Architecture and the Organisation of Knowledge[1]

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Abstract

Knowledge has been structured in many different ways in the course of human history. One way of organising knowledge is the encyclopedia, which reflects the views of Scholasticism, a philosophy that reached its peak at the same time as the Gothic cathedrals of Europe reached theirs. Erwin Panofsky showed that there was an analogy between the two.

Using several other (and quite distinct) examples, the relationship between architecture and the organisation of knowledge is explored in this paper. It is proposed that the reflection of the organisation of knowledge in architecture is not unusual, and a question is posed concerning how a contemporary organisation of knowledge might currently find an analogy in architecture. In particular, the question is put to Charles Francois, asking how his "International Encyclopedia of Systems and Cybernetics" might be structured and what the analogy in architecture would be. This is my 80th birthday present to him.

Introduction

I wrote a review article of Charles Francois' remarkable "International Encyclopaedia of Systems and Cybernetics" (Francois 1997, Glanville 1999). In this article, I talked of the concepts of the encyclopaedia and the dictionary, and of a remarkable work by Erwin Panofsky, "Gothic Architecture and Scholasticism" (Panofsky 1957). To summarise Panofsky's book, I cannot do better than to quote the blurb on the back of my copy:

> It is sometimes thought that art, philosophy, literature develop in hot-house environments, communicating little with each other, including but slightly each other's developments and discoveries. Though this view has often been challenged, the modern tradition, dependent in large measure upon attitudes that emerged in the romantic age, often imagines that genius and inspiration somehow overlap their cultural ancestry and surroundings. Erwin Panofsky, in Gothic Architecture and Scholasticism, indicates with grace and humanistic breadth the profound correlation between the development of Gothic architecture and the growth of scholastic philosophy. He succeeds, as perhaps few others have, in showing how architectural style and structure provide visible and tangible equivalents to the scholastic definitions of the order and form of thought. Gothic Architecture and Scholasticism is therefore not only an important contribution to the history of art, but to the history of ideas as well.

To those interested in cybernetics or systems theory, this description should resonate. It's clearly of a book founded in the approach of cybernetics/systems theory, even though the

[1] The organisation of knowledge is an embodiment of an attitude to knowledge. The attitude itself reflects our knowledge of knowledge. Organsation embodies, therefore, a type of reflexive (meta-)knowledge.

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lecture it was based on was given in 1951, scarcely an eye's blink after Wiener's Cybernetics (1948) and von Bertalanffy's General Systems Theory (1949, 1950). But that's the nature of systems: everything is connected! (It is also, in Panofsky's exposition, the nature of Scholasticism.)

As I reported in my review, there are scholars who argue against Panofsky's understanding of Scholasticism. I am not competent to enter into this argument, nor does it make any difference to the point I wish to make: that we can construct, enjoy (and benefit from) analogies. Panofsky wished to show a zeitgeist which was, in effect, a system of understanding that pervaded the collective mind of the Middle Ages.

I shall return to Panofsky, below, as I develop my theme. For, as my present to Charles Francois to help celebrate his 80th birthday, I want to set him a task. In an attempt to give this offering a dramatic form, I will not reveal the task till I have done the preparatory work, although it may not be hard to guess what the task I have in mind for Charles Francois!

The Name of the Rose

Those who read (or seen) Umberto Eco's "The Name of the Rose" (1980, film 1986) will have an understanding of the world of scholarship in the Middle Ages. In particular, the power of the Librarian is clearly depicted. In the days when all copies of texts were made laboriously by hand, there were what are to us, used as we are to print and, recently, the electronic xerox, incomprehensibly small numbers of copies of texts: and these quasi originals were kept under lock and key in the guardianship of the Librarian. The scholar (in the novel. William of Baskerville) was of necessity an itinerant, who rode to remote monasteries to study particular texts, sometimes for years, and then to move on. There was effectively little chance to go back, later, to check!

In the Middle Ages (The Name of the Rose is set around 1327), Librarians were very influential, very powerful people: the keepers (and gatekeepers) of knowledge. They were censors; they were political, swayed by considerations of what should be promoted; they were publicists; they were the controllers of knowledge. To gain knowledge involved a serious commitment, travelling from site to site and staying there for a long time: a very slow form of browsing.

In this dispersal of manuscripts (sources), knowledge had a spatial form—a physical organisation based in geographical location and religious function. Knowledge (in written form) existed in a sort of network of distribution. Each library had its books, and the scholar moved from site to site, according to the texts he needed to access. There was no one building, but there was a building type: the monastery with the library (where copies were slowly made in the library's scriptorium) and with sanctuaries in which special texts were kept, reserved for the initiates. You can still find echoes of such arrangements: the library at Winchester Cathedral in the UK, for instance, with its original copy of Magna Carta.

So how was knowledge organised in the Middle Ages? In Eco's novel, knowledge is stored in separate, secure "places," guarded over by a special guard (the Librarian) who only admits

appropriate people. These places have within them special (annex) spaces that are even more secure. Each such place is part of a network. Each place has its own collection (of books), which is not necessarily coherent. Those who search after knowledge must travel from place to place as they consult, with the permission of the Librarian, the works relevant to their search. The distances are long and the times are great, and we move slowly and with due decorum, in the Middle Ages.

The similarity of this form of organisation should be transparent nowadays, for it is (as I have hinted) an early (and very slow) version of Berners-Lee's world wide web (1999). In Berners-Lee's conception, strongly influenced by Ted Nelson's Hypertext Project Xanadu and its expression in Literary Machines (see web sites in references), the storage of information is uniquely particularised in a few locations, but can be accessed by opening a window on each, as needed. While the Librarian's role is changed and everything happens much faster, the attitude to visiting the particular sites where knowledge is stored is remarkably similar.

Gothic Architecture and Scholasticism

At about the time that Eco describes in "The Name of the Rose," a philosophical system was coming to its apogee in Europe. This system was called Scholasticism.

I started this piece by referring to Panofsky's beautiful study with the title I have used for this section. Panofsky argued that Scholasticism, in the form of scholastic thinking, was often expressed through an approach to the organisation of knowledge. As far as I can tell, few would dispute this, although, as noted, some experts believe Panofsky's understanding of Scholasticism was flawed.[2]

One aspect of Scholasticism of great significance[3] was the notion of the organisation of knowledge. The scholastic philosophers believed that the way pieces of knowledge fitted together was itself a sort of knowledge. They organised knowledge so that knowing the place of any piece of knowledge in the grand scheme of all knowledge (the totality), its connections to the whole, and, in principle all knowledge—the totality—could be deduced. Every part implied (was in concordance with) every other part (each was manifest in the others). Panofsky quotes thus: "arrangement according to a system of homologous parts and parts of parts." The Latin words used were *summa*, *concordantia* and *manifestatio.* It is no wonder that the scholastics invented the Encyclopaedia[4] in a form in which we now recognise it. I have seen various reports of who invented the scholastic encyclopaedia. The one I like is Bartholomeus Anglicus (but I may be biased since English Bartholomew's family name was Glanville).

[2] I refer to a numvberr of private conversations with members of staff at the University of London's Courtauld Institute. I make no claims to expertise: I am, more than usually, relying on my (possibly inaccurate) understanding of others.

[3] It was scholastic philosophers who argued about the number of angels that could fit on the head of a pin, so to our contemporary minds, not everything in scholastic philosophy is significant.

[4] According to Encyclopaedia Britannica, the word Encyclopaedia has Greek roots: enkyklios paideia, "general education."

The organising principle was, of course, theological. Since truth came through the Christian Revelation, knowledge would be formed according to the (Holy) Trinity under the three categories—being, knowledge and love—reflecting the three personages of the Godhead. The notion of triads, of the Trinity, or organisation in threes, was a central aspect of the scholastic scheme.

I would not like the reader to misunderstand what I am saying. I am summarising a summary that many claim is flawed. I do not claim that my nutshell summary is anything other than the most facile simplification: but it will have to do!

Panofsky argues that the Gothic style (which is divided into periods by art historians that accord chronologically astonishingly well with the periods of development of scholastic thought) embodies, in the Gothic Cathedral, the scholastic approach to the organisation of knowledge He showed how the plan is divided into threes, as are the walls (elevations). He showed how the ribs of the columns and vaults had developed until they ran in trios in such a way that they held everything together, in a sort of *concordantia*. Panofsky demonstrated the translation between the scholastic view of knowledge and the way of assembling the parts of a cathedral such that there were extensive parallels.

And don't forget that, in the Middle Ages, Gothic Cathedrals were not the plain stone they are nowadays: they were brightly painted with patterns and with paintings showing practical applications of knowledge, such as aspects of the agricultural year. They were visual encyclopaedias for the illiterate.

Since Panofsky's Essay, there has been a growing understanding of the cultural milieu, the glue in which different aspects are held together so that they can be understood as being expressions of a zeitgeist. Other critics have pursued the line Panofsky inaugurated—in particular, Christian Norberg Shulz.

The Library of Babel

If the Gothic Cathedral somehow embodied a view of the organisation of knowledge (as I said, in effect, a sort of picture encyclopaedia for the illiterate), Jorge Luis Borges' Library of Babel (Borges 1983) not only embodies a view of the organisation of knowledge in Borges' fabulous world, but it is also filled with the items in which that knowledge is contained—the books.

The world Borges describes consists of books, uniform in appearance, arranged in hexagons which are linked through doors and stairs. The books are made up of combinations of 22 letters, the space, and two punctuation marks, into words and sentences.

The hexagons seem limitless, organised around a central shaft of unfathomable length. No Librarian can cover its extent, and no Librarian has any firm knowledge of that extent, though there are hypotheses concerning the extent of both the hexagons and the books. It is claimed, for instance, that every possible combination of words occurs uniquely and exclusively in the books in the library, yet it is also claimed that some books were destroyed. It is not clear to what the books might refer, should the words be expected to have some sort of meaning.

Borges' Library is all about knowledge and its organisation. It is a fabulous epistemological conundrum. But the architecture is no less of a conundrum. The conundrum is constructed around questions that preoccupy us now in the world we normally live in.

Firstly, there is uncertainty, which is connected to questions of completeness, which is shown in vastness. This relates to both the content of the books and the Librarians' worlds of hexagons—emphasised by the gradual death of the Librarians leaving the hexagons seemingly less and less populated, thus reducing the flow of opinion that constituted the theorising about this world, and therefore the ability to resolve these very questions, whether they are about the knowledge that is in the books or about the building.

Secondly, there is the question of interpretation. What sense should be made of this situation? I have referred to this above, because it is not entirely separate from the first concern, rooted in uncertainty. In the face of uncertainty, there must be interpretation. But the interpretation of uncertainty is more uncertainty, and the uncertainty of interpretation is more interpretation!

Borges produces a building that perfectly, through reflection, contains the organisation of knowledge of his Library of Babel, a library that depends on interpretation and is founded in uncertainty. The position he presents is that we cannot even be sure when we say we have (or haven't) seen something before. This library is a very modern place.

Dewey's Decimal Monastery

Annetta Pedretti, when an architecture student, designed an extraordinary monastery. The monastic order that lived in her monastery were devoted to the curation of knowledge. This they did in a library (echoes of Borges). But in this library, the knowledge (which was contained in books) was organised according to the Dewey Decimal System.

The Dewey Decimal System is based at the Library of Congress in the USA (see web sites in the references), and claims to be the most extensively used classification system in use worldwide. I like it because, in it, cybernetics is classified as a fundamental, with the gloriously Bondian number, 007!

It is based on a categorisation of knowledge to a decimal scale with three orders of magnitude. The initial number (on the left) indicates the fundamental area that the knowledge fits into, the second number the subdivision, the third a secondary subdivision. There is then a decimal point and number to the right of that give precision and detail. Here is an illustration taken from the web site:

600	Technology (Applied sciences)
630	Agriculture and related technologies
636	Animal husbandry
636.7	Dogs
636.8	Cats

This is a hierarchy (or heterarchy) with ten equal top nodes, each branching to ten subnodes, each in turn branching… etc. Of course, not all the nodes will have the same number of members.

What Pedretti did was to take this organisation and to turn it, literally, into a plan and section. A fan shaped building, which also ramped up in section, to accommodate the form of the Dewey trees. The building was, quite literally, an embodiment of the Dewey Decimal System. This is an architecture where the form follows the function quite strictly.

But what is embodied? Not, primarily, the knowledge! It's the way of organising the knowledge that Dewey handles and that Pedretti built. The form reflects the expanding trees of the Dewey hierarchies modified by a rule that proposes there are less volumes as the number gets longer. This is a sort of meta-knowledge, where the knowledge is revealed and connected through reflections on it, which become the knowledge that gives organisation. In this, Dewey Decimal/Pedretti's building find parallels in Panofsky's thesis, although the interpretation is much more "modern"—that is, it is much more connected to the slogan "form follows function" that was such a clarion call for the international modernists, and which still retains traces of power in out thinking, even nowadays.

The Art of Memory

Long before any of these specifically architectural proposals, a relationship between spatial organisation and knowledge had been developed as an aide memoire. The study that brought this to our attention was Frances Yates' "The Art of Memory" (Yates 1966).[5]

The essence of Yates' starting point is the mnemonic devices of classical Rome. One of 5 aspects of Rhetoric, in Cicero's account, according to Yates, is memorising. Roman orators used no notes,[6] and had to declaim their addresses from memory. This involved *disposing* the thoughts in *words*, and then *declaiming* them. *Memory* made declamation possible.

Thus the challenge to find an "art of memory," a way of aiding our memory (which Yates came to argue was finding a new form in the electronic computer). The system developed by the Romans was based on architecture. Orators would remember their speeches by moving in their imagination round rooms in buildings, looking at architectural features and objects placed in the space, to which they would attach the key points in their orations. These peregrinations would remind the orator of the points he wished to make, in sequence. Thus, touring (in the memory) what might be a completely invented piece of architecture, the orator is reminded of and can recreate his speech. (As Yates says, architecture comes from the mind, and returns there: her memory architecture is an early virtual environment.)

[5] Yates gave an abbreviated and directed version of her long study in a lecture she gave at my invitation at the Architectural Association, "Architecture and the Art of Memory." (Yates 1980.)

[6] They didn't have easy access to a material on which they could jot notes easily and cheaply (and which was transportable)—or even to a means of jotting. Stylus on clay tablets was relatively slow and very heavy.

Yates traces the path of the art of memory through virtual extinction in the dark ages to its reinstatement under Charlemagne, but no longer as quite the same thing (she reported that it no longer served rhetoric, but Prudence). In its new form it came pre-formed, as representing a sort of absolute. It was tied into Scholasticism and the encyclopaedic nature of the cathedral (shades of Panofsky). One of its major later exponents, Giordano Bruno, saw it in a manner anticipating Borges' Library. As Yates says in her summarising article (Yates 1980):

> "Bruno…worked out immensely complicated arrangements of images, through which he hoped to obtain the memory and powers of a magus. Through volumes of unintelligible Latin, Bruno was endlessly striving to find the right system…which will magically integrate his memory into the powers of the cosmos…" It generated designs for "Memory Theatres," and traces of it are still found in mnemonic techniques used today

The Roman (original) form of the "Art of Memory" is clearly concerned with the idea of the organisation of knowledge, for that is what disposition means: the placing together of the various parts of an argument (more or less the facts) so that the argument is convincing, powerful and logical. The notion that this is how knowledge should be presented—as logical, convincing and reaching a conclusion—is the basis for how we form knowledge. It proposes argument. But the metaphor of the "Art of Memory" is not just of argument: it is of argument as a walk through spaces with many objects composed into a narrative sequence. Implicit is the idea that other walks (narrative sequences) are possible, and that there are other objects and spaces that may be part of a different walk. The objects may or may not be "physically" grouped, but they are certainly grouped in and by our minds. If we were to replace the word object by the word "place", we would have an image, similar in form though not in the scales of size or time, to that in William of Baskerville's search chronicled in "The Name of the Rose." The intentions are different, and William of Baskerville was not proclaiming an argument nor was he touring through virtual architectures populated by objects that reminded him of his string of thoughts. But the idea of travelling between various locations (objects, places) selected from a much larger collection, in order to explore some topic, is common.[7]

And what is equally true is that the Art of Memory that Frances Yates describes is essentially tied in to Architecture: it proposed architecture as its substance and as providing the container within which it operates. The Art of Yates' Memory is architectural. The action of Yates' Memory is the creation of a particular architecture. And it is through and in this metaphor that knowledge is organised and formed.

Finnish Architecture and Finnish Language

As a student of architecture, I was moved by that common thought of adolescence, that we are controlled by the language we speak.[8] In order to test this, I learnt Finnish—of the

[7] Yates work is very widespanning and detailed, in contrast to the other peices that I have reported here, which are essays. My summary, here, is therefore even more inadequate.

[8] The notion that language controls thought is commonly expressed as the Whorf-Sapir Hypothesis (Whorf 1956). I have heard linguists argue that this is a totally retrograde assertion. To me, all that is wrong is that the relationship between thought and language is seen as unidirectional. It seems to me, now, obvious that

languages found in Europe, the one that is most distant to the Indo-European that most of us speak.

One important characteristic of Finnish is that it is a highly inflected language, with many alternative forms of words that represent case endings, tenses, emphatics etc. What is remarkable, however, is that, in order to attach the inflectional suffixes, the roots of the words are modified. It is as if they are being formed to make a joint so the root and suffix are firmly conjoined Suffixes can't just be butted up against words: Words have to be prepared to receive them, so they "slot" together.

I found that there was something similar that happened in the vernacular architecture—the timber farmhouses that litter the country and that, at the time of my interest, had been little appreciated by Finnish architects. It happened in various ways. Firstly, in the ways that logs are formed to fit together in walls. Secondly, in the way that logs were prepared so that, if a future expansion was needed, it could be done and the addition made integral and structurally coherent. Thirdly, in the use of the courtyard notion around which buildings could be placed, with room for easy addition of new buildings or extensions (in Finland, even if there is only one building it is described as having a courtyard). Fourthly, there was an internal equivalent of the courtyard in the hallway that was also similarly used to permit and support extension. Fifthly in the way openings were make just where needed and emphasis/decoration was added as and where needed)rather than according to some overall, systemic principle of ordering (Glanville 1977.)

There were a number of other characteristics I found in the way the language was put together so that ideas were expressed in a particular manner that seemed to be reflected in the vernacular architecture. It was not the individual instances that, I believed, showed that there was an analogy, that behind both the language and the architecture there was a way of putting together thoughts and ideas that was particularly Finnish.[9] It was the collection, the sum of the evidence, of the cases I presented.

My argument was not that the language shaped the architecture, or even that the architecture shaped the language. As I would explain it now, I was not arguing influence or shaping: I was arguing parallel expressions of a way of thinking, a way of assembling knowledge. The architecture and the language both embodied a way of expanding concepts, which is a way of thinking, and which is a way of expanding knowledge. This mutualism is typical of systems thinking. It also points, very clearly, to my responsibility in creating the analogy. I am not claiming truth in any conventional sense. But I think I am claiming insight.

(in the verncacular) what we think is shaped by what we can say, and what we say is shaped by what we can think. Whorf's original observations came from his work in insurance, where he noticed that the Hopi Indians in North America presented a very small fiire risk to insurers. He concluded this was because they had a very large vocabulary for states of fire which gave them a precision of control (through a finer-grained perception) that we, with few words, did not have. I have heard similar arguments put forward about the terminological precision of both Innuit (Eskimo) and Finnish vocabulary for different forms or ice and snow for which there are no English equivalents.

[9] And which could be used, at that time, to explain the Finns success at Modern Architecture, which I had shown had a programme very similar to that of the Finnish farmstead (Glanville 1977).

A Task for Charles Francois

With a festschrift we celebrate the achievement of a scholar. But just to celebrate risks suggesting that their work is over, their task complete. In the case of Charles Francois, that is clearly not the case. I celebrate, with all the other authors in this journal, the life and work of Charles Francois, but I would not like to be seen as being party to any suggestion that he has reached an end point. For this reason my contribution has aimed to provide a background against which to set a challenge.

And so, at last, we reach that challenge.

I have shown, through six quite different examples reflecting six very different situations and historical themes, how we can see knowledge as embodied in architecture, where the embodiment shows an approach to the organisation of knowledge that is unique to a particular time. Doing this opens up an analogy that has proved valuable in the past (as I trust I have show in this paper) and I believe will prove valuable again nowadays.

I would like to ask Charles Francois, editor and composer of the " International Encyclopaedia of Systems and Cybernetics" the following:

> What form of organisation should we expect knowledge to take nowadays? And how would that appear in a building or between buildings? To put it another way, what would the appropriate spatial arrangement be that would accommodate and reflect this?

In asking this, I don't mean to imply the precedence of one medium over another, or to insist that there is some obligation that knowledge should, for instance, be represented in buildings (or anything else). What I want to get at is that our thinking may find expression in many forms/media, and, if we can find analogies between these forms/media, we may be able to imagine, in the analogy, the thinking that they somehow embody. How we chose to organise knowledge is a reflection on how and what we know: but it also changes that. What is our current attitude to the organisation of knowledge, and what does it mean, to know, at the start of the third millennium?

In the age of the Internet, of Ted Nelson's HyperText (Project Xanadu/Literary Machines) and the Project Gutenberg on-line free world library, we should ask these questions and try to find (spatial) analogies for our answers.[10]

Who better to ask than he who has catalogued the knowledge that represents the summation of the thinking of the second millennium, and creates the springboard into the third?

Don't take this too seriously, however, Charles. It's meant as a thing to play with because it's fun. But perhaps it will also aid learning and exploration.

[10] In fact, at the Royal Melbourne Institute of Technology University, a similar task is being essayed, from an architectural point of view, in the Spatial Information Architecture Laboratory (SIAL).

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Ranulph Glanville is a peripathetic professor holding positions in Australia, Argentina and the UK, and with associations to the Centre for Advanced investigation in the interactive Arts in Wales and the Centre for Innovation and Co-operative Technology in Amsterdam. He advises a number of universities and is on 4 editorial boards and 2 advisory boards. His background is in architecture and music/performance. He has 2 doctorates, the first in cybernetics and the second in human learning. He has lectured on 6 of the 7 continents and is approaching 250 publications. His company, CybernEthics Research, consults in design, cybernetics and innovative thinking. He is involved in developing new paradigms in research reflecting second order cybernetics especially for application in design, and in creating highly abstract electronic music and video art.