders cognitive high performance, though not resolved in this research, is well framed and discussed herein. Two hypotheses result, finally, from reviewing the 60 cases of cognitive high performance herein--the Ultimate Structure hypothesis, and the Volume and Diversity Drive hypothesis. Subsequent research should confirm or deny them, this paper suggests.

Motivating Examples--Towards a Topology of Cognitive High Performance

Casual remarks to a student about to take a standardized writing exam for college entrance produced a perfect 800 score. When similar remarks produced identical results for several other students, the remark maker got serious and wrote down his remarks, using them in a treatment versus control group experiment design, that confirmed the ability of the simple structuring of exam time and content in his remarks to produce perfect scores. While transcribing protocols of what was on the mind of an expert designer (of the machines that make Boeing aircraft wings,profilers) every 15 seconds, in order to build an expert system, in software, to automate parts of his design knowledge, I noticed that he, unlike less accomplished designers, examined more than three times as many alternatives, at each choice point in his design process, as they did. Simon and Ericsson did similar protocol analyses of mental contents of people able to quickly memorize strings of 70 or 80 numbers, then used that result to train ordinary people till they reached the same levels of memorization ability. They found that all these people mapped strings of numbers onto pre-existing structures of well-known-to-them numbers (track race times for one guy, scheduled flight times for another, for example). A defense contractor years ago approached me with a problem--how jet fighter pilots could choose one of 7000 evasive maneuvers within a few seconds. Other attempts at solution had produced too many buttons, occupied too much cockpit space, been unlearnable by pilots, or had error rates that were too high. I regularized the choice space of maneuvers into a fractal that repeated on each size scale the same principle of ordering, the same branch factor per node, and the same name formatting per each level. Pilots, as a result, could select with better than 99% accuracy the correct maneuver within a few seconds. Later I diagrammed the main points of every 20 lines of the imagery and plot actions of the play *Hamlet*, grouped such points, named those groups, and grouped those named groups, till one overall theme of the entire play got named (a hierarchy of grouped names for both imagery and action). I then counted how many of those topic names were mentioned in any way by the historically most famous books of literary criticism on *Hamlet*, finding no one mentioning more than 31% of the main points of imagery or action actually there in the play. This suggested vast incompleteness in usual standards of literary criticism work. A friend and I noticed a guy who constantly changed completely the direction of meetings he attended by making single somewhat complex remarks. Intrigued, we observed such meetings and transcribed the exact contents of his remarks, finding that he summarized the flow of topics thus far in the meeting, grouped adjacent remarks of others, named the points of those groups, named the principle that ordered them, then asked for help handling flaws or lackings in that direction of discussion from talented people in the group. This structure of remark sufficed to completely redirect group discussion again and again in group after group. A grad student of mine happened to read Tannen's book (Tannen, 1993) on male female discourse differences and put the eight main such differences in that book on a card the contents of which he memorized. He then did a one month experiment of applying many of those 8 to each conversational encounter with a female during that month. He reported developing intimate relations with over a third of the 15 girls he thusly approached during the month (vastly higher success rate than his usual conversing produced he said).

Dozens of other observations, incidents, experiments, impressions, could be added to the above. However, the above suffice to introduce my main point--structure itself, not only as the mind generates or uses it naturally (neurally, cognitively, and the like) but enhanced by deliberate human effort, has power to improve cognitive performance of various sorts. It is the role of structure in general in cognitive performance that I want to investigate--a sort of topology of cognitive high performance.

The Structural Cognition Model--a Topology of Thought Model

The aim of this article is to begin to define and hem in the role of structure in moving ordinary cognitive operation towards high cognitive performance. While it is too early for any article to produce a definitive such model now, it is not too early to begin defining what such a model must be like, what it might include, and what constraints operate on it. Among such constraints are the ambiguities below, not yet resolved about the role of structure in cognitive high performance.

Some Ambiguities in the Role of Structure in Cognitive High Performance

Is it the structure itself that propels cognitive performance higher or is it the process of erecting the structure or is it some subtle as yet unseen side-effect of building the structure. For example, in comprehending prose, long term recall is boosted by prose passages that require deep processing of macro-structure topic levels (Kintsch, ; Kintsch and van Dijk,). Prose written so clearly that such deep processing is not required is recalled less well and long than passages expressed somewhat muddily, requiring reader decoding work and mental effort to "read"(Kintsch,). Good structure may not be easy structure but structure erected with difficulty, side-effects of that difficulty propelling cognitive performance higher. Since you get no mental or action structure without mental process building it, you do not get one without the other. It is experimentally challenging to disentangle these two, given the plural size scales at which they affect each other in and outside the mind. If, in the review later in this paper, we find structure appearing in high performer transcripts as a core part of how they achieve higher than average cognitive performance, we have to consider both that structure and the process that erects and uses it as a trio till later research teases them apart. Another ambiguity in the role of structure in cognitive high performance comes from the habit of researching how things are rather than how things might be--the bias in research towards passive studying of how things now are, even when things now are not to great. There is abundant evidence that human cognition--reading, writing, communicating, and like functions--as done by "the average person" and even as done by "the average 'above-average' person", is performed at low levels of both performance and quality compared to peak performances achieved and sustained by the top 1% of individuals in any field of human endeavor. For eons such exceptionally high performing people were written off as geniuses and monstrosities, of little to teach

ordinary people trying to improve themselves. However, expert systems researchers at the end of the 20th century, found ways to obtain inside-the-mind protocols of such top 1% performers and ways to use those protocols to train ordinary people to match or surpass the high performer performances. The role of structure in high performance can split into two meanings--its role in high performances as presently done by people naturally and its role in new higher performances done by people artificially enhanced, trained, stimulated, entooled, or habituated in some ways. An example is the elimination of all sorts of text comprehension research in the 1990s when PDP (parallel distributed processing) models of neural net based minds showed all the symbol-processing models then competing to be “the most right” (constituting most of cognitive science, which was based on seeing minds as like computers) could simultaneously be done by neural nets of the Rumelhart/McClelland sort. That is, causal logic, theory-hypothesis, co-variation, and other cognitive models *all* were right (and wrong) because all simultaneously got executed in typical neural net models, with none of them having priority over the others. It may be that the role of structure in cognitive high performance in natural people depending only on their born-with parallel distributed neural net brain system differs from the role of structure in cognitive higher performances of un-natural people entooled or trained beyond that born-with basis of functioning. This article explores both of these to some extent, but ends up more interested in the latter than the former. Where built-in brain structure supports poor cognitive performance and quality, and consciously invented and learned other structures result in better performance and quality, the “role of structure” in cognitive high performance becomes the role of specially, consciously, invented structures that go beyond structures natural to brains as born.

The four roles of structure in cognitive high performance (found in the 60 cognitive domains that this paper later reviews) are as follows. People *read* structure in situations or they miss/ignore it. People *regularize* structure in their minds or else they omit or forget to apply parts of it. People *fuse and extend* idea structures, performing mental operations on entire structures rather than on single ideas only. People choose *how to deliver* a new idea structure they have imagined and produced, often adding mystery, drama, or false starts to optimize attention and later recall of audiences they mentally perform before. One ambiguity is whether all or only some of these employed suffice to move any particular cognitive function to high performance levels. It becomes difficult to allocate credit among the four roles, and very difficult to devise experiments with proper controls to disambiguate contributions from the various roles. This paper begs this question, frankly, leaving resolution of this ambiguity to later work.

Philosophers of the mind argue, have done so for centuries, that either structure is out there in the world (of texts, words of others, speech) or there is no structure out there at all, all structure being projected from limitations or machineries inside our minds (Fodor,). This is a philosophical ambiguity and since philosophers of mind have failed over centuries to resolve it, and I am not a philosopher of mind, I refuse in this paper to attempt to resolve it. However, there is genuine ambiguity about the extent to which structures among ideas are “out there” versus “mere projections from within”.

The very idea of idea structure is ambiguous, when one looks carefully at it. If any relationship between two ideas however slight constitutes “idea structure” the idea is perhaps so broad that it becomes meaningless. Yet any attempt to reign in scope of the term “idea structure” runs severe risks, given how utterly variegated human types of thought are (). Someone is surely going to quickly bring up precisely a type of thought violating that reigning in of scope yet clearly suggesting “idea structure”. Is one idea recalling one or more others structure? Is one idea suggesting one or more others structure? Is a set of ideas organized into a hierarchy of categories structure? We readily think the latter is structure while some of us doubt one or the other or both of the former two are. In the 60 domains of cognitive functioning dealt with in this paper, we find lists, mappings between lists, topic hierarchies, causal paths, that is, rather unambiguous structures.

For another ambiguity think of tennis players at Wimbledon thinking how they should address the next ball that comes their way. Research has found that mere thinking of what to do can reduce sports performance (). Techniques to ward off such thought are now taught to world class sports competitors of all sorts. Opponents of a player try to deliberately break concentration and rhythm, pulling the player out of unthinking automatic responding, so as to reduce performance. Players are taught techniques for doing this to opponents. Skilled cognitive performance is perhaps just as disturbed by overt conscious thinking one might suppose. On the other hand, one might suppose just as well that many kinds of skilled cognitive performance occur only because overt conscious thinking is employed during them. A manager making a decision who consults a list of 50 alternatives he made for similar prior decisions is more likely to spot patterns, risks, opportunities than a manager relying on a smaller list his mind automatically produces without use of such mind extensions as personal notes, files, friends to consult and the like. Is covert, unconsciously tapped structure just as enabling of high cognitive performance as overt, consciously tapped structure? For the 60 domains of cognitive functioning examined in this paper, conscious structuring, via rehearsal, gets automated into unconscious automatic use.

Finally there is the ambiguity of what structuring of ideas works well and what structuring works badly for particular cognitive functions a person wants to perform, in addition does a structuring that works well for Ms. A not work well for Ms. B. This is the topology of thought question--what structurings (and tools that support such) propel particular cognitive functions in particular persons to high performance levels compared to others (). This question has not been explored professionally and this paper, therefore, can only start by suggesting (suggestion taken from a review of 177 transcripts of 77 high performers in 42 domains) some structures for some cognitive functions that work and by providing arguments for why lots of other thinkable structurings of ideas are likely to later be found not to help as much as one might think.

Some Particular High Performances that Structures Were Found to Enable in the Above Cases and Prior Research

In the writing test case, that started this paper, a particular structure plus a process strategy for writing, improved performance, to wit: gather evidence for both sides of three different dilemmas, not easily decided, and argue for which evidence is best and why, then critique your own winning-chosen position by pointing out strong points of it and weak points, both intellectual ones and practical ones. Spend the first half of the writing test time making an outline of detailed points following this structure, perfect the name of each point and its ordering, then spend the second half of the time writing extremely simple sentences for each outline point, trying hard to convey the point clearly to the audience reading the test. In this case, a particular composition structure and process structure produced perfect scores on a standardized global test of writing composition. In the aircraft wing-making machine design case, the expert differed from non-experts in having larger lists of alternatives for each design point, allowing him to consider more alternatives with greater variety among them, than ordinary designers considered. In the memory for long numbers case, people had various pre-existing memorized structures of numbers that they mapped random digit strings onto to help them recall them. In the fighter interface design case, 7000 alternatives were regularized into a fractal pattern of nine things each having nine components each having nine components each having nine components, allowing a 4 digit telephone number to access each of 7000 choices in less than 2 seconds. In the measuring the quality of criticism of *Hamlet* case, diagrams of the main points in the play’s imagery and plot-actions were used to measure completeness of coverage of points in the play by world famous books of criticism of the play, finding low coverage rates. In the intimacy from discourse study case, mastery of 8 research results on differences between male and female preferred discourse structure resulted in increased intimacy attained with strangers some time later. In professional practice theory of high performance (), hierarchical knowledge structures are built up via thousands of hours of professional practice such that levels of fame attained directly correlate to hours of professional practice invested. Professional practice differs from amateur practice in the way it recognizes rough attainment and automatization of one goal and suffers willingly extension to goals just beyond current abilities but not so far beyond as to be impossible. In the well indexed knowledge theory of high performance (), it is how many different routes to finding any particular knowledge, that you have, that determines your level of performance. People able to access what they know accurately and quickly outperform those unable to do that. In particular, experts and creators tend to have extremely diverse ways to the same piece of knowledge. In the non-linear runaway theory of high performance, slight differences in performance, perhaps accidental in cause, result in rewards and more interest in and investment of effort in something, they producing more reward, which increases interest and investment again, till huge differences eventuate overall. In the microstructure detection, macrostructure erection theory of high comprehension performance (), ability to accurately name topics shared by adjacent passages of text is a primary determinant of comprehension measured by recognition, recall, reproduction hours or years later. In particular, naming that reveals, representationally, what subpoints a point has, and relationally, what points precede and succeed a point, simplifies number of things to be recognized, recalled, and reproduced, and thereby increases them. Names that cause more diverse frameworks, within the mind already, to be used, to assimilate the point, are recalled, recognized, and reproduced better, later. In research on the dominance of the average in research (), scholars find that so much research is done using means of populations studied and correlations among those means, that the fact that outliers in those populations operate by very different principles gets missed. We end up reading research suggesting that best performance is attained by means of X, when that is true only for average people in a population and various outlier subgroups operate by entirely different or even contrary means. In research on the dominance of expertise (), enormous performance differences of experts compared to novices, in various domains, are explained by very particular structures they use, to perform cognitive functions done, not done by novices. In theory on the determinative role of implicit theories (), various kinds of cognitive performance are found to be highly affected by theories that people are not aware that they have and apply. In architecture of thought theory (), the immense flow and dynamism within the daily-life folk observed mind we all have, hides effectively a great stability of knowledge structure, worldview, and preference structures within us, (researched under various schema theories) that filter and constrain greatly, what we perceive, are interested in, and notice. In planning and action theory (), researchers find hierarchies of goals with larger scale ones supported by medium scale ones and they in turn supported by micro scale ones. These goal hierarchies are everywhere within action and the mind as a result of the omni-importance of goal directed action in human work and life.

Collection of Representative Cases of the Role of Structure in High Cognitive Performance

Case Name	The Structure Involved	Role of Structure	Source
Writing Test Perfect Score	balanced evidence for pro and con positions of points self critiqued	develop structure, regularize it, write simply to convey it	Greene
Aircraft Wing-Making Machine Expert Design	repertoires of alternatives at design choice points	better choices from more alternatives surveyed	Greene
Memory for long numbers	pre-existing structure of remembered numbers (race times etc.)	associate random number sets with remembered items	Simon
Fighter interface design	fractal repetition of branch factor, name formatting, point order	turn 7000 choices into 4 digit phone number access means	Greene
Measuring Quality of Criticism of Hamlet	hierarchy of main points of imagery and plot-actions of every 20 lines in the play	compare points in the play to points covered in criticism books	Greene
Intimacy from discourse study	8 points of discourse differences between men and women	application of all 8 points in each conversational encounter produced intimacy some conversations later	Greene
Professional Practice Theory of High Performance	case library in the mind more abstract and precise and diverse than novices had	case library in the mind more abstract and precise and diverse than novices allowing precise association of new case to existing solution routines of past cases	Ericsson
Well Indexed Knowledge as Basis for Expert Performance	good indexes to existing knowledge in one’s mind	experts have access to more of what they know and have experienced and done than novices = better indexing	Anderson
Non-Linear Runaway “Rich get Richer” Basis of Expert Performance	slight accidental differences exaggerated into vastly different destinies	people with slight accidental advantages invest more effort improving both ability and knowledge hence rewards hence more investment	Ackerbman & Beier

Collection of Representative Cases of the Role of Structure in High Cognitive Performance

Case Name	The Structure Involved	Role of Structure	Source
Microstructure detection, macrostructure erection	proper naming of topics common to surface text adjacent segments (relationally and representationally)	the foundation of comprehending text is accurate naming of topics shared by adjacent portions of text	Kintsch, van Dijk, Meyer
Dominance of the average	[any]	published research on how the mind works understates role of structure due to using averages not outlier performers	Cairns, Bergman, Kagan
Dominance of the expert	invent grammar	high performer programmers typically are 80 to 100 times as productive as ordinary ones because they invent grammars, combinations of elements of which enact all wanted application functions plus hundreds more	Greene
Determinative role of implicit theories	entity theories versus incremental theories of mind	entity theories lead to aiming for attained performance judged well by others while incremental ones lead to aiming for continual improvement in one's performance as judged by self	Dweck
Architecture of thought	hierarchy of knowledge structures about self and world	great stability of image of self and world constraining what is seen, learned, and added to knowledge	Vallacher and Kaufman
Goal hierarchies	hierarchy of goals = higher ones larger in time or space or effort scale	macro goals constituted of meso and micro goals	Carver

The cases and theories, few though they be in number, in the table above, suggest the following. Greater number and diversity of alternatives for choices improves cognitive performance of many sorts (9). Greater regularity or ordering of structures of points produces greater mutual constraints among points and greater mutual cuing of one point by others, thereby improving cognitive performance of many sorts (10). Greater hierarchical elaboration of goals and mental operators having component goals and operators, that is a greater number of levels, improves cognitive performance (11). Greater number and diversity of links that index new knowledge to existing knowledge improves cognitive performance (12). Greater knowledge structure complexity to map (index) new ideas onto produces greater cognitive performance (13). Greater number and diversity of theories by expanding what you can see in cases faced, improves cognitive performance (14). Greater abstraction of theory increases generality of what that theory can be applied to, hence, improves cognitive performance (15).

- Expanded number, and diversity of choices--the cognitive list limit
- Regularity of structure--many points recalled simply because well ordered, mutually constraining and cuing one another.
- Category hierarchies of entities and role hierarchies of operators and goals.
- Number and diversity of index links to existing goals and knowledge.
- Complexity of structure of knowledge already in the mind to map new things onto for recall.
- Number and diversity of theories for noticing things others cannot see in the world
- Greater abstraction of theory and case concepts allowing greater generality of future application.

Initial Factors from Above Cases and Theories

We can split the above points into traits that structures have, and the structures involved, and the cognitive contents, idea types in those structurings. We have the number, diversity, regularity (ordering), number of scale levels, and abstractness of aspects of structures. We have lists, mappings between lists, hierarchies, mappings between hierarchies, and causal paths among items. We have alternatives, mental operators, goals, associated ideas, and theories. Since the literature reviewed above is very incomplete, we can expect a more comprehensive later survey to increase traits, structures, and cognitive contents. This paper aims to establish an argument and a research agenda based on that argument, so it is not necessary here to achieve completeness of coverage of what will, after all, take years if not decades to research.

An Initial Hypothesis--These Structurings Move These Cognitive Functions toward High Performance

The above review suggests the following hypothesis:

- The Elemental Structure-Performance Hypothesis: increasing the number, diversity, regularity (ordering), number of scale levels, and/or abstractness of lists, hierarchies, causal paths, and mappings among lists, mappings among hierarchies, mappings among causal paths, mappings between lists and hierarchies, mappings between lists and causal paths, mappings between hierarchies and causal paths, moves cognitive performance (of choosing, applying mental operators, forming goals, associating ideas, and applying theories) towards high performance.

Several things are worth noting about this hypothesis. Increasing the numbers of things in any structure produces a volume or chaos problem unless regularity (ordering) is commensurately increased. Vice versa, increasing regularity (ordering) without commensurate increases in number or diversity produces bigotry (tightly interwoven ideas that have narrow scope of explanation and application). Increasing diversity of item without increasing number makes regularity (ordering) nearly impossible if taken to extremes. So there are trade-off relations among the structure traits in the Elemental Structure-Performance Hypothesis.

Trade-offs:

- increase in number requires increase in regularity (ordering), else chaos and poor recall,
- increase in diversity requires increase in number, else bigotry,
- increase in abstractness requires increase in diversity, else the abstraction is too obvious and applies to all
- increase in number of scale levels requires increase in number, else bigotry,
- increase in number of scale levels requires increase in diversity, else higher categories too abstract, apply to all;
- the less regularity (order) there is for a fixed large number of diverse items, the more time it takes to learn, and commit to memory those items; conversely the more regularity for that number of diverse items, the less time it takes to learn and commit them to memory

In general, the more things you have, the more diversity among them, the more regularity (order) you need to impose. The trick is to, as in ordinary daily life, organize a great number of highly diverse things so they appear when being handled as many fewer things of less diversity. So structure is an inverted U function, with too little lowering performance, and too much lowering performance. However, structures of ideas, once they exist, can be used to generate new cases and individual ideas. Sparsely populated categories, hierarchy levels, causal paths, can be populated by interpolating or extrapolating existing idea sequences. These new cases, in turn, can suggest new categories or hierarchy levels. So an inverted U function somewhat understates things, in that it implies an upper limit, that is softened, if not removed entirely, by using existing idea structures to generate new case instances, which in turn introduce unplanned diversity, that may suggest new categories or hierarchy levels. This suggests that people who structure all the ideas that they have well but not too much, then use such structures to generate new case instances, whose diversity is used to extend categories and hierarchy levels, outperform people who do not. More structure may mean more and better ordered more retrievable ideas, with more mutual cuing and interindexing going on for fast, lasting access ease.

This leaves the ambiguity of whether more regularized structurings of ideas outperform less regularized structurings or vice versa. The research in handling prose suggests that more regularized naming, counts (branching, keeping the number of components the same per all ideas in a model), and order maximizes mutual inter-indexing and cuing and constraining. This allows one missing item, often, to be generated anew by guesses projected from the indexes, cues, and constraints around it. However, such regularization of structure may, by reducing the processing needed to assimilate it to existing knowledge at many levels of hierarchy, reduce levels of processing depth, hence, long term retention of the ideas. Structures too easy to remember become too easy to forget, paradoxically, research in prose shows (effort in effort out, it has been called). Prose comprehension, however, is an input function where humans might tolerate complex decoding and encoding work for accuracy of recall, given control over how long they take to input something. Output cognition, however, where time and pressure limits human options, may favor more regular mental and action structures, more easily handled, though not encoded as deeply for long term recall. Only later research will tell us if this is true to any useful extent.

People who work globally have reported a cognitive list limit with some cultures (16), when unprompted for lists of alternatives (places to eat tonight, people to fill John's role, places to seek funding from, and like examples) typically offering 3 or 4 items, others offering six to 8, still others offering 9 or 10, none offering more than 10 on average. Some people have reported that professions have distinct typical cognitive list limits with lawyers having larger ones than physicians who have larger ones than politicians. Multiply consideration of such numbers of alternative by 30 or more such decisions a day by 365 days a year and you end up with entire cultures considering tens of thousands more alternatives per year than other cultures. No data on outcome differences exists from cognitive list limits (the outputs of entire cultures are so various and enormous that intermediate linkage demonstration may be prohibitive statistically or financially). Yet we wonder whether nations and genders with higher list limits (Germany and females for example) in some ways perform cognitively better than nations and genders with lower list limits (the US and males). Expert system builders dealt with experts so minutely--every 15 second mental contents being transcribed for example--that a link between larger number of ideas better ordered and high performance seemed apparent to many of them.

It is not just structuring but that structuring allows an increase in number and diversity of idea handled, and an increase of indexing of ideas. Regularization of such structures of ideas increases (via increased simplicity, inter-indexing, mutual cuing, mutual constraining) recognition, recall, and reproduction but at a cost of loss of depth of processing, hence decreases in recognition, recall, and reproduction. Whether these are equal in magnitude and matched in functional shape so they cancel each other out or whether one dominates in certain regions of parameter value is yet not thoroughly explored by research, even in heavily researched areas like comprehension of prose.

Below the above hypothesis with following considerations are explored for prose, a well researched arena of cognitive performance, great performance at the comprehending of which is used, worldwide, to select people into the world's best colleges, professions, and firms. Then 60 other areas of achieving high cognitive performance (via particular structuring of ideas) are examined to possibly confirm/disconfirm parts of the hypothesis and suggest new items to add to the hypothesis.

helter skelter collected points “of interest”, because it changes the shared higher level topics that context the appearance of any one expression or idea, amounts to modifying and regularizing something quite other than what the author wrote. Idea without context is nothing in comprehension terms. Of course, such collecting of bits and pieces from prose is a primary vehicle for sustaining bigotries of any sort, by ignoring structuring, hence contexts, of authors and replacing it with our favored structures and contexts.

We use the modified and regularized structure we get from “improving” the structure put there by the author, to generate and extend what the author said--adding case details he omitted or putting details of his into new contexts via new upper level categories we invent.

Fourth, that new model, modified and regularized from the structure the original author put on his points, gets expressed by us eventually. But we are expressing in spoken or written prose too, in most cases (not using two-dimension point diagrams or regularized fractals of points, generally). So we take a hierarchy of points, modified and regularized somewhat from the author’s original one, and express that structure via a linear sequence of spoken or written sentences. Good speakers and writers devote between one third and one half of their sentences to purely structural functions, signalling where in a horizontal sequence of related points, and where in a vertical hierarchy of levels of points, we now are and where we are going (). Bad speakers and writers waste few sentences on locatory functions and give us, as a result, points not in any clear relation to each other, with confusingly inconsistent contexts around points seemingly closely related ().

Thus, prose involves reading a structure put there by an author, modifying and regularizing that structure to make it our own, extending though using our new structuring of the author’s points, and coding that resulting structure of points for spoken or written delivery with some expressions revealing structure and location while other expressions convey points at those locations in structure. These four functions--reading structure, regularizing structure, extending structure, and coded expression of structure--appear in nearly all cognitive functional domains.

60 Structural Cognition Domains--Particular Structures that Induce High Cognitive Performance in Each

The purpose of the below survey of a comprehensive set of cognitive performance domains and the role of structure in moving people toward high performance in them is to test the above hypothesis of this paper and lend hints that might confirm or deny whether the simplicity effects of high structure dominate the loss of depth of processing effects or vice versa.

The Data that Produced the List Below

I spent the years from 1982 to 1992 building expert systems of dozens of world leaders in a great variety of fields. For each expert system project, several extremely detailed transcripts, of the expert handling typical, difficult, easy, frequent, and rare cases were obtained. Inevitably in these transcripts, structurings of materials, not usually structured at all, or unusual structurings compared to structurings most people have heard of, were encountered. Though not a part of building expert systems, these structure roles in supporting expertise interested me, so I marked them in transcripts that I and my employees produced, and collected hundreds of them over the ten years involved. For this paper, I dug out my old lists and built a categorical model of them all, showing what was structured, what was chaotic before being structured, and what performance of the expert involved that was enhanced or attained by the structuring. 77 experts in 42 different fields and 177 transcripts were involved in this work. Triplets of mess, structure, attained performance were marked in transcripts, and put into a giant list, wherein similar items were grouped, those groups named, those named groups grouped and named, repeated till one overall top level group was formed and named. Groups on each hierarchy level were then ordered, from top down and from bottom up and a hybrid ordering that combined the best parts of both earlier orderings was set. The result is the model illustrated above and explained below.

Theory

Theory is what causes what under what conditions producing what effects. It is the facts that tell a story and the story that organizes a collection of facts. It reveals aspects of cases we otherwise would never notice and respond to. The more theories we have the bigger each experience in our lives is, in terms of phenomena noticed and responded to. People without theory are merely slaves of theories put into them unconsciously in socialization processes while growing up.

Text to Theory Conversion. We convert prose into some representation of number of points, names of point, and principles ordering points, we may regularize that to enhance long term memory and use and fusion with existing knowledge in us, then we may prune away all points not causes, effects, conditions, parameter values, or links (the topology) among these. Most people do this intuitively with high performer people doing this better and more than low performers. Some people consciously do this, actually drawing diagrams of one or more steps and the final causal model result that they get.

- chaos = mix of actionable and non-actionable points; structure = causal path; performance attained = actionable knowledge from much non-actionable knowledge

Theory Force-Effect Diagrams.

The most elemental representation of causality is cause-effect pairs, with force being a stand in for cause. Most of us imagine pairs of forces and the effects they produce as we read or hear something.

- chaos = unmatched lists of causes and effects; structure = cause-effect pairs; performance attained = lists of alternative ways to influence situations, lists of alternative results to aim for in situations

Theory Causal-Path Diagrams. Pairs of causes and effects they produce, when listed, are out of sequence because some effects produced by some causes are the causes of later effects. We put cause-effect pairs into ordered sequences, paths, to show effects that are also causes.

- chaos = effects that are causes mixed with causes that are effects; structure = effects that are causes diagrammed in paths showing what effects they are the causes of; performance attained = mediating variables between ultimate causes and ultimate effects correctly sequenced in time (horizontally) and correctly distinguished in path (vertically), aligned with what causes them and what they in turn cause

Theory Grounding Tables. Often new theory is hard to visualize so we automatically map theory constructs, which are rather abstract, onto aspects of cases we know particularly well, forcing all constructs into our mapping, and verifying if the relations said in the theory to obtain among constructs corresponds with relations among their correlates in the case we choose for grounding concepts.

- chaos = abstract constructs in theory we do not understand; structure = mapping of constructs to aspects of a case well known to us; performance attained = non-abstract intuitive “grounded” understanding of abstract constructs in theory

Multiple Theory Regularization Tables. We almost never apply one theory at a time to a case of interest to us. We usually think up half a dozen or many more theories from the vantage point, rather abstract, of which to spot aspects of a case before us. There can be lots of overlaps among diverse theories--many supposed causes of one effect, many supposed effects of one cause, many supposed conditions making one cause-effect relation contingent, many cause-effect relations made contingent by one supposed condition, and so on. Keeping track of such multiple theory overlaps quickly overwhelms human short term memory and attention load handling capacity. Hence, we organize large causal models in table form with categories for each theory (rows, say) and columns for shared variables across theories.

- chaos = too many overlaps among different theories involving the same factors to keep track of; structure = tables with sets of rows per theory and columns for variables shared across theories; performance attained = abstractions from sets of overlapping theories that fuse many theories under them become entirely new theories using the best parts (highest correlations) of existing ones

Theory Gap Diagrams. The visual or verbal clarity of linkage among cause, effect, condition, parameter value, of any theory is just a particular human expression and often it hides sloppy logic, careless conceptualizing, and like faults. One item in a theory may, for example, suggest dozens of better alternatives to itself, with the theory providing nothing to explain why the one item was included but not the many better-seeming thinkable alternatives to it. There are two sorts of gaps, then, in any theory--links that overtly look appealing but when examined closely lack logic, evidence, plausibility, cogency, or relevance, and links that suggest entire sets of alternatives not chosen and no justification for no choosing them is proffered.

- chaos = seeming flow, linkage, logic, and reality hiding actual slop, error, or falsehood; structure = causal paths with dubious links marked and dubious nodes between links marked, combined with, lists of better alternatives for nodes or links unjustifiedly omitting them; performance attained = visual map of all primary weaknesses in a theory apparent simultaneously.

Percept

Percept is both what impinges on our machineries for noticing and what is admitted consciously or unconsciously into “play” in our minds as a result of such impingements. That is percept is objectively there stuff and the much-reduced subjectively filtered stuff we allow ourselves to notice about all that impinging.

Demystification. All of us are socialized, not only as children, but strongly by professions we join and institutions of rank that select us, to automatically respect and give obeisance to certain authorities. We automatically prefer, assent, support, condone all sorts of biased, sneaky, selfish, erroneous, dated, bigoted ideas daily, for this reason in this way. Most of us heatedly deny this, even while reading my sentence about it a few words ago. We cannot perceive the world or our selves accurately till we master power taken from us, by ourselves, unconsciously via socialization processes, and given automatically and unthinkingly (mindlessly says Langer) to authorities, and take back that power for ourselves, removing automatic choice, preference, respect and the like.

- chaos = choices made but that we never experienced ourselves choosing that narrow us without us realizing it; structure = pairing any claim of an other sharing our own interests with hidden self interests of that other that deny or undermine what our interests are; performance attained = power that was automatically removed from us, restored to us and under our overt conscious direction

Stratifying Responding. We respond so automatically, quickly, and multi-dimensionally to any stimulus that all we notice is the result, in many cases. Also, we filter, assimilate, and bias so much of what we perceive that we often get the impression that we are experiencing lots but noticing little, since most of what we input confirms or repeats what we already know, prefer, and favor. D. H. Lawrence expressed this in a poem about being sick of “I” and all that “I want” and that “I am”, wanting merely to be “not I” even if just for a while. Bud-

dhist meditation regimes entice people into meditation as a regular vehicle for removing self from “I”-ness (the true self, the ground upon which “I-ness” sprouts is Buddhism’s proffered alternative). Instead, we can notice what we are noticing via distinguishing object encountered, emotion generated, association imagined, reminding occurring, pattern among any of the prior things generated, interpretive framework automatically applied, favored or planned actions killed by that interpretation, new actions brought into consideration as a result of that interpretation. That is each strata of response can be separately noticed and made complete before moving to the next by slowing down our responding and meditatively attending to its strata.

- chaos = not noticing what we notice and fail to notice among stimuli presented to our perceptual apparatus; structure = distinct strata of responding in a fixed sequence each of which we push for completeness of noticing on before moving onto the next; performance attained = identification of things in us that filter out, bias against, ignore, slight much of what is actually impinging on us perceptually all the time.

Grounding Events in an All-Stories-Are-1 Model. Joseph Campbell among others has surveyed thousands of stories, myths, dramas, tales and by comparing them found one overall story they are all subsets of. When we react to an event as if it is one particular type of happening or experience we are taking it as perceived or presented as a particular subset of the universal story. Undoing that partiality of interpretation shows us intents and results hidden from view when universal story elements are omitted by story-tellers to us or by us when telling stories to ourselves or others. This is not entirely different than demystification in this regard.

- chaos = taking partial stories as unique types of experiences of special types; structure = seeing the universal story elements left out of a telling by others or by ourselves and the effects (hidden motives) behind that omission; performance attained = spotting bias in “what happened” tellings

Personal Quality Checklists. Lives and experience and consciousness itself are longitudinal yet we notice and react cross-sectionally a lot, it seems (relative to what others think, or to what we think others think and the like). Sin, as the omnipresent difference between our intents and our streams of actions, is something we rarely have the courage to face. When our lives drift again and again, or more and more out of control, we sometimes rebel, and push hard to become again masters of our fate. This not infrequently takes the form of tracking failures to fulfill our intents, noticing trend lines in them and targeting trend lines with unfavorable slopes for special daily or hourly attention.

- chaos = drift of our mastery of our selves towards being out of control; structure = plotting daily or hourly failures to fulfill particular intents for some time to notice trends and pay special attention to unwanted such trends; performance attained = out of control behaviors regularly spotted and brought into conformance with personal norms

System Effects Table. Our lack of keeping track of consequences of our actions causes us to be continually surprised by obvious powerful inevitable consequences of what we did earlier. We continually wrongly take present crises and happenings as coming from some unique not yet known force or actor when, in fact, much of it was predictable from our earlier actions. We are, in truth, abysmally poor at noticing and keeping track of non-linear interactions among the myriad parts of our selves, minds, lives, tasks, goals, and so forth. A great portion of what is new and eventful in our lives is necessary implication and inevitable consequence, but we miss that because we cannot keep track of many things interacting non-linearly around and inside us.

- chaos = many surprises, events, and happenings to us taken as new or mysterious in origin when actually not; structure = list of non-linear system dynamics surprise types mapped onto what we do, to predict consequences, and onto what surprises us, to identify our own causal contributions to things that surprise or mystify us; performance attained = poise under pressure--things that upset and dismay others around us, leave us unmoved as we learn to expect such things.

De-image-ify. We live in artificial worlds we humans and we ourselves personally erect, reacting to things we enacted. Moreover, we all project images of who we are, what things are, how the world is, what the world should be, and so on. We live amid so many images that losing reality is a real possibility and newspaper are filled daily with tragic consequences of image taken as reality by someone hopelessly disoriented in the artificial worlds we erect. Perceiving involves subtracting our images at odds with reality, images meant to distort in order to get something from us, and the like. This is not unlike demystification mentioned above.

- chaos = images projects by ourselves and others mistaken for reality; structure = for each image encountered reversing its message to approximate its truth value (the airline least on time pays for ads about how on-time it is, for example); performance attained = those painting reality to make it look different than it is get spotted and power in their messages evaporates before us, freeing us to see reality and the real motives and end results of images.

Read

Reading, whether you read people, gestures, political situations, texts, or paintings, is consciously designed and controlled perception. It is not relying on what the hardware machineries of eye, ear and the like present to us as “seen” or “heard”. It is disciplinedly examining streams of inputs to us for identifying underlying pattern, structure, reference, and couching in them. It is reading their structuring and what is embedded in those structurings.

Reading Topic-Function Structures. The coherence we sense in a text comes from bridging inferences we make between clauses of a sentence, and between sentences in a paragraph and between paragraphs in a chapter. We calculate what topic is shared by each set of adjacent units. We can get this wrong in many ways but primarily we can identify a topic too general, not representing what is common between the adjacent units but more than that, or too specific, missing some of what is common between adjacent units. There is a sequential component too--the flow of topics constrains what one set of units can be “about” that is their topic. We must dynamically in milliseconds combine what vertical representation constrains a shared topic to be with what horizontal flow constrains it to be. Moreover, units (clauses, sentences, paragraphs) may express content (topics and comments about topics) or structure (telling us the role topics play in a flow of topics).

- chaos = missing what adjacent code units share by guessing something less than what is shared or more than what is shared, mistaking structure code for content code and vice versa; structure = sequence of main points of basic units, grouped, and groups named by topics shared by group members, recursively done till one topic shared by entire passage is named as the top level node in the hierarchy; performance attained = accurate identification of the count, names, and principles of ordering of all topics in a passage

Reading Image-Action Structure. In fiction and stories and tellings of experience or happenings, coherence comes from identifying the images shared across basic units and the actions (and actors) shared across such units. We calculate what context the action is expressed under (the imagery) and what action starts here and ends there. The action alone does not tell us the meaning of the action, for that we need also the imagery that serves as the context put around the action by the author. How authors structure imagery associated with plot actions tells us how the author interprets or wants us to see him/her interpreting actions. Failure to grasp this results in entire misunderstanding of every part of the story. Calculating the horizontal and vertical scope of a particular image and of a particular plot action (where it begins and where it ends, what image starts it and what image finishes it) is taxing to ordinary cognitive machinery and attention capacities.

- chaos = missing the images the author associates with particular plot actions; structure = scope in terms of actions covered by particular images expressed by shared topics among sequences of adjacent images and adjacent actions; performance attained = accurate identification of the count, names, and principles of ordering of all topics shared by images and actions

Reading the Structure of Response Strata. Each stratum of responding--objects noticed, emotions evoked, associations made, reminders, patterns, frameworks and associated interpretations, decisions--has its own topic flow and super-topics of content shared across adjacent unit level topics. The hierarchy of such bridging themes can be read for each stratum individually.

- chaos = sloppy overall noticing of what we respond to and what our response is (and where our response comes from) as we assimilate responses to favored biased frameworks, by omitting key unfitting details in them; structure = hierarchy of shared topics across adjacent items for each response stratum--noticings, emotings, associations, reminders, patterns, frameworks and corresponding interpretations, decisions; performance attained = detailed information on automatically responding parts of self for each encounter examined

Reading Cause-Condition Structure. We “see” causes instantly and all the time, even when overtly something else is presented to us as cause. We have favored causes we like to see in the world. Similarly and not independently, we “see” effects all the time--this is caused by something, we feel. In fact, we perceive pairs of effects and causes, causes and effects, conditions and what those conditions cause, causes and what conditions those causes set up (which can cause in their own right other things). There is a flow of causes across what we perceive as there is a flow of effects/conditions. Within each such flow is a hierarchy structure of shared topics across flow of causes and across the flow of effects/conditions.

- chaos = trapped in habitual unthinking unexamined attributions of effects to causes; structure = hierarchy of shared topics across flows of causes and flows of effects; performance attained = gradual realization in full of our latent “theories of the world” and how incomplete and tainted by limits of our background and courage they are.

Reading Assumption-Mystification Structure. We make assumptions, often of other people’s good intent or of our own good intent, without examining deliberate efforts to hide made by others or by ourselves, reality from our preferred proffered view of reality. For every glowing rosy assumed image of the world there is an associated mystification going on, where we hide ulterior motives that are less rosy and glowing and not something we wish publically revealed or examined. Similarly for others.

- chaos = assumed images hiding deliberate hiding of ulterior motive by us or others; structure = hierarchy of shared topics among the flow of images we assume and among what those images deliberately hide from us; performance attained = the naturalness of what is others, world, or ourselves revealed as projected image, image projected for particular purposes made evident in the structure of topic flows across images and what they hide.

Reading Proposition and Topic-of-Topic Structure. As we notice the hierarchy of shared topics across flows of topics, functions, images, actions, response strata, causes, effects, assumed images, hidden ulterior, we may re-articulate what we are reading into unembellished core miniature sentences--propositions of logic almost--and topics-of-topics, that is, what the proffered topics are themselves about. The flows of propositions and topics-of-topics themselves have shared common topics in a hierarchy that we can read and diagram.

- chaos = the truth is in the structuring of the flow itself as a false impression automatic in our casual perceiving; structure = abstracting from flowing topics the flow of topics-of-topics and from that the flow of truth statements being made in each unit of structure encountered and noticing in those abstracted flows a hierarchy of shared topics across items; performance attained = precise recognition of the effort at making truth a particular something that goes into each unit of a stream of coded messages of natural language, actions-gesture, or the like.

Mind Extensions

It is not what is inside our brains that makes us intelligent so much as the tools outside our bodies that amplify what we can remember, name, find, combine, select from, and influence. These extensions of our minds outside our heads make us intelligent. It is not what question we can answer today, now, that reflects our intelligence but what questions we can answer

tomorrow morning after consulting various extensions of our mind that we have built up over years of living and work. The ways we structure these extensions of our minds determine our intelligence and ability to function intelligently to others.

Structuring Your Personal Professional Library. We all have experienced new insight and fullness of mind just after a house move forces us to re-organize our personal library of books. We renew interest in forgotten topics, we find sources for current issues being worked by us or those near us, we recognize vast omissions and gaps in all we have allowed ourselves to become interested in thus far in life, and the like. As we accumulate considerable personal library resources we may haltingly or only superficially bring order to them--leaving it hard to find items or groups of related items on a topic. As a result we end up with a lot of "I know it is there but it is not worth the effort of looking for it" experiences.

- chaos = inadequately organized personal library and inadequate index to that organization of it so we fail to find things, fail to add things, fail to drop things, fail to keep up-to-date various topics, and the like; structure = each book indexed under multiple projects and topics and interests of us as our interests unfold, and, all books structured as a panoramic representation of the evolution and current structure of our interests; performance attained = we and others learn more about our identity and potentials as they evolve every time we peruse the library and its indexes

Structuring Your Personal File System. I met a professor who devoted every Friday afternoon to turning articles he had torn out or copied from readings into overhead slides. He made three overheads for every article or copied page, filing them under different topics in his overall file system--a bank of five multi-drawer cabinets along one office wall. When he faced a consult or speaking job, he perused his topics and pulled out relevant folders of overheads, making preparation for a several-hour seminar a matter of ten minutes of work or less. It was the combination of devoted time, conversion to usable overhead form, and multiple filings of items accumulated that constituted the effectiveness of his filing system. Note it is inevitable that number of copies of a book will not match topics it appear under in indexing, so how books are physically displayed serves a different self identity representation function than how books are indexed.

- chaos = the disorder and vastness of personal files matching the disorder and vastness of all world publications, that is, trying to find something in value in either of them is about the same level of difficulty; structure = a topic structure of file in places maintained with a regular maintenance function of that flow of topics and insertion of items in that flow; performance attained = appearance and ability to deliver intelligence instantly in thousands of occasions on thousands of topics without apparent effort.

Structuring Your Cognitive Friend Network. We all have acquaintances who perform certain valuable cognitive functions for us: challenging our ideas, updating us with news in certain areas, referring us to sources and people, and the like. However, most of us do not structure these happenstance networks, deliberately filling particular cognitive functions with a person able to inspire and assist us in doing that function. Note the difference between having a book or file to refer to and a competent person is vast--a single conversational fragment with the right person can put us onto a dozen references and thoughts we would otherwise have never imagined, sought, encountered, or recognized the value of even if we encountered them. People also quickly convey weightings and partialities of value missing or hard to fathom in most of the world ("that's a great source for topic X, if you subtract out the self-promotion stuff everywhere in it" for example).

- chaos = having cognitive friends for certain happenstance functions and not for more important or hard for us other functions; structure = a hierarchy model of mental functions vital to us and not entirely mastered by us for which we need decent help with matching acquaintances for each function in the model, able to perform that function for us occasionally as needed; performance attained = one day build up of true expertise on topics entirely new to you that would take others weeks to master

Structuring Architecture, Furniture, Apparel Cognitively. Though initially invented for physical purposes, architecture, furniture, and apparel today are increasingly actually used to assist cognitive work in our lives. Some rooms are set up to inspire us, detach us, or remind us, or structure us. Some displays or tables are arranged for similar functions. Even clothing has arrangements of pockets into which we put standard types of objects performing standard cognitive roles for us. Researchers found that even sloppy, falling down, piles of files and books accumulated on desks for months, were more effectively indexed than we might believe by colors, "piles", document aging and curling, centimeters-from-top in pile, and other happenstance physical characteristics.

- chaos = default use of architecture, furniture, and apparel for physical functions, reducing their support for cognition; structure = arrangement/display of wall contents, table and cabinet contents, and pocket contents so as to perform particular cognitive functions we assign and regularly update; performance attained = a regular flow of contents into more and more valuable formats and locales, more and more ordered and indexed and accessed arrangements.

Structuring Your Network of Enterprises and Audiences. Creative people multi-task among a network of enterprises so rest for one project is engagement in a rather different, hence restful, other project. Creative people multi-task among a network of audiences so rest from one is engagement with different others. Since each enterprise itself has present or future potential audiences of its own, pairs of enterprise-audience associations build up. As a result, research shows that creative people are also much more productive than non-creative people in the same field--they create by producing lots of ideas and throwing away the bad ones (from Linus Pauling the dual Nobelist).

- chaos = poor quality execution of any one enterprise as multi-tasking leads to disorientation and discoordination; structure = multi-level regularized fractal models and outlines of each enterprise and its audience satisfaction determinants so in and out engagement never leads to disorientation and has slight re-entry re-contexting costs of re-engagement; performance attained = multi-tasking among more enterprises/audiences and more varied ones than others with higher quality of execution and nothing falling between cracks

Structuring Social Mind Extensions. Idea rooms, phone research, and social indexing events are three of many social mind extensions that make people more intelligent. Idea rooms are displays on room walls that ask visitors to add ideas and comments, then such additions are regularly compiled into further wall topics and questions inviting next step thought contributions by new visitors or further visits of initial visitors. Phone research is moving from absolute beginner to world class expert on a topic in three days by intensive, outside-in phoning of experts, at first based on ideas published in literature, then on transcripts of people first interviewed on the periphery of new fields. Social indexing events are parties or task team meetings that have activities structured so as to reveal needs, abilities, and interests of everyone attending. This structuring issue with all three is the same--initial over-structuring scares off contributions by making things look too completed already; initial under-structuring asks for such bland, general contributions that people feel not enough of them is needed to bother contributing.

- chaos = over individualized growth, action, development efforts that suffer from lack of what social additions and resources unmobilized around could contribute; structure = externalization of inside the mind dilemmas projected in terms audiences engageable by physical visits, phone calls, or meeting events can understand yet be challenged by, that solicit their contributions in a developmental sequence that benefits their own further thought by participating; performance attained = personal thought initiatives considerably embellished and undergirded by contributions from acquaintances, propinquity groups, and contacted world experts.

Power

We need power to dare to engage this complicated, crowded world of contending people and principles. We can fight for control of already established power or generate new power of our own, but without power, we do nothing. Power is a measure of how plugged in our thinkings and doings are to the society and people around us.

Structuring Connection to Social Brokers, Mavens, and Natural Salespeople. Power is significantly situational in that where you are located in social networks explains your access, audiences, and ability to resource initiatives and dreams. There is some chicken and egg nature to this in that outstanding performance drawn social connections and social connectedness draws superb performances out of people. Our location relative to networks of people well connected socially, people masters of certain specific domains, and people effective at persuading others, getting others to act determines much of our power.

- chaos = brokers, mavens, and salespeople mixed in, indiscriminately, with one's acquaintances; structure = lists of principal brokers, mavens, and salespeople in your society at all size scales made, maintained, and contacted systematically as your career progresses--the entire group managed as a principal resource; performance attained = automatic and effortless production of audiences for your inventions and inventions for you as an audience

Structuring Social Change Processes. Eventually we all decide to fundamentally change some parts of the world, whether by increment or revolutionary leap. The world is surprisingly resistant to single actions and messages, requiring continuous floods of similar contents before being nudged to change direction even slightly. The inertia in the world and its parts surprises individual human beings who feel little inertia around them, though ignoring their own tendency as persons to do as little self change as they can get away with in life. Inertia rules the day, quite generally. Therefore, social change requires persistence, repetition, multiple channels, and coordinated nudgings.

- chaos = myriad unfocused uncoordinated change tactics not in scale with the inertia resisting change in the world; structure = a process of change model having stages that invite very particular change tactics in each stage that "set the stage" for later stage tactical contributions; performance attained = people famous in history for having actually changed things are universally persistent and well structured in their process of changing.

Structuring the Power Development Process. Power develops in set stages that, if ignored, result in power collapse or misuse. Specifically skipping stages results in power collapse. Controversy follows new power development, always, because new emerging power crowds out old established ones, who react defensively. Power emergence without controversy, defense, opposition, and dislike is probably nearly impossible. To create power is to need the power of others less, reducing their influence. This is true even when you are not competing for roles in old established hierarchies of power. People welcome all sorts of creativity except that of anyone other than themselves, somewhat.

- chaos = attempts to establish new power via unstructured process resulting in sudden collapses of power already established; structure = a stage model of power development, for example, Rollo May's negative, assertive, partnering, and transformation stages of power development with each stage requiring a particular type of power exercise; performance attained = steady power development progress without surprises and collapses

Structuring Messages to Stick. Most messages do not mean to their receiver anything like what they meant to their authors, hence, most messages do not transmit meaning but lose it or exchange it with entirely other meanings. We have all experienced this with parent admonitions endlessly and ineffectively repeated to our teenage selves--they intended to convey danger but instead, given the ways we viewed them and ourselves, they actually conveyed their dated mindsets and laziness of attempting to control everything by issuing verbal commands instead of getting off their duffs and engaging the world seriously. Research has uncovered the attributes that allow messages to stick and transmit intended content.

- chaos = lots of messages sent and expected to be transmitting intended content when in fact most are interpreted by frameworks unknown to us producing meaning not at all imagined or intended by us; structure = message content packaged so as to fit into, appeal to goals of, and match abilities of intended receiver lives by calling forth frameworks that receivers have that preserve message intents; performance attained = nearly complete planned impact of everyone in intended audiences instead of some slight statistical fraction being impacted by a message

Structuring Meetings. Meetings are primary power establishment and exercise arenas. They are often squandered via clumsy displays of power and ritual rank exhibitions (greater monkeys reminding the lesser monkeys who is boss). There is the matter of the total power generated by a gathering or meeting. Though commonsense assumes that total authority in a meeting is fixed as is the total power in it, various arrangements--structurings--of meetings permit variable and even greatly expandable amounts of authority and power from the same meeting at different times. Structurings that amplify the total amount of authority exercised and power investable by people in a meeting are often tools found, developed, or invented by leaders and central to how they lead.

- chaos = imbalance between issues seen and faced by a group and invested effort by the group in handling them; structure = structural remark making (remarks that read the structure of elapsed discussion thus far in meetings, numbering, naming, and ordering points made), democratic rules of order (meetings designed by their participants with each agenda item assigned a treatment and a treatment leader from among participants so all end up leading each meeting) and like structurings of parts of the whole of meetings; performance attained = power amounts increased by meetings and applications of it increased over time along with all participants over time mastering all preferred treatments of each type of topic that comes up in the meeting till all become equally competent leaders of the meeting

Structuring Between Meeting Periods. All time in workplaces is spent either in meetings or in between-meeting work, often carrying out action items generated in some meetings and checked by later ones. Structuring between meeting periods can greatly increase power amounts and the actual application of power. Meetings can be undone and redone by debriefing all participants after the meeting and getting their impressions and wishes, selectively reporting reactions to other participants making a second Echo Meeting that revises commitments made and data bases of decision from first meetings, for example. Action items for one intent launched by a meeting can be used as exposure excuses and platforms for projecting or preparing execution of other agenda not imagined in the meetings that authorized them, for another example.

- chaos = between meeting periods that merely execute blindly what meetings dictate; structure = echo meetings that redo meeting contents, orthogonal agendas launched on the basis of streams of action items from meetings, serial asynchronous discussions structured as following meetings in non-face-to-face form, all three of which are ways to make between meeting periods places where initiative, consensus, new authority, and new power arise not restricting those to generation only in meetings; performance attained = meetings that must take into account the creativity and initiatives launched by between-meeting forms of togetherness, executing action items generated from between-meeting initiatives.

Risk

Power must be used or it decays. Using power requires directing it somewhere toward some vision or goal. Such choosing is always a risk, the risk of choosing wrongly.

Demystifying Love of Possibility. Power corrupts, absolute power corrupts absolutely, power decays, unused power decays absolutely, we might say. Having power unmatched by willingness and ability to prudently take risk results in the power going unused and that causes decay. There is another related barrier to action, however, the huge potential we lose whenever we choose. When we choose one path or direction, one way to go, we thereby make more costly or impossible dozens or hundreds of other possible directions and ways. We lose lots more than we gain, it feels like. Some people love having the possibility of lots of possible futures and love that more than making any one of those possibles actual. Loving actuality is an acquired taste, essential to effective work and leadership, parenting and creativity. The risk of choosing wrong, from attractive alternatives, is frightening enough that it paralyzes many people into lives of ineffectiveness.

- chaos = entire lives caught up in potential that never gets realized, actualized, applied; structure = personal tools for coordinating pursuit of parallel goals selected strictly from larger lists of possibilities, and projections from all present accomplishments of goals orthogonally based on changed personal identity and potential that results from such accomplishments; performance attained = continually expanding number and heft of goals regularly attained supported by growing infrastructure of tools for parallel work, rigorous selection among potentials, and projection of present attainments into new "you"s and associated goals/deeds

Structuring Plans as Viewpoints on Emergents. People loyal to their plans tend to end up fighting reality as its regularly and unexpectedly busts up those plans. Much energy gets squandered in such fighting. Plans are risks, we say we will insert such and such into reality and we do our best to do so, finding, however, often that reality not only resists such insertions but so transforms interests, frameworks, and goals that what we planned, if done, would no longer satisfy the goals we set out with. Mature people and effective people tend to view plans as platforms from the vantage point of which to view the unpredictable flows and emergent phenomena of our non-linear world and environments and fellow actors. By structuring plans as platforms for viewing emergents, arguments between ideal and reality are minimized and a balance between furthering old goals and latching onto new better possible goals is maintained.

- chaos = stubborn pursuit of failing goals or wimpy abandonment of goals at the first sign of trouble/resistance; structure = powerful persisting in pursuit of goals while using them primarily as windows for spotting unexpected emergent problems and opportunities to amplify or recontext present pursuits; performance attainment = even failing plans get turned effortlessly into victories and greater than planned accomplishments, lives of sheer problemlessness

Structuring Design. Before the risk of action taking is the risk of design, dodging multiple sources of constraint, committing to one structure at a cost of making harder another, committing to one outcome trait at the cost of making attainment of another harder or impossible. Design runs two fundamentally different types of risk--the risk of unwittingly slighting costs of certain trade-offs among design parameters, so those costs undermine the overall viability or value of the design, and, the risk of doing little of worth with much opportunity, freedom of maneuver, and resources. The first can be called the side-effect of choice risk and the second, the suboptimal result risk. Structuring design processes and designs themselves to minimize these risks is a major component of high cognitive performance.

- chaos = slighted costs of design choices undermining designs and suboptimal results undermining respect from design work; structure = constraint trade-off houses (showing which traits make other traits easier or harder to achieve) and dimensions of difference designs (sequencing of peer and competitor design history allowing abstract dimensions of difference to be spotted so interpolations and extrapolations invent revolutionary designs); performance attained = designs that clearly are risks while superbly handling risks

Structuring Policy and Organizations as Experiments. We tend to structure policy and organization as right, true, the best available then go on using them without much attention to hidden costs and side-effects, not to mention foregone opportunity costs of policies and ways to organize not chosen. Indeed, there is an entire battery of psychic mechanisms in the mind and culture that allow us to instantly use policy and organization as excuse or limit, beyond appeal, excusing our own personal failures to succeed or achieve. We create our own policy and organizations then instantly act like they are unchangeable acts of God, beyond appeal, that limit us and serves as excuses for our failures. This is a bit disingenuous. Cognitive high performers seem to somehow fail to commit to particular policies and ways to organize things, seeing them as experiments designed to gather data on "correct" policies and ways to organize rather than decided "right" answers. You can view this as risk handling by changing the purpose of commitments from handling our anxieties about risk to providing data about actual risks and results.

- chaos = policies and organizations that we made serving as primary excuses for our failures to achieve; structure = designing policies and ways to organize to generate valid data on what works and does not work, helping us choose on a valid data basis among alternatives; performance attained = commitments turned into valid data that tell us what works

Structuring Policy Making as Deployed Catch-Ball Processes. There is the risk that policy will be made but never implemented. There is a major disconnect in strategy and policy making between composing policies and strategies and actually getting anybody to implement them. Most organizations and leaders find it sufficient to look like they and their organizations are going somewhere without actually transforming anything very much. After crises make going nowhere no longer possible, new leaders from the outside are brought in to start new directions made easy by the utter collapse of old ones, before they were brought in. It is amusing to see how seriously university professors doctor up corporate strategy meetings with fancy analysis techniques, laughed at for subsequent years by entire workforces, amused by professorial out-of-toughness.

- chaos = wonderful rational bold strategies ballyhooed here and there without even a hint of real application by huge workforces; structure = policies made, refined, nominated, and selected by expert processes deployed across entire workforces top to bottom and bottom to top, in policy design eventlets; performance attained = commitment, idea boldness, resourcing, incorporation into existing workflows and constraints all developed simultaneously by those who, after all, have to implement every last bit of any strategy

Structuring Reactions-to-Reactions. One risk is people with frameworks other than ours will see what we do differently than we imagine and react in ways we never expected, changing our environment, competition, destiny, budgets, and images. The meaning of our actions is not something we alone determine but is emerges from a dialog of all interested parties as they variously see, interpret, and react to what we do. To make the meaning of our own actions means to manage this emergence process of meaning of our acts emerging from myriad interpretations and reactions of stakeholders in what we do (those in any way affected by what we do).

- chaos = lose of control of what we do and what it means as reactions by others overwhelm not only in number but in their unanticipatable contents; structure = building a matrix of our actions as rows with all stakeholders as columns with intersection boxes filled with how each stakeholder views and reacts to each of our actions, then following that with another matrix of the main such reactions in those intersections as rows, the same stakeholders as columns, putting in intersection boxes reactions of those stakeholders to those key reactions of other stakeholders; performance attained = packaging of our actions that anticipate and manage effectively reactions by others to what we do, minimizing distractive or disruptive surprise reactions from others

Act

Action, unlike labor that merely repeats motion, and unlike work that erects pieces of an artificial world around us, spawns unforeseeable consequences we stand responsible for, though we could not have foreseen them. Action is a dual risk, the decision risk of choosing to direct our power wrongly and the risk of setting in motion second and third order consequences that reality springs upon us suddenly later.

Response Stopping. Most action from us is not action at all, but mere behavior--automatic responses from us that happen so automatically and unconsciously that we are hardly aware of them and do little to shape them, preferring to justify them after the fact out of inertia if nothing else. The beginning of action, therefore, is stopping such unthinking automatic responses, delaying reaction, and switching for habitual unthinking reactions particular consciously chosen or designed ones we think better.

- chaos = inability to act due to the ease and naturalness of our automatic behavior and responses leaving no room for riskier and more creative acting; structure = deliberate targeting of automatic reactions in us for elimination, delaying all reactions, in the delay switching reactions from automatic ones to consciously preferred/designed ones; performance attained = continual weekly or bi-weekly evolution out of old habits into new routines that by practice become automatic and our new habits

Finding Whistle Points. We are tiny beings in an immense universe and the insecurity of knowing this gnaws at us lifelong prompting exaggerations of our importance before self and others that mislead us about our actual ability to influence things. Power in action comes from locating the small actions we are capable of where situational factors of that location will multiply consequences non-linearly (greatly).

- chaos = much insight and planning and action with little result; structure = systematic maps of all social functions and ways to such maps to find where in society small actions get multiplied into having large consequences; performance attained: from actions not bigger than those of other players much greater results

Structuring Problems, Causes, Solutions, Implementations etc. for Root Effects. We tend to act where problems appear. We tend to act in single spots not all over entire systems. We tend to plan 3 or 4 or 8 or 10 steps or tactics to get something done, not 125 or 350. We tend to imagine solutions immediately upon hearing the description of a problem, without bothering to consider actual causes of the problem, how many causes there might be, and how to blunt, redirect, or stop the force of such causes. In other words, our natural problem solving processes are quite abysmal in quality, effectiveness, and rationality. Our folk solving tends to choose, also, only solutions guaranteed to perpetuate our problems (dealt with by a particular structure described later in this paper).

- chaos = local not system solutions, few not myriad tactics, symptom-directed not cause-directed tactics, only things called “solutions” that perpetuate our problems; structure = structured solving processes that move us beyond local, symptoms, addressed by few tactics to addressing root problems that generate other problems, root causes that generate other causes, root solutions that generate other solutions and the like; performance attained = many small actions so located that they forever eradicate the causes of an entire category of problems

Stratifying Responses. Stratifying responses is the opposite of response stratification dealt with above. This means we separate the strata of our response before or while designing or delivering it. We plan for distinct response actions for each stratum but tightly coordinated and delivered. That is what people notice, what they feel, what they are reminded of, what patterns they notice, what frameworks they call forth and interpret that with, and what decisions they reach are designed for in the responses we imagine. We design not a mere action but traits of that action that produce the noticing, feeling, reminding, pattern, interpretation, decision we wish.

- chaos = response actions that mean one things to us but produce something quite different for others; structure = action contents or structure adjusted so as to produce in particular stakeholders our intended impacts on each response stratum of human experience; performance attained = impact we plan is impact we get

Event-izing Nascent and Emergents. By putting slight nascent emergent things into relation with each other, making them visible to each other, we can turn nothing into something quite visible and powerful. This is acting by careful orchestration, staging, and focussing of things already there--impact on the cheap.

- chaos = having to produce ourselves every tactic and component that produce the impact we intend; structure = borrowing slight, nascent, emergent things already there and by putting them into relation with each other turning them into something much bigger, more visible, with greater impact than all of them acting alone add up to; performance attained = large impacts from minimal actual invested effort, resources, and tactics.

Viral Growth by Micro-Institution Development Structuring. Self funding, self replicating, self training, self marketing units, without central control or great resources can utterly transform whole sectors of society. The Grameen Bank in Bangladesh has pulled more people out of poverty than massively greater decades of World Bank lending in that nation, for one example. The key is structure that latches onto exploitative imbalances among people or institutions in society and by releasing the exploited party in relative productivity and wealth compared to their exploited situation, cause exponential replication by friends and associates viewing their liberation and transformation of life condition.

- chaos = massive outside central dominating unsustainable resource and motive flows to transform large scale local conditions; structure = basic units that transform, producing surplus's locally invested in further growth, till exponential take-off occurs; performance attained = get the local units and their interactions and growth dynamics right and extremely small investments can utterly transform huge situations and territories.

Manage

Acting spawns consequences, side-effects, and reactions of self and others we must handle, that is, manage.

Manage by Building Movements. Managing by commanding hierarchies of monkey-like arrays of men works well when the men are uneducated and their commanders are educated, when things change slowly if at all, when size is a valid basis of productivity. It works terribly in all other conditions. Yet our world is populated by giant slow central ritual rank rehearsing monkey-like hierarchies of men. As they struggle to survive they emit layers of fluid, fast assembling and recombining task teams across functions, across ranks, across organizations. We find everywhere a dead library of bureaus kept barely alive by a teeming fluid task team layer that actually notices things in time to get things done in time to survive, with enough profit to pay for the continual upkeep of a giant dead bureaucracy devoted mostly to ritual rehearsing of which monkey out-status-es which other monkey.

- chaos = a fluid task team layer keeping alive a dead bureau layer; structure = eliciting volunteers from the dead bureau layer via successive movements passed over entire sets of firms, training those volunteers in local chapters that funnel them into focussed demonstration transformation projects, the profits of which pay for viral spread of the movement; performance attained = gradual entire evaporation of the dead bureau layer as all of its worthwhile people are elicited from it, till all is movementally engaged and nothing is left in bureau form

Managing by Balancing. The problem with hunches, intuition, experience, authority, charisma is they are unscientific, not data-based, and subject to huge, omnipresent biases and self-serving distortions. Montesque's checks and balances of splitting powers and putting them in positions to check each other because their bases of power are distinct is a cumbersome expensive but viable way to reduce these problems on the macro-level. Boards, CEOs, chief finance officers, and the SEC (in the US) continually have to reconfigure themselves to handle out of control unscientific management whose self-serving-ness destroyed the pensions and happiness of hundreds of thousands or millions of un-powerful people. A micro-approach to solving this exists, based on structuring managerial actions to address imbalances of myriad sorts plotted on comprehensive maps of various dynamics in trade-off relations with each other. Every focus is a much larger non-focus--we focus on X which means we reduce attention to A, B, C, D, and others. Hence unseen side-effects in those under attended to areas usually come upon us as unwanted surprises, we were so busy watching our focus, X.

- chaos = no models of what attention to X removes attention from so unmonitored side-effects suddenly ruin X for us; structure = comprehensive models of all dynamics of various types that we achieve focus among so we can plot what we are emphasizing now and thereby articulate and monitor closely all that we are not thereby attending so; performance attained = scheduled re-attending to under-emphasized dynamics and removal of emphasis on attended to ones that prevents disastrous surprise side-effects

Managing by Events. Work done in departments was replaced with work done in cross-department, cross-organization processes. More recently work done in such processes has been replaced by work done in mass workshop events. Globalization and internetization of work content has dissipated face-to-face contact and attenuated human relations to the point that consensus, loyalty, and common understanding are unattainable or unsustainable. Events where people sit and hear speeches do nothing to correct this, so the contents of events have evolved into world class best practice procedures embedded in event workshops where dozens or hundreds do in hours work that usually takes small staffs months or years to do. Dozens of such workshop groups working in parallel in one location and sharing intermediate results of their workshop work constitutes a Managing by Event event.

- chaos = processes stretched so far geographically by globalization and human relations stretched so thin via internetization of work that the community basis of work fails; structure = many simultaneous workshops each executing a procedure derived from people world best at some function, coordinated in intense events; performance attained = extremely fast doing of functions with large organizational learning side-profits and great visibility to deeds nearly unnoticeable if done alone by isolated groups

Just-in-Time Managing. Just-in-Time theory found that inventories were used to hide process steps from unreliability of adjacent steps, allowing flaws in process design and execution to go unnoticed and unfixed for generations, and upping costs. By removing inventories, such actual situations and causes were laid bare and attention forced on them, vastly improving process design and execution while no longer paying for inventory items. At first applied to physical and specification inventories, this theory was applied to successively less physical and more informational and mentally interior, cognitive, inventories, finally recently dealing with using a specially designated social class called “managers” or “leaders” to deliver leadership functions to workprocesses. A fixed expensive inventory of human beings in a social class with a monopoly on deliver of certain work functions results in continual over-managing (to look managerial and justify perks) and continual under-managing (missing more scientifically based determination of what leadership function in what amount delivered when to where is needed). Such over-shooting and under-shooting of targets is common to all fixed inventory regimes, including “managers”. Alternatives to a fixed social class for delivering leadership functions to steps in work processes were devised, tested, refined, and installed globally in pioneering workplaces with the same results of work processes better served by more accurately delivered leadership functions without the costs of a fixed inventory of managers.

- chaos = continual over-managing and under-managing (at the same time) of work processes by expensive fixed “social class” inventory of managers; structure = scientifically determined needs for which amounts and types of leadership functions installed with alternatives to a fixed social class--events and rescue squads; performance attained = precisely the leadership functions needed, when and where and in the amount needed, delivered without the cost of a fixed social class “inventory” of managers

Social Automata Management. As work products and contents become more cognitive, knowledge intensive, informational in nature, management becomes the management not of work but of creation. Managing creatives is nearly an oxymoron--creatives by definition resist “management”. Hence much less directive ways to shape and channel work and imaginations are needed to replace command hierarchy styles and people. Social automata, arranging people as arrays of processors over which pass algorithms, constitutes a more indirect role for leaders, that of tuning system properties till better-than-wanted results emerge from myriad interactions among populations of actors in the system.

- chaos = evolution of products and markets towards knowledge products made by creativity processes in conflict with traditions of leadership far too directive for managing creativity; structure = envisioning and organizing the workforce as a social automaton or fractal hierarchy of many of them, with leadership tuning system properties of their interactions till better-than-wanted results emerge; performance attained = more actual places and kinds of intervention for leadership roles while far less directive and creativity-disruptive intervening.

The Performance Art and Magic of Leadership. The emotive component of leadership transforms workforce experience into a performance before history and competitors, and in so doing transforms leaders into orchestrators or choreographers of such workforce performance before historic audiences. Structuring leadership interventions so they foster highly visible performances of entire workforces (instead of glorifying individual person leaders) is what finally ends up glorifying persons who lead.

- chaos = leader performances that distract from and detract from workforce performances leading to historically poor unlauded results by both leader and workforce; structure = leader performing that elicits historic performances of entire workforces, gaining fame for both; performance attained = highly visible historic performances of entire workforces.

Create

Directing power somewhere, that is risking, produces particular actions with unknowable consequences we end up managing. We choose, then, either to endure and manage on or to escalate the scale of our intervention and involvement into the world by changing the world and its rules, that is, creating.

Darwinian Operators. People like to assume they are good and right unless proven otherwise so they operate inside the assumed rightness of who and what they are till it is apparent they cannot trust that anymore--then they are forced to get creative. Again and again, in field after field, situation after situation, issue after issue, the same basic creativity operators show up--generate, combine, select, and reproduce. These are, after all, the major parts of the most creative process known in the universe, the process that created human beings, Darwin's natural selection process.

- chaos = people assuming what alternatives are available, whether consciously or unconsciously, operate in tiny fragments of what is possible, exploring tiny opportunity and solution spaces; structure = commitment to not assume what alternative are available and explore/list all thinkable ones, commitment to not assume alternatives as presented are individual but combining them into myriad interesting hybrids, then combining those hybrids, and so on, commitment to not assume best combinations automatically get noticed and stand out but thoroughly reviewing all combinations of interest for exactly which perform best, commitment to not trust mere announcement of best selections but doing the hard work of getting best selections widely reproduced in systems and locales

Using Paradox Generators as Doorways to Creation. When we try to go beyond what exists, the encounter inter-related barriers, like a tough skin protecting the future from easy penetration: negation, networks of mutual constraint, at the level of thoughts, hubris and despair at the level of emotion, feedback and side-effects at the level of interacting works and people, parallel projects at the level of selecting career direction and problems to work on. All of these generate paradoxes that stop the "past" us from penetrating the future. To get to the new we have to put aside common modes of feeling and thought.

- chaos--attempting to create with what we already are and know, wanting the new to somehow already be inside us without further effort or self change being necessary; structure = knowing what level we are operating at and seeing what generates paradox when we try to innovate with who we already are at that level, and knowing what generates such paradox at that level; performance attained = creativity not attempted with old self but after all that you are and know are marshalled and fail against the problem, further pushing mentally beyond paradox, emotionally beyond despair, socially beyond side-effects and reactions, and beyond single lines of engagement works, produces creativity.

Structuring Darwinian Operations on Four Scales. We have a within mind level of darwinian goings on, an inter-personal emotional level of the same darwinian dynamics, a social performance level of darwinian competitions among competing creators and creative works, and a career historic focus level of darwinian competitions among parallel lines of work we project, sustain, and develop not knowing which will end up creative. If we emphasize the within mind level and neglect the others, or emphasize any of the others ignoring the remaining three, we end up without creativity. Creativity is leveled and those levels cannot be ignored blithely without consequence.

- chaos = trying to create on one level; structure = being creative by working dynamics on four progressively large levels--within mind, interpersonally, socially, and career; performance attained = creative efforts directed at all four size scales resulting in creativity attained.

Structuring the Insight Process as Alternating Engagement and Detachment. Insight comes after all that you know and can do fails, again, to work. It is at the point of despair that you emotionally unhook from past beliefs and commitments enough to let entirely new approaches drift into place. Insight comes from accumulating lots of failures because as those failures accumulate the become a better and better inverse specification of what eventual solutions must be like. By accumulating a huge failure index we specify well the eventual solution. Insights emerge, they are not planned or designed. They come when they wish, not when we wish them. They resemble the punch line of jokes, a slight trigger causes shifting to an entirely different framework that re-interprets all that went before from the solution's point of view.

- chaos = trying for insight without doing the prerequisites of insight; structure = attaching to the problem, by engaging thoroughly all that you know and are and can do, punctuated by withdrawal into reflective reverie where unrelated ideas can melt and blend with each other freed of rational and traditional constraints; performance attained = sudden insights that present entire solutions, possibly encumbered in much noisy junk.

Structuring the Social Conditions for Creating. It does little good to arrange house and home, office and workplace to make them conducive to creativity when you know nearly nothing about what creativity comes from and consists of. Creating has parts and components, steps and directions, that each have their own specific requirements and needs. Learning what creating is is a prerequisite for tweaking environments to support all that it is.

- chaos = attempting to tweak environments to support creating without have a model of what creating is and consists of; structure = a model of what creating is and consists of; performance attained = creativity

Tuning Social Automata till Creations Emerge. The same social automata regimes that help managers manage creativity as it becomes the ordinary work content of our growing knowledge economy help individuals and groups become creative themselves.

- chaos = highly directive command styles of management of self or others when attempting creativity; structure = organizing your self or others as a social automaton, tuning the interactions of the components of which till better-than-planned results emerge as your style and mode of intervention; performance attained = creativity.

Become

The very first thing we all create is our self. It is also, the last thing we all create, the story history tells after we die of our contributions to the world.

Orthogonal Self Image. Every time you accomplish something that was hard enough for you that it required growth in ability, courage, or some other important aspect of you, you need to take enough of a break to build a new identity for yourself, asking "who have I now become, what am I now capable of, what parts of the world will now respect and show interest in me".

- chaos = accomplishing things while staying the same person you always were, so much, that past accomplishments and successes never expand possibilities, opportunities, and future accomplishments for you; structure = punctuating your life with breaks, after each significant accomplishment, wherein you build a new identity that incorporates new potentials from what you just accomplished. Note it is an orthogonal projection of new identity, not a linear projection from the accomplishment to further similar such accomplishments.

From Be X to Have X. We grow when we despair, just as we have insights when we despair. You cannot fake despair in either case. We grow when we despair over ever attaining some goal with the self we currently are. When something deep in who we are prevents us growing in wanted ways or directions, and again and again we fail to grow that way, we fall into despair. It is that despair that opens the door by raising the question, then possibility, in us, of maybe changing who we are--maybe there is some part of our self, our identity, that we can do without, and thereby grow the way we want. Despair is what loosens the emotional bond between us and who we are, our identity, that allows us to contemplate seriously changing part of who we are, the part in the way of how we want to grow.

- chaos = attempting personal growth without going through despair at your old self's ability to support the growth you desire; structure = reducing what you emotionally depend on in your self, and learning to have that part of your self that you just before depended on being for security--replace what you were by having it instead of being it (example: adolescents are defensive when you attack their opinions you attack their selves, when adolescents grow into adults they learn to have opinions not be their opinions so attacks on their beliefs do not attack their selves or confidence); performance attained = fundamental changes in you, who you are and what you desire, regularly made.

Absurd Concentrations. Our world is filled with amplifiers of good and interesting things--publishing industries, talk shows, conventions, venture capital, and more. However, before you get multiplied by them you have to come into view for them, you have to be noticed, you have to become visible. This means that what you like and do has to reach absurd levels, absurd enough levels to be unusual enough to attract attention of these large multipliers of life's contents in our midst. Learning not just to do interesting and good things but to do them enough so as to achieve absurd levels of or concentrations of their outcomes takes times but is fundamental to worldly success in our time.

- chaos = doing interesting and wonderful and good things that no one ever notices and that do not grow into further interesting things; structure = pushing what you do till absurd concentration levels are obtained that attract the attention of the large multipliers in modern societies; performance attained = slight good personal accomplishments multiplied into immense accomplishment via multipliers in our societies.

Bridge Community Building. The primary resistance when we try personal change is what is called our "primary group" of close friends and family. These people have developed deep relations and dependencies on us and resent, possibly unconsciously, when we wish to change who we are. So all personal change ends up including putting our selves into new communities that call forth and enjoy the new parts of us that we are growing. Such new communities that foster the new parts of our selves we are growing are called "bridge communities".

- chaos - attempting personal change without bridge community support; structure = meeting or forming a bridge community of new people to relate to who like the new parts of you that you are growing; performance attained = lasting personal change.

Critical Mass Appearance. Dribbling out creative works or products, leaking ideas and images, incrementally publishing advancements--all fail to reach critical mass. They thereby fail to surprise, impress, spark envy and emulation. They lack, in short, visibility and ability to attract attention and respect. Nobel Prizes have been awarded because scholars waited to publish, waited till a critical mass of results and evidence was accumulated so that initial skepticism, doubts, challenges, and attacks could be instantly countered with valid data. The theatre of challengers amateurly attacking and defenders overwhelming one and all with already done valid experimental and survey data, added elan, drama, and continual victory that paved the way for awarding of the Nobel Prize (social scientists will be able to guess exactly whom I am describing here).

- chaos = great work being continually released so it never comes in increments big enough and unexpected enough to surprise, catch major attention, and change allegiances/visions of people; structure = waiting till own results accumulate into a huge volume and quality, then releasing an overwhelming response to early challenges and doubts; performance attained = Nobel Prize level of recognition and reward of one's creativity.

Using Fame. It is customary for people to succeed, go to elite parties, take sex and drugs there, go into treatment centers after run-ins with the police, attend the funerals of their children after variously motivated suicides and overdoses. This is a customary way to handle fame, not uncommon in society. It leaves much to be desired. Indeed, the newspaper do not well report the tens of thousands of famous people who handle fame as cleverly as they handled the rest of their career that resulted in fame.

- chaos = working hard for success then letting success ruin you and all around you; structure = dual visions of a road to success and a road of using success once it comes to tackle immensely greater and more fun challenges; performance attained = entry into history, fame before the generations unborn as fame before the born gets invested by you in history-changing and history-challenging endeavors future ages will admire and respect and build on.

Result 1: (of the Review of 60 Structure-Performance Case Types Above)

We want to know whether talent's capacity to move people toward cognitive high performance always acts via erecting mental structures like those above or via something else. Similarly, we want to know that for professional practice and for non-linear amplification feedback processes--do they act via structure or via something else. We want to know whether the structures that move people toward high cognitive performance come from innate talent, from professional practice, from non-linear amplification feedbacks, or from something else. We want to know whether regularizing mental structures helps or hurts their power to move people toward high cognitive performance. We want to know whether the primary way that all forms of mental structures move people toward cognitive high performance is by allowing ordinary cognitive operators to be applied, instead of to single or a few ideas, to highly organized entire structures of related ideas, in the same time with the same quality as application to one or a few ideas in ordinary cognition. Is structures amplification of cognitive performance role primarily a multiplication one of allowing more items of more variety to be handled by the same ordinary cognitive operators. Did the review of 60 domains of cognitive high performance above, help us answer any or all of these? That is what is discussed below.

The various structures described in the above 60 domains of cognitive high performance are nothing very complicated: sequences, associated lists (items on one list mapped onto items on another list), tables, matrices, hierarchy of categories, lists mapped to spaces/organizations/events, regularized fractals of categories, sequences of lists/events/spaces, sequences/lists/tables/matrices of events, and sequences/lists/tables/events of procedures. We can see an implicit ordering among these forms. Lists if long enough become unwieldy, needing a hierarchy of categories to index them into parts. Hierarchies of categories, if they become long enough, become unwieldy, needing transformation into regularized fractals of categories. So we have lists, hierarchies of categories, and regularized fractals to handle sequencing/listing in general--let's call this the regularized indexed list dimension. If we "multiply" two of these regularized indexed list dimensions together, we get tables or matrices whose rows and columns are indexed by nothing, or hierarchies of categories, or regularized fractals of categories. Let us call this a "multiplied regularized indexed lists" dimension. This one structure is all, with all of the 60 cases reviewed above mere subsets of it. There is just this one topology then in reaching high cognitive performance of the sorts this paper investigates. That raises the question of improvements in cognitive performance, now based on subsets of this one topology--can they be improved by moving up to greater subsets and finally by moving up to multiplied-regularized-indexed-lists form?

Consider the following experiment--find a cognitive high performer in some particular cognitive function whose current performance is based on some subset of the multiplied-regularized-indexed-lists form, find an effective, motivated, appropriate, embraced (by the subject) way of handling either more volume or diversity or both via moving from that subset to the next most complete one of the multiplied-regularized-indexed-lists form. See if performance becomes significantly better. This simplified description is not meant to detail the actual statistical considerations and experimental controls and complexity needed over a sample of high performers to validate this idea of an ultimate structure behind high cognitive performance. Here it is enough to suggest that this idea of an ultimate structure can be tested fairly straight-forward-ly.

Research questions of this study are summarized below (they come from several parts of this paper's arguments and include some ambiguities reworded as research questions) with answers to them *suggested* (not proved) by the 60 cases reviewed above listed below each:

- We want to know whether talent's capacity to move people toward cognitive high performance always acts via erecting mental structures like those above or via something else.
 - the use of the structures of the 60 reviewed cases above is probably independent of talent, but what portion of the ultimate structure of which all others are mere subsets--the multiplied-regularized-indexed-lists form--is probably determined somewhat by talent interacting with professional practice and non-linear amplification.
- Similarly, we want to know that for professional practice and for non-linear amplification feedback processes--do they act via structure or via something else.
 - graduating from simple subsets of the ultimate multiplied-regularized-indexed-lists form to more complete subsets of it probably follows linearly increases in professional practice and non-linear amplifications.
- We want to know whether the structures that move people toward high cognitive performance come from innate talent, from professional practice, from non-linear amplification feedbacks, or from something else.
 - structure seems to evolve from a drive to handle more volume, more diversity, with limited ultimate human mental machinery inside us; we evolve to handle more in volume and diversity and we evolve structures of greater complexity to expand the volume and diversity amounts we can handle with our almost fixed endowments of mental machinery.
- We want to know whether regularizing mental structures helps or hurts their power to move people toward high cognitive performance.
 - most of the cases reviewed that were leaders, particular sophisticated, involved movement from simple sequences and lists, or tables and matrices, to hierarchies of categories indexing such simple structures; only one case involved regularized fractal ization of hierarchies of categories--should we interpret this rarity as a sign of ineffectiveness or as a sign of requiring real genius?
- We want to know whether the primary way that all forms of mental structures move people toward cognitive high performance is by allowing ordinary cognitive operators to be applied, instead of to single or a few ideas, to highly organized entire structures of related ideas, in the same time with the same quality as application to one or a few ideas in ordinary cognition. Is structure's amplification of cognitive performance role primarily a multiplication one of allowing more items of more variety to be handled by the same ordinary cognitive operators.
 - the review of 60 cases seems to suggest an evolution of topology from simplest subsets of one ultimate form, multiplied-regularized-indexed-lists, to more and more comprehensive subsets of it, suggesting that high cognitive performance does come from being able to handle more volume and diversity, using more regularized and more indexed structures to handle greater volume and diversity of idea or action.
- We want to know whether it is the structure or the process that erects or uses the structure that moves people to high cognitive performance.
 - we cannot in the review of 60 case above, dis-entangle structure from processing that makes it and uses it, so no answer to this is forthcoming from this study.
- We want to know to know what is the minimal amount and type of structure that yet suffices to move cognitive performance to high performance.
 - in the cases reviewed we ranged from simple lists to multiplied-regularized-indexed-lists.
- We want to know whether conscious use of structure outperforms automated unconscious use or vice versa in moving people towards high performance.
 - the review of 60 cases suggests that nearly all structures start as conscious contents, turned automatic and unconscious by rehearsal and repetition.
- We want to know which structures work best for which cognition functions in achieving high cognitive performance.
 - the review of 60 cases suggests strongly an ultimate topology--the multiplied-regularized-indexed-lists form; that form may be best for all cognitive functions since people seem to merely evolve from simplest to more complete subsets of it as they become reach higher levels of cognitive performance.

Result 2: the Ultimate Structure Hypothesis (for Reaching Cognitive High Performance) and the Volume and Diversity Drive Hypothesis

The review of 60 cases suggests that there is one ultimate structure that propels any cognitive function towards high performance:

- The Ultimate Structure Hypothesis: the multiplied-regularized-indexed-lists form will be found in the highest performers of all major cognitive functions as key to their achievement of that performance.

This study has not proved this, but suggested this hypothesis. Along with this hypothesis comes a corollary:

-- The Volume and Diversity Drive Hypothesis: the ultimate structure--multiplied-regularized-indexed-lists--emerges because high performers achieve high cognitive performance in any cognitive function via handling more items/ideas/actions and more diversity of items/ideas/actions than average performers, evolving the multiplied-regularized-indexed-lists form as a means of handling greater number and diversity with their fixed human endowment of mental machinery.

Implicit Theories as Organizers of Goals and Behavior, in Gollwitzer and Bargh eds, *The Psychology of Action*, Guilford, 1996).

References

Books under the following categories in the bibliography (see my 4000 favorites books list at www.scribd.com)

Structural Cognition: A New Publishing Industry: Comprehending Streams of Inputs
Discourse: Natural and Research Analysis
Text: Natural and Research Analysis
Naming
Neural Associative and Linguistic Syntactic Structuring
Fractal Categorizing
Structural Learning
Structural Communication
Orthogonal Disciplines: Locally

Event & Performance Design (you design and hold two new event types)

Knowledge Modeling (you build and implement 2 organization knowledge diagnoses)

The Creative Sector of Economies and Societies

Algorithms of Creation

Particular Types of Creativity

Creation as Information Processing

Communication and Media Theory (plus Social Psych Influence books at left)

The Social Cognitions of Creating

Cognition Overviews

The Overall Nature of Cognition: Surveys

Arguments about Mind and How it Works

Particular Kinds of Thought