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From Information to Imagination: Multivalent Logic and System Creation in Personal Knowledge Management

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INTRODUCTION

What does personal knowledge management mean for the way that we think, create, write, and muse? How does it impact and alter the process of creation? Inversely, how do the media of creation—intuition, pattern recognition, visualization, improvisation, paradoxical thought, and synchronicity—shape the way that we manage personal digital libraries? The following explores the role of personal knowledge management in bridging between the shallows of our data streams and the depths of our creative imagination.

INFORMATION

It is increasingly common today for researchers, artists or writers to possess a 180GB computer hard drive and a 500GB external drive. As movie and image collections expand, personal terabyte drives will grow in popularity. At a person's finger tips, then, is a larger universe of information than in early versions of inter-networked computing. So what do we do with all the bytes that we now store in our personal digital libraries on mobile phones, PDAs, i-Pods, personal computers, and flash drives? On one level we treat them as information objects—data to be retrieved. First of all we accumulate and archive it. Then we browse and search the amassed information capital, seeking useful items.

Information retrieval is the most elementary relationship we have with the mountains of data on our machines and devices. In this simple state, we find ourselves a little like the child who goes to the information desk at the local library seeking to find out the birth date of the 42nd President of the United States. Each one of the actors in this story begins by hoping that an all-knowing automaton will serve up the required information. The child looks expectantly at the seemingly omniscient librarian, while the seasoned PC-user fires up their desktop search tools. But, as even the child in the library soon discovers, information is never unmediated. There are catalogues, indexes and classification systems to master before anyone can effectively retrieve information. Extracting granular information requires a grasp of high-level information architectures. Automated search tools may appear to side-step this but, in reality, command of those tools requires the ability to match search terms with correct guesses about their indexing assumptions. Such matching is intuitive and often resists explicit description. None the less, it is real—and it rests on long-term learning of the relation between low-level units of data and high-level cognitive architectures.

This learning begins young. With the aid of teachers, parents and librarians, the amorphous mass of information in a library and the world at large gradually acquires a legible shape in the mind of the child. This happens through the interaction of classificatory systems and data elements. Children learn to move back and forward between parts (fragmentary data) and the whole (ontology and taxonomies). They learn about elements and they learn about frames. They learn to match one with the other. Users of personal digital libraries find themselves in the same position. They are both retrievers and classifiers of information. They access data and they catalogue it. They tag it, group it, and bunch it in clusters. Yet, in one respect at least, these do-it-yourself cataloguers find themselves in a yet more complicated position. For they not only have to juggle their need for data with an understanding of its systematic arrangement by means of taxonomies, cataloguing, indexing, nomenclature, tagging, labeling, grouping, classing, sorting, and categorization. But sometime users of personal digital libraries and archives also have to be creators of their own systems of classification.

This is an odd situation to be in. Most users in an everyday setting just want to find information on their machine or device. Yet to do that effectively, they have to catalogue and file documents and media objects. This cataloguing and filing, admittedly, is often not very good. It is the work of an amateur—in this case, the 'prosumer'. The prosumer by definition is not an expert—and yet this agent is not simply a user or consumer of information systems either. Nor is the cataloguing and filing that the prosumer does on a computer automatically pre-defined or pre-structured. The prosumer in fact has license to create all kinds of information architectures, given the power and flexibility of the software on personal computing devices. At the same time, this is a necessity. Even if the user hates filing, it has to be done. Most prosumers of information do not experiment very far with their information architecture. Typically they use the stock information tree hierarchy that comes built-in with the standard operating system, and will store files on that tree alphanumerically. The tree hierarchy is the most common of all taxonomies. While the technology offers enormous latitude for users to create artful classification systems, that latitude is rarely explored in any great depth or rigor. Nonetheless the fact that it exists is interesting. Even in avoiding the challenges that technology presents, the prosumer has to confront some of the very peculiar issues that the process of 'creating systems' presents.

Information management is a form of architecture. It involves both the design and building of structures. Users typically find the granular data they want by paying attention to the clues provided by the taxonomic structure underpinning the information system. There is a good chance users will find the data they are looking for as long as there is a legible fit between the data sought and the enveloping information structure. Political science books are in the "300"

Section of the Dewey Decimal Classification system. If I walk into a library and want a politics book, I look for the “300” signs. Numeric sequence is a structuring principle. The crux of information management—whether it is on a personal computer or in the setting of an institutional library—is the systematic arrangement of information. If data is deposited by one person in a system or structure, there is a good chance that another person can find that data as long as they understand the underlying principle of systemic order that has been used. No information system is infallible. This is so for very good reasons. The Dewey system draws the distinction between politics books and engineering books. But a book on the politics of engineering might be classified as a politics, engineering or management book. Distinctions create clarity. They also create ambiguity. Both are inherent in systems—though at different levels of systems. Clarity is a premise of the everyday operation of systems. If a system does not generate legibility, it will be self-defeating. On the other hand, in order to create a system, ambiguity is necessary.

A comparison can be usefully made with the conduct of research. Dissemination of knowledge is very effectively done through the systemic drawing of distinctions between knowledge fields, for instance by the development of distinctive teaching disciplines. Creation of new knowledge, in contrast, requires the blurring of boundaries between established fields of knowledge and the breaking down of distinctions between them. New knowledge most often is generated at the intersection of such fields. The classic driver of research is ‘inter-disciplinary’ work. Conversely, once knowledge has been created, and validated, the openness of boundaries closes, and the porous relations between researchers and their organizations is replaced by the strong boundaries of a teaching discipline that functions to propagate the knowledge thus created. The difference between knowledge creation and knowledge dissemination broadly parallels the difference between the design of a system and the building of a system. The method of creating a system is substantially at odds with the way a system is subsequently developed and made operational.

Let us put to one side for the moment the question of the creation of a new system. We will return to that matter shortly. Let us focus for now on the issue of an operational system. To operate well, a system needs to engender clarity. Clarity is the epistemological face of efficiency. Systems that operate well are efficient. Efficiency is central to information retrieval because information is always ‘urgent’ in some sense. Think how few people on a web site use the browse function, and how many people use the search function. Indeed, think how few people use advanced search, and how many people use the basic search function. This is because they are ‘in a hurry’. Commentators have often assumed that this is a function of the computer medium.

Somehow magically it turns us all into speed freaks. But I doubt that this is true. More like it, we are always in a state of hurrying when looking for information. We browse luxury catalogues at our leisure, day dreaming. But when we need a hammer, because the one we were using is broken, its handle has sheared right in the midst of repairing the roof, and it looks like a storm is brewing, we want to find the address of the local hardware supplier as quickly as possible. So we grab the phone book and quickly flick through it searching for the right classification under which we will find the address we need. We expect the telephone book and its classificatory system to be as clear as possible. We are all intuitive Cartesians when it comes to information searching. Ambiguity, complexity and lack of clarity stand in the way of quick information retrieval.

If that all sounds mundane, then it is. The emotional excitement surrounding information is generated by the frenetic search for it. That is why the Internet has been so appealing. Its speed is seductive. It engages us when we are bolting through a task, animated by one of the endless minor urgencies that seem to define human life. But swiftness requires a clear pathway to the information we need, even if it is only to find out the birthday of the 42nd President. To a child that task is urgent as well—'because Miss Salisbury told us that we have to find out…' For a ten year old, Miss Salisbury is a daunting authority, so the one charged with the task had better get on with it. The child approaches the librarian, another of these seemingly infallible authorities, with a sense that 'all shall be revealed'. And indeed it shall, but only through the effort of the child guided by the keeper of the books who gently instructs the youngster in the mysteries of classification. What the child eventually learns are the basic functions of taxonomies, ontologies, indexes, tags, labels, sets, classes, clusters, frames, lists, and categories.

Users retain enough sense of classificatory systems not only to use them regularly throughout their lives but also to build classificatory systems themselves irregularly. As we store larger and larger amounts of data on our machines and devices, we find increasing need to categorize and organize that data. But, truth be told, our personal information management is suspect. We are not very good at it. We have no real system. We are not good auto-librarians. Our taxonomies are idiosyncratic. If it was not for fast desktop search technologies, in many ways the most useful generic software application of the past decade, we would be lost. We have been saved by the search index from being buried in the vastness of our personal information stores.

Yet none of that takes us much beyond the horizon of the child who entered the library searching for the vital answer to Miss Salisbury's question. At a certain age, a child learns to use the library catalogue's subject index, follow the numeric classification, get a book down from the shelf, turn to its index or table of contents, and scan the entries—until some likely trail to the requisite birth date is found. That is no trivial achievement, and some of us will repeat similar tasks every day for the rest of our lives. But those who do this also realize that the function of a library is more than this. There is more to books than their indexes or the numbers on their spines—or their reference, almanac and encyclopedic functions.

KNOWLEDGE

This is where the distinction between information and knowledge comes into play. A book may be used to store information—and some books are filled with information. But most books contain more than information.[1] Most of them contain knowledge—and knowledge is not the same thing as information. Sometimes knowledge is mistaken for information, but we ought not to perpetuate that confusion. Knowledge occupies the continuum—or spectrum—between information and imagination. Knowledge is a half-way house between information and imagination. The more demanding knowledge is, the more it is characterized by imagination, and the more difficult it is to systematize and manage.

As we shall see later on, high-end knowledge—knowledge that is suffused with imagination—demonstrates something that is double-edged. It shows both how information systems are constructed and the enormous strain system building places on the predicates of those systems. This reminds us that often the best way to make a system is to break a system. This will be considered later on. But we are not at that point quite yet. For the moment, let us content ourselves with the distinction between information and knowledge. Let us suppose the obvious—that a library is more than an information desk, and that its users spend a fair portion of their time at the library in the quest for something that is more than information. It does not matter whether the library is in a building, online, or on a hard-disk on a personal computer.

To clarify this, let us consider what else a book does apart from carry information. In brief—books tell stories and provide explanations. Stories and explanations make the world meaningful. We manage and order the world by telling stories and by giving explanations. This applies to information systems as it does to all of the domains of human life. One of the ways we arrange the holdings in a library is by 'telling a story'. National museums in the late twentieth-century, for instance, moved away from taxonomy as a basis for displays. They adopted narrative as a structuring principle. Many popular library exhibitions these days do something similar. They tell a story. Digital story-telling, a sub-set of narrative techniques, took off as a key tool for online and in-house representations of libraries and museums in the early 2000s.

The extension of this into the world of PC-based personal knowledge management is entirely conceivable. The hard disk of a computer, no less than the servers that support the

Internet, is an archive of data. An archive has to be structured in order to be accessible and legible. Narration is one way of creating such a structure. This is especially applicable to data that has a personal significance. Human beings like to tell stories about themselves. The practical obstacle to this in a digital setting is the time involved in doing it well. Yet it is plausible that narrative, in the form of pre-packaged narrative lines, one day might become the structural principle for hard-disk archiving of document and image files. We ought not to assume that the standard information tree hierarchy of today's computer operating systems will continue to dominate personal archiving strategies.[2] For the moment, though, most people rely on the default node-and-branch cascading tree hierarchies of computing operating systems.

These hierarchies are so familiar that we almost forget they exist. This should not surprise us. Successful structures are always invisible. Invisibility is a sign of their success. The more we need to discuss a structure, the more this is a sign that it is failing to function properly. Human beings do not much discuss the viability of their skeletons because skeletal structure is, for the most part, very well adapted to human functioning. Skeletons don't need much fixing. The pragmatic criterion ('does it work?') is always important when we are considering systems. This is because systems need to be efficient. They need to reduce the use of time and energy. Yet there is an expansive range of structural principles deployed in human and non-human domains. So, while branching tree hierarchies may serve many purposes very adequately, it is a reasonable assumption to make that they will not serve all purposes equally well. Thus in building knowledge systems, especially in pioneering areas where we are building experimentally, it is useful to be able to step back from the sub-set of familiar 'taken-for-granted structures' and explore the much larger, encompassing set of 'efficient structures' in their entirety.

For the purposes of knowledge systems in general, narration and explanation, as has already been suggested, are key structuring principles. Explanations in general are more abstract than stories—or at least they lend themselves to greater abstraction. From the impulse to explain arises science.[3] While explanations are usually more abstract than stories, explanation and narration nevertheless share in common the structuring element of time. They share a sense of 'before and after'. Science prominently employs explanations involving prior causation. *If* one thing occurs, *then* another follows sequentially in time. Scientific explanation refers to sequences of events in time that occur either without exception or else probabilistically. In human conduct, 'before and after' refers to sequences of motive and consequence, intention and result. The latter are less predictable than those reported by science. Yet they may still bear the weight of necessity. The fateful and tragic decisions of human beings can have all the baleful force of nature at its most unrelenting.

Just as time is a fundamental category of explanation, so also is space. When we explain matters in spatial terms, we identify how one thing 'stands' in a spatial relationship to another thing—and the effects and meanings that flow from that relationship. The spatial relationship may be hierarchical, lateral, vertical, horizontal, or skeletal. It may be modeled after an intersection of axes, webbing or networks, sponges and lattices. Its principal features may mimic cracking and erosion patterns, polygonal and hexagonal symmetries, spirals and slalom curvatures, highlights and accents, grades and ranks. There is a large set of standard spatial (spatial-kinetic, spatial-visual, spatial-auditory) structures that can be deployed to build systems, be they cognitive or social systems—or models of natural systems. Even the stock-standard tree hierarchy is a sub-set of spatial-visual explanation. Hierarchy has long been employed in the explanation and formation of a wide range of cognitive and social systems, and equally pervasively in the explanation and formation of natural systems.

Another way of thinking about explanation as a structural principle of knowledge systems is to think about the 'four categories of causes' that Aristotle identified.[4] These are parts, beginnings, ends and forms. Or—to put it more exactly—Aristotle invented the very useful schema of material, efficient, final and formal causes. We owe him much. Many of the common ways that we organize knowledge assumes 'beginnings and endings'. This is true of knowledge right across the spectrum between information and imagination. Classic information trees, for example, have a root node which is 'where we begin'. We click down the hierarchy of subsidiary nodes till we reach the bottom-most node. Having a beginning and an ending is one of the key ways that human beings make the world around them meaningful and create order out of chaos. Both stories and explanations, irrespective of whether they are simple or sophisticated kinds, suppose 'beginnings and endings'. The start and conclusion of an information trail is the equivalent of the motive and the goal of human conduct. 'Home' is the ubiquitous sign of a web page. Leaving home and returning home is the animating force of much of the great corpus of human literature.

If start and finish—motive and teleology—are repeatedly found in system architecture, so also are 'parts and wholes'. All structure, including cognitive structure, involves a relationship between parts and the whole. Every structure has constituents or elements. The millions of media objects on a terabyte hard disk are elements. We have to compose, combine and structure those elements—and find an efficient and elegant relationship between the parts and the whole. But at this point, in doing this, we discover something startling. We began with the distinction that Aristotle made between parts, beginnings, ends, and forms. This is an excellent typology of the structures involved in system building. However, as we begin to build systems, we start to realize that in doing so these distinctions begin to break down. As we will see shortly, they break down as we move across the spectrum of knowledge away from information and toward imagination. In the case of the structuring principle that says that parts or elements have to be composed or combined together in a whole—which is a very sound principle—we find that in fact one of the best ways of doing that is with the aid of what Aristotle called formal causes. We combine parts into brilliant wholes through patterns and shapes—that is through the medium of forms. A book, for instance, is a form. Through the form of the book, we compose words into sentences, sentences into paragraphs, paragraphs into sections, sections into chapters, and chapters into books. Each one of these parts composed into a whole is a form enacted within a larger form. Each form permits or effects a combination of elements.

The form of anything is its shape. The form of the human face gives us an impression of beauty or lack of beauty. That is equally true of an information system or an archive. We are impressed by its elegance or irritated by its lack of the same. Beautiful systems give us great pleasure. The pleasure that we get from virtually 'walking though' an information space—or browsing the shelves of a traditional library—derives from the tacit structures of these spaces. Even when we do not expect a system to arouse in us pleasure, it may do so. Note how computer users will often tell us that 'time disappears' when they are working to screen. This experience is the result of the operation of a formal cause. Formal causes turn our actions into ends-in-themselves. Thus even relentless clicking through web pages or a database can become seductively pleasurable. Routine work of this kind can even become mildly addictive. This is explicable in musical terms. The tap-tap-tapping of the keyboard—and the click-click-clicking from one web page to the next—sets up a rhythm. Rhythms seduce us. They bathe us in pleasures. In the case of rhythm, this is the uncanny pleasure of 'repetition and change'—or 'same and difference'. Rhythms repeat, repeat, then they change on the beat. We don't notice this subtle union when we work. We don't think about it.

All successful systems work best when we are least aware of them. We focus instead on the problems that we have to solve. Building systems should be the exception, not the rule. Good knowledge systems help us solve problems by having in place a facilitating order—a framework of knowledge. Such frameworks operate like the organization of musical tones in melodies, chords, or rhythms. We organize information 'musically' all of the time. This is because we have a large stock of forms that we draw on, usually tacitly, when we build systems. These are forms such as ratio, right proportion, symmetry, and rhythm. Each of these represents key ways in which we can put together the parts of a whole. Crucially such forms give us the capacity to create a union of contrary qualities. In this manner, we create unions of large and small, hard and soft, same and different, up and down, major and minor, light and dark. As in the Dewey Classification system, science coexists with literature, and engineering with philosophy. The best—the most audacious—systems are like Bach's music. They are built on a kind of structural counterpoint. Counterpoint is a contradiction in terms. It is the union of two independent, contrasting melody lines that are harmonically interdependent. A child learns to play a melody, a young adult learns to compose a melody—but all of that is still far removed from the composer who works effortlessly in counterpoint.

IMAGINATION

The systemic aspect of a system invariably comes up against an ultimate limit. This is the limit of creation itself, and the limit of creation is the challenge of the imagination. Every functioning system has to be invented. When we invent things, we do so firstly by adapting what is close-to-hand. Invention is as much a function of what is old as what is new. But the converse is equally true. So that invention is never simply a function of precedent either.

When digital computers were created, there were pre-existing calculating machines. The digital computer also interpolated a pre-existing system distinction. Literally the operating system of a digital computer is built on the distinction between true and false. The bivalent value is hard wired into the logic chip of the digital computer's Central Processing Unit. 'True and false' is a powerful system-building distinction. Any system builder would be foolish to ignore a distinction like this when it is close-to-hand. The architects of the digital computer adapted the terminology of George Boole's logic and its animating distinction between true and false. In Boolean logic, a set of elements can contain only two possible values—'true' and/or 'false'. These two axiomatic values can be given a variety of alternative names. They can be called yes and no, one and zero, on and off—and so on. Digital computing is two-valued. It is built on electrical circuits that can be in either of one of two states—defined by high or low voltage. The voltage of the current cannot be high and low simultaneously. In figurative terms, a Boolean switch cannot signify 'true and false' ('one and zero') *at the same time*. Anyone who has ever experienced the unforgiving nature of a machine spell checker knows what this means. There is no room for fuzziness or ambiguity—or multivalent logic—in the Central Processing Unit of a digital computer.

Yet all system builders who embrace the true-false distinction, which is a very powerful and very useful distinction, will at some stage have some doubts about doing so. Such doubts are inscribed in the very act of system creation or system design. A system may be built on the true-false distinction, but to conceive—or imagine—the distinction in the first instance requires the person doing so to suspend the distinction. The act of imagination occurs in a medium that is constituted by three or more values. Its logic—if that is a word that is applicable to the imagination—is multivalent. Human beings *think*—as opposed to *reason*—in multivalent terms. The principle media of thought are analogy and paradox.[5] Thinking means connecting the unconnected and making the dissimilar similar. This may be summarized thus: Paradox is contradiction. At the core of difference is likeness. Analogy brings disparate things together.

Analogy and paradox create agreement between disagreeing terms. But that is not their only role. For, before we can draw a distinction between two terms, we must first of all draw an analogy between them. Creation is the third term that binds together two contrary terms which it posits in the act of creation. Think for example of the most influential of all classification systems, Carl Linnaeus' taxonomy of living things. Linnaean taxonomy classifies the animal and plant world using social terms like 'domain', 'kingdom', 'family', 'tribe', 'class', and 'legion'. The agreement of terms precedes their distinction. In the act of creation, no distinction is drawn between axiomatic pairs (such as the biological and the social) without an implied analogy or connecting thread between them—no matter how polarized they may appear to be when looked at from certain vantage-points. No axiomatic polarity—no twinning of ultimate truth-values—occurs outside an implied system that binds them together: a priori and in unison. This is the paradox of system creation. The system provides the third term that unites polarities—the 'middle' of the story unites the 'beginning' and the 'end'. The Boolean true-false distinction can be hardwired into a machine. But at some point, out of necessity, the designer of the machine will have had to have thought in terms that suppose not the bivalent logic of George Boole but the multivalent logic of Jan Łukasiewicz and Hans Reichenbach.[6] This is an odd state that all creators find themselves in, from time to time.

Multivalent logic can be thought of as a formalized description of how the imagination or intuition works. The imagination connects the unconnected. This imaginative ability—to make the 'dissimilar similar'—lies at the core of system creation. This is not a universal view. The mathematician George Spencer-Brown, in his influential work *Laws of Form* (1969), in contrast emphasizes the importance of drawing a distinction.[7] A distinction is a line or boundary that separates something from everything else. Drawing a distinction is akin to the act of a demiurge that creates something from the chaos of the void. It is tempting to think of system building in this sense. But system creation in fact rests on a paradox: to draw a distinction the designer must first erase the distinction. The implication of this is that it is not the sharpening of the distinction (say) between 'major and minor' or 'inside and outside' that matters in the act of system creation, but rather the coalescence of 'major and minor' or 'inside and outside'. The medium of creation is an analogical or paradoxical super-positional entity, rather than two distinct counter-positional entities. This is a strange matter, doubtless, but then so is system creation.

In practical settings, it is just as likely to be the amateur as the expert who notices this strange quality. The expert acquires expertise through familiarity with distinctions. The most commonplace distinction is represented by the boundary of the expert's discipline. Knowledge in general is erected on system distinctions. This is very apt. Yet sometimes it is useful to look at things not as the expert does 'from the inside' but as the little boy who viewed the emperor did—'from the outside looking inside'. While the royal tailors are busy dressing the naked king in nothing at all, the little boy declares 'the king has no clothes'. So let us consider the problem of knowledge system building not from the standpoint of the expert, but from the standpoint of the amateur.

Personal computing has led to the wide diffusion of tools to build knowledge and information systems. The technology is inexpensive. Consequently the barriers of entry into the world of knowledge system building are low. This is not to say that there are not other barriers, aside from the cost of technology. Most people with a computer are not going to build a personal knowledge management system from scratch. Rather they are going to make an ad hoc adaptation of structures that are already built into their computer. But even adaptive behavior is a kind of invention. It is the inventiveness of everyday life. It may not lead to the development of a formal system, but it will expose substantial numbers of people incidentally to experiences that formal system builders face in a more exacting fashion. Two experiences are of especial note.

First a system builder must 'choose the distinction' on which to begin to build a knowledge system. Truth and falsity, beginning and end, material and formal cause, part and whole, space and time, arrival and departure—all of these are powerful distinctions on which systems can be raised up. Second a system builder will encounter moments of intuition when these powerful distinctions begin to break down. This is an uncanny, even vertiginous, experience. Personal knowledge management highlights these experiences because it is a 'wild west'. Nobody is around to tell the amateur designer what to do. Most amateur designers will not do very much. Nonetheless the relative openness of the terrain of 'working with your own computer on your own time' means that there are also not the built-in institutional resistances to those surreal moments of having to 'choose the system of distinction' or—even worse—having to cope with the breakdown of all systems of distinction (at least momentarily) as the amateur comes face-to-face with what it really means to 'compose in counterpoint'. Most, sensibly, will give up at such a point because they realize it is too difficult. But, in a way, giving up is better than having been an institutionalized drudge and not having even noticed that there is a counterpoint moment in system design.

The amateur designer will have a modest ambition: to build an archive in which to store the family photos. But often the seemingly simplest things are the most difficult. For the designer begins with a tricky choice: on which distinction shall the design be based? Will it be the distinction between ending and beginning, matter and form, truth and falsity? Let us pursue this further via a thought experiment. We'll begin by supposing that a choice is made. Our amateur designer decides to create an information architecture on an 'historical' principle. The reason is that three generations ago there was a famous family member. The family story circulates around this person. The information architecture is designed to mimic this order of events. The images of this person must have prominence. Perhaps that person's image file is created as the node of family file hierarchy, or the famous predecessor's images are chosen as the start of a slide show, or a flash movie is created with a narration that casts the predecessor as the family icon, or a web site is created with the family icon prominent on the home page and subsidiary pages devoted both to the illustrious figure and to other family members. The point of such design is seemingly clear. Yet it also poses some tricky issues for the designer. For the system assumptions that seemed evident at one point are liable to become more ambiguous later on.

Nagging questions start to arise. Is the architectonic apex of this design—i.e. 'the beginning'—the illustrious ancestor or the present-day family? Will the fixation on the famous predecessor remain, or will focus move to the precursors of the predecessor? The 'historical principle' of organization begins to slide around under these forces. The 'origin' of the system is pushed back or forward in time. In a practical sense the creator will create and delete, move and rearrange files and file structures as the niggling questions emerge. Files that were expected to be large will not fill up. Files that were intended to be subsidiary will become primary. What began as an apparently certain nod to the axiom of 'the beginning' ends in confusion. Is the beginning something that is in the present or the past? Does the beginning have earlier beginnings? If so, does anything really begin or is it already started before it begins? Can something not yet begun—the future—be the beginning of something?

System designers deal with such questions not articulately but intuitively. They get a flickering sense that either their structures are built on firm distinctions—or not. Sometimes in a project firmness gives way. The plunging sensation that follows is not an intimation of chaos. It is rather a graphic apprehension of the paradox of system creation. Systems are built on distinctions. To create a distinction, distinctions must be collapsed. Here we confront the paradox of creation 'in the first instance'. We are looking in on the 'moment of gestation' of a system. That our creator in this case is an amateur is all the more interesting because the naivety of the amateur makes the puzzle of gestation all the more evident. The amateur designer is trying to think structurally about how the images of a family shall be arranged and presented. The outcome of this process is likely to be idiosyncratic. There is no settled formula for how this might be done. It may produce results that no one, not even the creator, is interested in. Yet the questions posed by such experimentalism are questions that system creation always poses—sometimes on infinitely grander scales.

What this discussion points to is the counter-point moment of creation. The child who was sent by Miss Salisbury to the local library is on a quest for certainty. The information desk is a beacon of salvation. The poor kid is faced with a world that is filled with information that sounds mostly unintelligible. The child has the aggravating task of making sense of things, many of which are difficult to make sense of. At ten years old, the youngster understands birth days, but as for Presidents, or America, or States—what are those things? The child needs clarity, in the same way that a child goes through a long phase where the world is divided into 'good children' and 'bad children'. That is necessary in order to learn morality. We all have to learn to distinguish between good and bad. But when children become adults they come to understand that sometimes bad people do good things and sometimes good people do terrible things. In the world of the adult, there is ambiguity, paradox and irony. The great art of the world teaches us this. This is the lesson of comedy and tragedy—and counterpoint. In a parallel sense, an information provider like Wikipedia frequently offers us disambiguation pages—when you searched on 'president' did you mean a political leader or the chief executive officer of a company? When we deal with information, we want clarity. We do not want a long debate about whether the President of the United States is a leader first-and-foremost or an executive figure charged with implementing the laws of the country. Once we are past the childish state of learning, though, we realize that the American President is *both*—and at the same time. We start to grasp that this is a deeply ambivalent office, one that is difficult to get a handle on, let alone occupy. We don't expect a child to grasp that. They first have to understand what a leader is. Then they have to understand what an executor does. Then, if they have the nous, they will figure out that there is an ambiguous state in which someone can 'lead and execute', 'initiate and serve' at the same time.

CONCLUSION

What such ambiguity does is to undermine distinctions between true and false, beginning and end, matter and form. At a certain stage we come to realize that gestation is both a start and an end. It is both past and future combined. What we start to appreciate is that at least some aspects of the world that we inhabit have a super-positional or ‘quantum’ nature. We also start to understand that some parts of our own selves have a ‘quantum’ nature as well. This is especially so when we have to deal with the question of creation.

At the moment of creation, systemic distinctions between true and false, matter and form, ending and beginning collapse. They do not collapse into chaos, though. Quite the contrary—nothing is less chaotic than counterpoint. The distinctions collapse by folding into each other. Through the media of analogy and paradox they enter into each other seamlessly. Axiomatic system distinctions do not give rise to themselves. Taxonomic pairs are not their own unconditional presuppositions. Thus the collapsing of distinctions—or more exactly their super-positioning—is a matter of necessity. The creation of distinctions, and systems based on them, requires that those distinctions are inoperative. All pivotal system distinctions—all axiomatic values—in the moment that they are posited are conditioned by a supervening state. In this state, system distinctions are not distinct but rather exist in the symbiosis of analogy and paradox. In the act of system creation, we see—as William Blake saw—the world in a grain of sand and eternity in an hour.[8]

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Notes

[1] What applies to a book applies equally to film, music, and visual artworks.

[2] The work of David Gelernter, Professor of Computer Science at Yale University, and his company Mirror Worlds Technologies, to produce indexing software that operates on the principle of 'life streams' or electronic life stories is a case in point. See for example Heiss (2003).

[3] Generally causation is distinguishable from magic. The child thinks of the power of their teacher or parent as a magical. Adults can think magically as well. Computer-user neophytes sometimes think that computers 'cause' knowledge. This enchanted or magical belief is soon brought undone, just as child comes to realize that Santa Claus does not exist.

[4] Aristotle, Alpha.3.

[5] An elegant introduction to the topic of analogy and paradox is Hugh Kenner's short book on the work of G.K. Chesterton, *Paradox in Chesterton* (1947). Kenner was a prominent associate of Marshall McLuhan, who was himself an artful master of analogy and paradox. On McLuhan's use of paradox, see the study by McLuhan's student—Theall (2001).

[6] A short account of multi-valued logic is presented in Hans Reichenbach (1951, 225-227). Notably the starting-point of this discussion is the failure of classical two-valued logic to account for antinomies and paradoxes.

[7] The system theory of Niklas Luhmann (1995), for example, emphasises the drawing of the boundary between system and environment, and Spencer-Brown is cited as key support for the system-environment distinction that permeates Luhmann's work. The criticism of this from the standpoint of TPA—the theory of paradox and analogy—is that every system is an environment, and every environment has systemic characteristics.

[8] From Blake's *Auguries of Innocence* (Composition date: ca. 1800-1803)

To see a World in a Grain of Sand
And a Heaven in a Wild Flower,
Hold Infinity in the palm of your hand
And Eternity in an hour. …