

Chapter 7

Building Society, Constructing Knowledge, Weaving the Web: Otlet's Visualizations of a Global Information Society and His Concept of a Universal Civilization

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Weaving the Web

In his 1999 book *Weaving the Web*, Tim Berners-Lee describes the history of the internet and the World Wide Web and explores future developments such as the Semantic Web. Although Berners-Lee is from England and his ideas were mainly developed at CERN in Geneva, like most who write about the internet and the World Wide Web, he positions their origins in post-war America. He begins with the famous article of Vannevar Bush in the *Atlantic Monthly* on a photo-electrical-mechanical device called Memex, for memory extension, which could make and follow 'trails' (links) between documents on microfiche (Bush 1945). He continues with developments in the 1960s with Douglas Englebart's *oNLine system (NLS)* and in the 1970s with Ted Nelson's ideas about hypertext, a term Nelson coined in his *Literary Machines* (Nelson 1992). Berners-Lee ends with his own design for the program he developed at CERN: *Enquire-Within-Upon-Everything*, in which nodes and links become the fundamental components in weaving the web.

Berners-Lee considers the World Wide Web to be primarily a technological development. This development is based on the idea that by connecting computers we can link all the knowledge of the world in one space. In addition to the internet as an infrastructure, he considered that the development of hypertext in software was essential to the creation of the World Wide Web: 'The task left to me was to marry them together' (Berners-Lee 1999, 7).

In this marriage of the internet and hypertext, Berners-Lee considered as crucial the development of protocols that define how information will be sent. This required an overall view about the how the World Wide Web would be organized and used.

¹ The author wishes to thank Boyd Rayward for his useful comments on the content and extensive corrections of this text and the Mundaneum in Mons (Belgium) for the use of the images that illustrate this text.

First of all he believed that the web should be open for everyone: ordinary individuals, scholars, public organizations and companies, noncommercial and commercial. This in return required a consensus on how the World Wide Web should work, without setting norms and rules from above. The organization of this consensus by Berners-Lee and others resulted in the World Wide Web Consortium (W3C). In *Weaving the Web*, he also depicts the future of the World Wide Web. His 'dream of the web', as he calls it, has two parts. In the first part, the web becomes a more powerful means for collaboration between people. He imagines information space as something to which everyone has immediate and intuitive access, not just to browse in, but also to create in. In the second part of his dream, collaborations extend to computers. Machines become capable of analyzing all the data on the web – the content, links and transactions between people and computers – resulting in a 'Semantic Web'.

Finally, Berners-Lee suggests how disseminating and receiving information by means of the World Wide Web might be improved by new forms of graphics. For people to share knowledge, he says, the Web must be a 'universal space'. The adjective is important because the European pioneers, who will be introduced here, also used it frequently. Universality, according to Berners-Lee, must exist along several dimensions. We must be able to interlink all documents, from those expressing half-baked ideas to highly polished works. Another dimension critical to universality is the ability to link local material globally and to cross social boundaries (Berners-Lee 1999, 176–7). By connecting across groups, people in his view also provide organization and consistency to the world. In short, the World Wide Web becomes a tool which helps to organize society.

I have discussed at such length Berners-Lee's *Weaving the Web* in order to compare the US-oriented views of the history and future of the World Wide Web, as its proclaimed inventor expressed them toward the end of the twentieth century, with the ideas explored 50 years or more earlier by Paul Otlet and his colleagues about knowledge organization on a global level. My aim is to try to show how some of the issues that were important in explaining the origin of the World Wide Web and in predicting its future were already being explored at the beginning of the twentieth century by a number of European pioneers, who proposed similar solutions and encountered similar problems to Berners-Lee. European scholars like Patrick Geddes, Paul Otlet, Otto Neurath and Wilhelm Ostwald tried at the end of the nineteenth century and the first half of the twentieth century to find new ways to organize and disseminate knowledge on a global level in order to guarantee world peace and to create a more civilized, universal society. It is important to realize that these thinkers were very different people, with different backgrounds, often with different agendas. Nevertheless they exchanged ideas and in some cases even worked together.

One of the interests they had in common was architecture, especially modernist architecture. They were not only thinking of new means of creating knowledge buildings, but also in the use of architecture as a metaphor for the organization, transformation and globalization of knowledge. This interest in modernist architecture in its material and in its immaterial, metaphorical form can perhaps be illustrated best by looking into the works of Paul Otlet (Rayward 1975; Rayward 1990). Although Otlet published hundreds of articles, his most considered views are contained in

three major publications which came out in the years 1934 and 1935. The *Traité de documentation* deals with the organization of knowledge and anticipates later ideas about the World Wide Web (Otlet 1934). *Le Plan Belgique* reflects Otlet's actions to realize a world city in Belgium (Otlet 1935b). While Otlet first focuses on Brussels, he would later move his attention to Antwerp where the plan of a world city returned in a much diluted form in the plans drawn up for it by Le Corbusier and Hoste. And finally there is *Monde: Essai d'universalisme* (Otlet 1935a), which is a rather esoteric and less accessible work compared to *Le Plan Belgique* and the *Traité de documentation*. Here Otlet expresses his world views and sketches a path toward a 'civitates mundaneum'. Apart from these texts, there are thousands of unpublished images prepared by Otlet in the Archives of the Mundaneum at Mons (Belgium). Those for *The Encyclopedia Universalis Mundaneum* are of particular interest, since Otlet prepared for this visual encyclopedia hundreds of diagrams, schemas and maps expressing his views on knowledge organization, on political and administrative actions and on a universal society.² Frequently in these images he uses modernist architecture as a metaphor to visualize his information society.

Architecture of Knowledge (Otlet and Le Corbusier)

In his *Traité de documentation* Paul Otlet described the book in terms of architecture: 'The character of the book, being an "architecture of ideas", of intellectual data, requires the consideration of the enormous revolution architecture itself accomplished in our days' (Otlet 1934, 100). Le Corbusier, on the other hand, formulated the naked fact in architecture as the materialization of an idea (Le Corbusier 1923 [ed. 1976], 28). It may well be that Otlet had the theories of the famous architect in mind when he referred in the *Traité de documentation* to the changing character of the book in relation to the contemporary revolution in architecture. If we compare the terms Otlet used to describe the organization of knowledge, there is a striking similarity with the vocabulary of Le Corbusier in his most important manifesto, *Vers une architecture* (translated into English with the title *Towards a New Architecture*), and in his work on town planning, *Urbanisme* (Le Corbusier 1923; Le Corbusier 1924). Both men frequently use similar terms such as plan, analysis, classification, abstraction, standardization and synthesis.

The definitions used by Le Corbusier and Otlet are not synonymous, but it is important to note that these terms – plan, analysis, classification, abstraction, standardization and synthesis – in their view not only were needed to bring conceptual order into the disciplines of architecture and knowledge organization, but can also be considered to be instruments to be used to order human actions and to create a better society. The role of architecture in organizing knowledge can perhaps best explained by Otlet's concept of a Mundaneum. On the one hand the Mundaneum was a project for a real building in which would be combined a World Library, World Museum, World Archive, World University and a World Headquarters for

² Mons, Mundaneum, EUM. For the numeration of the documents I have followed the inventory of Benoît Leclercq, *Encyclopedia Universalis Mundaneum ISAD (G)* August 2005; see further <<http://www.mundaneum.be/index.asp?ID=411>> [accessed 11 September 2006].

International Organizations. On the other hand the Mundaneum was used as an architectural metaphor of knowledge organization and dissemination on a global level. In *Monde: Essai d'universalisme* of 1935, Otlet wrote: The Mundaneum is 'an idea, an institution, a method, a material body of work, a building and a network' (Otlet 1935, 448-52).

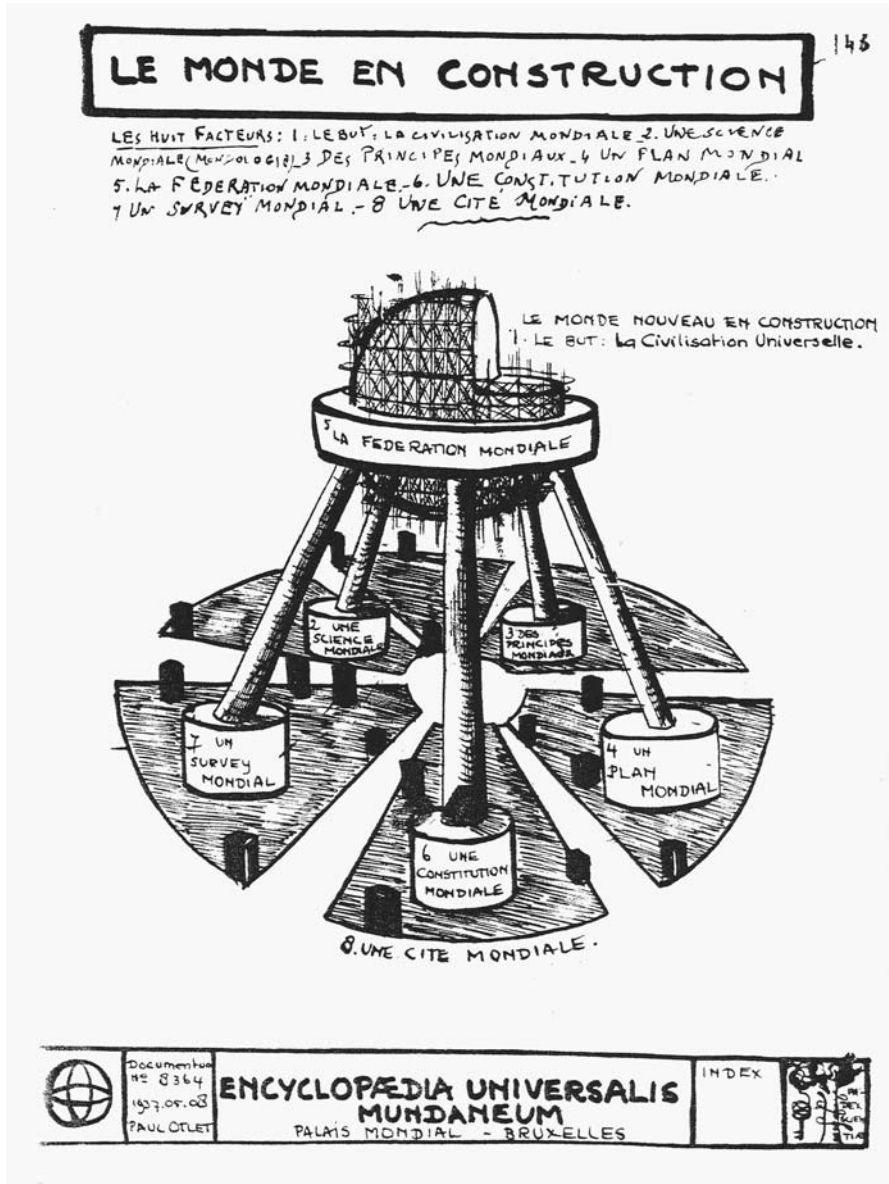


Figure 7.1 Otlet, *Le Construction du Monde*. EUM 9-81 © Mundaneum

In its material form the Mundaneum can be visualized in the famous design of Le Corbusier for the actual structure that Otlet had proposed to be situated on the shore of Lake Geneva in Switzerland (Courtiau 1987; Courtiau 2003; Fueg 2003).³ In an immaterial sense, however, the Mundaneum becomes an architectural metaphor for a modern, universal civilization.

An illustration (see Figure 7.1) intended for Otlet's unfinished *Encyclopedia Universalis Mundaneum*, 'Le Monde en Construction' of 1937, shows an incomplete world under construction, held together by a 'world federation' and supported by immaterial pillars of 'world knowledge', 'world principles', 'a world plan', 'a world constitution' and 'a world survey' all rising from the material object of a 'world city'.⁴

The architectural metaphor shows a well organized, planned construction of universal civilization. The survey (research into economic, demographic and other relevant statistical data regarding regional and urban areas) was a common instrument in modernist town planning and architecture of which Otlet was aware, not least through having worked with Le Corbusier on the plans for a world city.

However, Otlet understood the limits of planning. He was aware of the unpredictable. Once again he is referring to Le Corbusier when he brings up this matter in an appendix of *Monde: La Prévision sociologique mondiale*:

If there is prediction based on natural determinism and a human plan, there is also the unforeseen in nature and man [...] There are continuous clashes, precipitated and accelerated by modern events, turbulence, pushed by life that inventors manifest to us through their media (Le Corbusier) (Otlet 1935, 418).

For Otlet it was important to leave space for transformation and modification in response to the unforeseen and unpredictable. As we will see, the metaphors used by modernist architects would inspire Otlet in his discussion of planning and controlling the transformation of knowledge.

Transformation of Knowledge

Knowledge is the genesis of things. Their genetics form the basis of prediction. From the past one can deduce part of the future, provided that one allows intervening factors of transformation and modification (Otlet 1935, 418).

Otlet's plea in his *Traité de documentation*, for a modernization of the book that will be comparable to the modernization of architecture, can be seen in this light. Fundamental to the creation of the new form of the book that Otlet foresees is what he calls the Monographic Principle. This principle, perhaps based on Ostwald's 'Monographieprinzip' (Hapke 1999, 142–3), holds that texts should be dissected into their basic elements and, together with different sources of information such as formulas, charts, images, schemas, etc., can then be reassembled in new kinds

3 For an illustration of Le Corbusier's design see Pierre Chabard's chapter below.

4 Mons, Mundaneum, EUM – Palais Mondial Bruxelles, boîte 9 farde 81. Documentation No. 8364 – 1937.05.08 I have translated 'world science' as 'world knowledge'.

of books, encyclopedias, repertoires; in new kinds of demonstration and teaching materials; and in transformed libraries and museums, which Otlet called ‘offices of documentation’ (Rayward 1990, 9). It is possible to see Otlet’s use of the Monographic Principle in the organization of knowledge as comparable to the use of hyperlinks on the World Wide Web (Rayward 1994).

Dissecting and recomposing books and other sources of information would not only constitute a revolutionary reorganization, but would also result in a transformation and modification of information. On the one hand for Otlet there is a search for ‘new’ book forms, like visual encyclopedias or atlases; on the other hand there is an exploration of the technical possibilities for retrieving, organizing and disseminating information by means of other media such as film (especially microfilm), radio and that most recent of inventions, television (Levie 2003). These new media would become ever more important in the future and in his view might perhaps even replace the book. Otlet called these new media ‘substitutes’ for the book [*les Substituts du Livre*].

In considering new book forms as well those inventions that would transform and substitute for the book, Otlet is convinced that images would gain importance over text, and that this would have important implications not only for knowledge organization in particular, but also for society in general. These ideas require a closer examination to which the rest of this chapter is devoted.

Visualizations of Knowledge Transformation

The Monographic Principle, the application of which requires splitting and recombining parts of documents in a standardized way, leads to new combinations of ideas that constitute new information. The system that structures this process of ordering and reordering is the *Classification decimale universelle* (UDC). Otlet uses the architectural metaphor of the factory to visualize this process.

In an image of a knowledge factory entitled ‘*Laboratorium Mundaneum*’, he depicts the different sources of information (books, journals, periodicals, statistics, etc.) as raw material, being pulverized and sifted by an enormous grinder (see Figure 7.2). The result, according to a note on the drawing, is ‘the purest matter useful for civilization extracted from mountains of documents’.⁵ The products (‘elements’) of this mechanical process of extracting documents are sorted in an orderly way into the different wagons of knowledge-classes, which are pulled by the locomotive of the UDC, and by these means this essential knowledge is disseminated to the outer world.

However, as well as being assembled and coordinated in the *Classification decimale universelle* (UDC), the information elements revealed by the monographic principle are completed, reclassified and simplified in what Otlet calls a ‘*nouveau tableau synthétique*’, a new synthetic table or chart, as in a statistical table or medical chart.

5 Mons, Mundaneum, EUM III, 2.3 Varia, boite 10 farde 88 Varia – Laboratorium Mundaneum Document 8694.

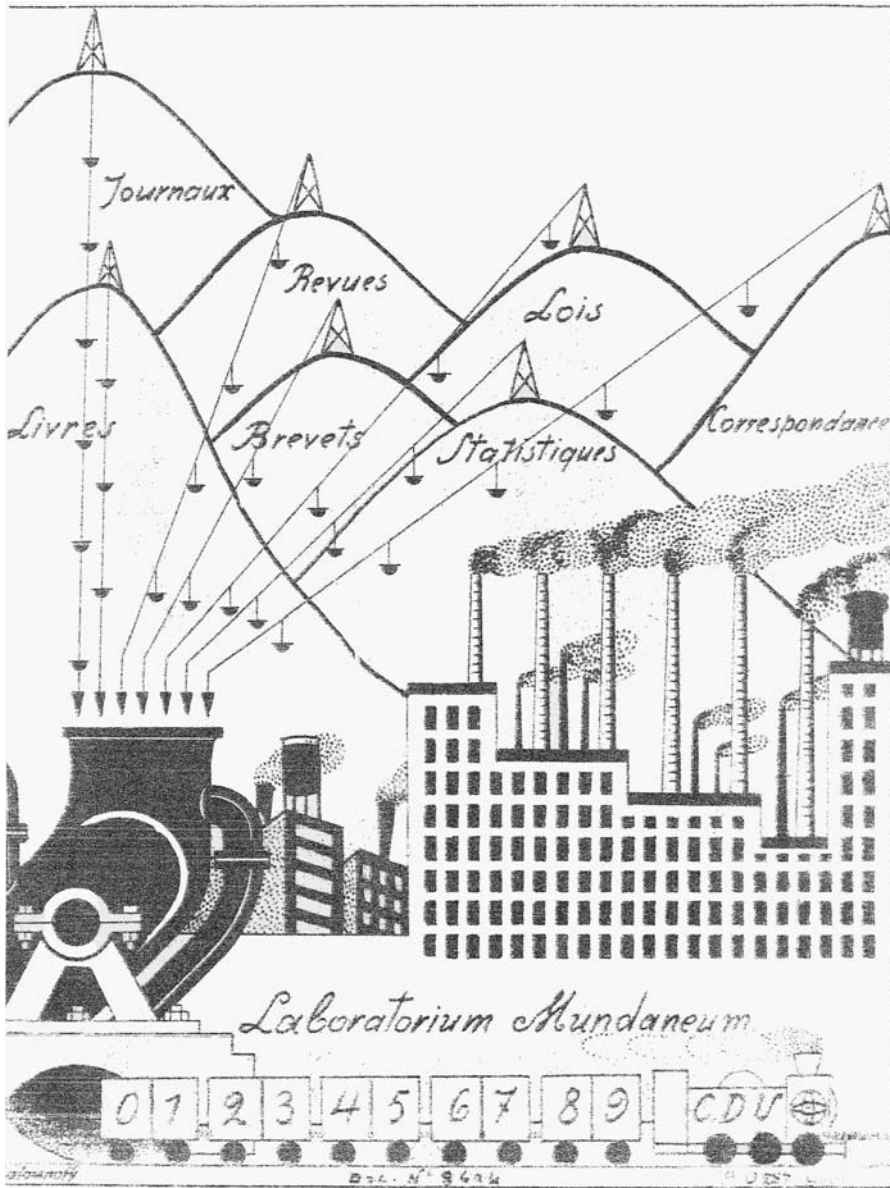


Figure 7.2 Otlet, *Laboratorium Mundaneum*. EUM 10-88. © Mundaneum

Images, schemas and diagrams not only were a concise, informative way of presenting accumulations of data; for Otlet they could be thought of as constituting the grammar of a universal language for the exchange of knowledge. In *Le livre dans les sciences* (1913) Otlet describes the book as all forms in which ‘thought’ and ‘ideas’ are registered, including journals, photographs, diagrams and schemas,

phonograph disks, films, and so on. 'Each author should be considered as co-operating in one great universal book, dedicated to the integral presentation of knowledge and intellectually formed by an ensemble of the different publications' (Otlet 1913, 384). *Le Livre universel de la Science* [The Universal Book of Knowledge], as he called it, will become the totality of all published works. From individual books, collective books are created. Instead of an encyclopedia limited and determined by a certain date, The Universal Book of Knowledge would be 'an unlimited work, always up to date, always growing, concentrating, absorbing, synthesizing, systematizing every intellectual product from the moment it is born' (Otlet 1913, 385).

In 1912 Otlet and the Scottish sociologist and town planner Patrick Geddes proposed the preparation of an *Encyclopedia Synthetica Schematica* by 'an international group of collaborating scientists' under their direction.⁶ They proposed that the encyclopedic synthesis being proposed for this great work would be presented in the form of charts and diagrams. These they believed would help to solve the problem of how to present effectively enormous accumulations of data, and thus would give the schema and the diagram a more important place in the exposition of scientific results. The schemas and the diagrams could become a 'graphical language that would permit the expression of general or abstract ideas more completely and more definitely'. To achieve that goal the schemas and diagrams themselves should become objects of study that focused on the properties necessary for them 'to represent schematically different notions and points of view of different scientific questions'.⁷ They proposed that *The Encyclopedia Synthetica Schematica* would appear in the form of a series of sheets. Each sheet would indicate the name of the author, the general scientific subject dealt with, and the most appropriate image used for the representation of the idea or problem in question. In the beginning, the different issues (each dedicated to a particular subject) would be directed to a small group of collaborators, but after a period of free exchange in this form it would be possible to present the general and less preliminary results to a larger public.

This encyclopedia went no further at the time than its printed title page and a short introductory note of three pages. The idea had to wait another 15 years for further development. In 1927 the Bureau International d'Education [the International Bureau of Education] created a 'Commission Internationale de Matériel Didactique' [The International Committee for Instructional Material] in liaison with Otlet's Institutes of the Palais Mondial, and this gave a new impetus to the idea (Rayward 1975, 240). At a meeting of the committee in Brussels on 6 April 1928 it was decided to concentrate their first efforts of cooperation around the development of an *Atlas de la civilisation universelle*. Otlet presented his ideas about this in a preliminary

6 Mons, Mundaneum, EUM I, Généralités, 4 Orbis Encyclopedia Synthetica, boîte 1 farde 4. Printed title page *Encyclopedia Synthetica Schematica* with the following subtitle: 'Matériaux pour l'élaboration d'une méthode et d'une synthèse à l'aide de schemas et de diagrammes, publiés par une collaboration interscientifique et international sous la direction de Patrick Geddes et Paul Otlet'.

7 Mons, Mundaneum, EUM, Généralités, 4 Orbis Encyclopedia Synthetica, boîte I farde 4. *Encyclopedia Synthetica Schematica*, an introductory note in typescript of 17 September 1912, p. 1.

report. This report formed the basis of a publication with Anne Oderfeld in which they sketched an outline of the concept, organization and method of the *Atlas de la civilisation universelle* (Otlet and Oderfeld 1929). In the atlas, the territory, people and culture of each country would be represented in ‘*tableaux synthétiques*’ or summary tables presenting the most important data ‘of its civilization’. This systematic way of synthesizing and visualizing civilization in the atlas was intended to support the teaching of the principles of international peace: ‘Peace is not only a feeling but a commitment to a higher form of organization in which, completely secure, the vital forces of nations can flourish’ (Otlet and Oderfeld 1929, 2).

The images of the atlas were to be created on separate sheets of engravings, maps, graphs etc. that could be combined in various ways. The replaceable sheets were to be in a standard format (21.5 x 27.5 cm) and would give an indication of the subject and the time and place of the events depicted, to be summed up in a UDC classification number. However, apart from the requirements that each sheet be separate and of a standard format, Otlet and Oderfeld were wary of superimposing a rigid organizational structure on the atlas. Each teacher or pupil was to be free to compose collections from the sheets related one to another as they wished. Moreover, the *Atlas de la civilisation universelle* would not stand on its own but would have connections with other ‘ensembles’. These were listed as: (1) General Documentation, (2) World Museum, (3) Universal Atlas (*Encyclopedia Universalis*) associated with the Mundaneum in Brussels and (4) Museums of Civilizations in various countries.

Although there was a second meeting of the International Committee for Instructional Materials in July 1929 in Geneva, in which Otto Neurath also participated, the *Atlas de la civilisation universelle* progressed very slowly. The idea would return, however, in yet a different form when Otlet and Neurath tried to work together.⁸ It was Otlet’s concept of a World Museum that first attracted Neurath, who in 1925 had founded the *Gesellschafts und Wirtschaftsmuseum* [Museum of Society and Economy] in Vienna. In July 1929 during a meeting in Geneva of the Union of International Associations, which followed the meeting of the International Committee on Instructional Materials, Otlet and Neurath entered into an agreement to create an *Atlas of World Culture* (Vossoughian 2003).⁹ The idea was that copies of this atlas would draw on the material of the World Museum (in Otlet’s view already part of the Mundaneum in Brussels) and disseminate it to as many regional museums throughout the world as possible. While the Museum of Society and Economy was to look after general design issues, the organization of exhibitions and the production of the Atlas itself, the Mundaneum was to assemble, classify and organize each project on a macro level. As early as December 1929, however, Otlet and Neurath were in a conflict about Neurath’s proposal to split the *Nuovo Orbis Pictus* into the Orbis Institute in Vienna, which was charged with the creation of the World Atlas of

⁸ Mons, Mundaneum. EUM I, Généralités, 4 Orbis Encyclopedia Synthetica, boîte 1 farde 4, Orbis and APM OP 384 Correspondance Neurath.

⁹ The agreement was known as *Nuovo Orbis Pictus*, the New Orbis Pictus, a reference to the influential *Orbis Pictus*, the World in Pictures, by the seventeenth-century Bohemian scholar and educator Comenius.

Civilization and in which Neurath continued his work in pictorial statistics, and the Mundaneum, which under the supervision of Otlet would build regional museums and exhibitions (Vossoughian 2003, 91).

Although Otlet and Neurath remained in contact for a number of years, the working relationship seemed to have cooled down at this point.¹⁰ In 1930 Otlet received from Vienna an atlas, *Gesellschaft und Wirtschaft* [Society and Economy], consisting of 100 separate charts and 30 text tables that reflected Neurath's research in pictorial form.¹¹ In the correspondence between Otlet and Neurath in the Mundaneum in Mons is a comment by Otlet dated 15 February 1930 about these images. Although Otlet notes that this is an '*atlas magnifique*', he was not completely satisfied with what the images revealed. He wanted the atlas to extend its economic and social focus to '*la pensée*' (thought, knowledge) in general, including all countries. The atlas should be, he believed, universal and should include different points of view. Its subject matter should deal with all knowledge, and in form it should combine images and information resources of many different kinds: statistics, schemas, photographs. If Neurath would only bring these documents together in a way that showed the fundamental unity of the whole world in all its great variety, these images could in Otlet's view form the first volume of the projected *Atlas Encyclopédique Universel* (*l'Atlas de la Civilisation*).¹²

Otlet probably kept his comment to himself, or at least no direct action followed, since Neurath asked in 1932: 'When will we begin finally work on the Atlas for Civilisation' (Vossoughian 2003, 92). The opportunity came in 1934 when, fleeing the social and political unrest marking the rise of fascist, anti-Semitic Austria, Neurath left Vienna and reestablished himself in The Hague, where he opened the *International Foundation for Visual Education (by the Neurath Method)*. This foundation was dedicated to the development of his international pictorial language 'ISOTYPE' (International System of Typographic Picture Education). Using this 'language', Neurath organized exhibitions in department stores in which were presented visual statistics on economic and societal issues as well as on cultural subjects, such as the work of the Dutch painter Rembrandt (*Rondom Rembrandt* 1938).

Otlet, fearing that the Belgian government intended to close down his Mundaneum in Brussels (as indeed it did in 1934), suggested to Neurath that they continue their work in a Mundaneum in The Hague. Neurath replied to Otlet's overture that he deplored the developments in Brussels, but advised him to concentrate on trying to relocate his institutes to Geneva, since in The Netherlands there would not be room to create adequate displays of their visual education methods; certainly there would

10 Mons, Mundaneum. EUM I, Généralités, 4 Orbis Encyclopedia Synthetica, boîte 1 farde 4, Orbis contains much correspondence between Otlet and Neurath in the years 1929 and 1930 regarding the *Novus Orbis Pictus*.

11 *Gesellschaft und Wirtschaft* 1930. For an analysis of this work see Nikolow 2005 and her chapter in this volume.

12 Mons, Mundaneum, APM OP 384 – Correspondance Neurath. Note No. 6226, 1930.II.15. Note of Otlet regarding Neurath's *Gesellschaft und Wirtschaft Bildstatistisches Elementarwerk*.

not be room enough for a complete Museum.¹³ However, Otlet, whose second wife was a wealthy Dutch woman, did not give up and was able to put Neurath in contact with a number of rich and influential people in The Hague. Apparently Neurath was impressed with the possibilities that this opened up. Within a week, the legend on the letterhead he was using in The Hague changed from ‘Direktor, Gesellschafts- und Wirtschaftsmuseum in Wien’ into ‘Director, Mundaneum Institute, The Hague’.¹⁴ Neurath now started to work on finding exhibition rooms for a local Mundaneum Institute. He wrote Otlet to say that he was thinking in terms of 1,000 square meters of space (twice as much as he had in Vienna) for exhibition and storage rooms to house the collections and library of the Mundaneum.¹⁵

In a letter of 29 August 1934, Otlet gave a first and typical reaction to Neurath’s initiative, saying that they should consider 1,000 cubic meters rather than 1,000 square meters. But of course Otlet was already thinking on a much bigger scale. Independently of Neurath in 1937, Otlet tried to convince the City of The Hague to create a Mundaneum in ‘Zorgvliet’, the actual work palace of the Dutch Prime Minister, conveniently situated between the Peace Palace (given to The Hague by Andrew Carnegie in 1903) and the Municipal Museum.¹⁶ However, it was not just a difference in opinion about the scale of the institution needed for exhibitions that hindered the cooperation between the two men and the production of the *Atlas de la civilisation universelle* [*The Atlas of Universal Civilization*]. Neurath and Otlet had developed different views about the function of visualizations.

Neurath and Otlet both believed in their own ways in the purifying power of images. Neurath’s theory of the ‘unity of scientific concepts’ was based on the reduction of all scientific concepts to a universal language of observation. Otlet believed that chaotic reality could be abstracted in a scientific process by means of images that reflected clearly the relationship between the parts and the whole (see Figure 7.3).¹⁷

However, Otlet believed that a classification system was necessary to hold the ‘facts’ in various visual forms together in a hierarchical order. Neurath did not share this belief in an apparently absolute system involving a hierarchy of concepts. Rather, he embraced the idea of a ‘provisional assemblage of knowledge’ that was open and in continual mutation (Chapel 1996, 174). Whereas Neurath concentrated on the pictorial language itself as part of visual education, Otlet was more interested in images that were inclusive and illustrated his world views best. In his comment on

13 Mons, Mundaneum, APM OP 384 – Correspondance Neurath, Letter Otto Neurath to Paul Otlet, The Hague, s.a. [1934].

14 Mons, Mundaneum, APM OP 384 – Correspondance Neurath, Letter Otto Neurath to Paul Otlet, The Hague 30 July 1934.

15 Mons, Mundaneum, APM OP 384 – Correspondance Neurath, Letter Otto Neurath to Paul Otlet, The Hague, 18 August 1934.

16 Mons, Mundaneum, APM OP 384 – Correspondance Neurath, [COPIE] Letter Paul Otlet to Otto Neurath, Honfleur (Normandy), 29 August 1934 and Mundaneum Mons, EUM III Mundaneum 2 Mundaneum E Natioeneum 1 Neerlandium, boite 14 farde 113 – [s.l. s.a. [Otlet], April 1937.

17 Mons, Mundaneum, EUM II Thèmes 1 Méthodologie 2 système d’organisation Mundaneum EUM boite 2 farde 8.



Figure 7.3 Otllet, diagrams purifying chaotic reality. EUM 2-8.
© Mundaneum

Neurath's atlas, Otllet wrote: 'However the preparation for the [Atlas of Civilization] involves more than teaching, one begins to hope for an Atlas that is universal.'¹⁸

This shift in Otllet's view of the Atlas of Civilization, from an instructional instrument in a strict sense to an atlas that would illustrate his universalistic world views, becomes apparent in 1936 in a project that he called the *Atlas Mundaneum* (*Encyclopaedia Universalis Mundaneum*). This started off as an illustration of his book *Monde*, and his notes for the atlas follow the exact captions of the chapters in the book, albeit sometimes in a different order.¹⁹ However, this Atlas would soon lose

¹⁸ Mons, Mundaneum, APM OP 384 – Correspondance Neurath. Note No. 6226, 1930. II.15.

¹⁹ Mons, Mundaneum, EUM, Généralités, 2 Explications et méthodes, boîte 1 farde 2: Monde. Mundus per Mundaneum. Atlas Universalis. Pars: Principa et Fundamenta [001] Illustration de l'ouvrage 'Monde' par Paul OTLET Bruxelles 1935 (Essai d'universalisme – connaissance du Monde – Sentiment, du Monde – Action organisée et Plan du Monde). Notes pour l'explication des tableaux. However the preparation of such summary tables goes back to 1910.

its original character. From a brief exploration of how *Monde* could be illustrated best, Otlet would start an enormous visualization project of his world views in atlas form on which he would work until the end of his life: *The Encyclopedia Universalis Mundaneum*.

A further analysis of *The Encyclopedia Universalis Mundaneum* is important for various reasons. First it is a proof of concept of how all Otlet's ideas on the organization, visualization and dissemination of knowledge, explored until then in a variety of publications and systematized in *Traité de documentation* and *Monde*, might subsequently be instantiated. It is also an attempt to provide a visualization of his views on a universal society, views which until then had been expressed in the sometimes cryptic texts of *Monde*. But *The Encyclopedia Universalis Mundaneum* has another more particular interest in that it gives us an insight into the development and transformation that Otlet's ideas underwent in the period after the publication of the *Traité de documentation* and *Monde* until his death in 1944. Not only does it provide the most complete synthesis he was to achieve of his work in visual form, but also it reveals the emergence of new ideas stimulated in part by changes in technical possibilities presented by new media.

The Encyclopedia Universalis Mundaneum visualizes, step by step, the documentation process from the initial formation of an idea to the point at which documents, scrutinized and approved by peers, are classified and incorporated into the body of public knowledge. It is possible to follow Otlet's thinking about this process from rough sketches, drawings with handwritten notes, calques with typed notes, to the final visualizations in a strictly standardized chart format. An aspect of the requirements of such charts was the inclusion of spaces for standard document identification. These standardized fields on the charts are similar to headers and footers in word-processing documents and contain what we would call metadata, such as the title of the document, the producer of the document, classification numbers, date of production, etc.

Studying *The Encyclopedia Universalis Mundaneum* is also useful since many of those in contact with Otlet were interested in his views on visualization. Scholars such as Geddes and Neurath were attracted by these views as expressed in his written texts, but in making such visual documents as the encyclopedia Otlet revealed discrepancies between theory and practice, as we already noticed in the production of the *Atlas de la civilisation*. Finally, *The Encyclopedia Universalis Mundaneum* is interesting in allowing us to compare his ideas about knowledge organization and dissemination with what now exists in the technology and its affordances in the modern 'information society'. But for such comparisons to be effective, some understanding is necessary of Otlet's ideas about substitutes for the book and about networks.

Substitutes for the Book

Parallel to the development of new book forms, Otlet was exploring the possibility of something that might substitute for the book, which in his view was nothing more than a container of ideas that might be conveyed equally well in a more efficient way. As early as 1901 he remarked that the book was tending toward a photographic form,

not just in the illustration of text, but as text itself (Otlet 1901; Rayward 1990, 87). This idea was worked out further in the publication with Robert Goldschmidt, *Sur une forme nouvelle du livre: Le livre microphotographique* (Otlet and Goldschmidt 1906). In the same year during a conference at Marseille, where this paper was read, the members of the meeting adopted a resolution that Goldschmidt together with the International Institute of Bibliography should find a practical procedure for creating and reading documents (both text and illustration) according to the methods of microphotography and cinematography. The statistical machines of Goldberg and the Memex of Vannevar Bush were later to put these ideas into practice independently (Buckland 1992 and 2006).

Otlet's ideas about substitutes for the book were worked out further in the lecture *La fonction et les transformations du Livre* on 14 November 1908 in the Maison du Livre. Otlet stated that the most important transformations of the book would not take place in its conventional form but in the appearance of substitutes for it, '*les substituts du Livre*' (Otlet 1909, 28). The content could easily be expressed by other means than the book. Otlet acknowledged that the telephone was an important means to transmit sound, and the gramophone an important means for storing and reproducing sound, including words, but the technological development that as early as 1908 he considered would effect the most radical transformation of the book was wireless: '[...] the principle of transmission at a distance, without limitations of place and direction – of waves that can translate sounds or images indiscriminately' (Otlet 1909, 29). In the same lecture Otlet spoke of 'A universal network that would permit the dissemination of knowledge without limitation' (Otlet 1909, 29).

The idea of the world-wide dissemination of knowledge in the form of sound and image by wireless that Otlet had expressed in 1908 would return in his discussion of the mechanical, collective brain, '*Le Cerveau mécanique*', that he envisioned in his *Traité de documentation* (1934), and which can be compared to the modern computer. He proposed seven functions for such a device, which would consist of a collection of machines that simultaneously or sequentially could perform the following operations: (1) transform sound into writing; (2) reproduce this writing into as many copies as was needed; (3) create documents in such a way that each item of information had its own identity as part of a collection and could be retrieved as necessary; (4) assign classification numbers to each item of information, with perforations of the documents corresponding to these index numbers; (5) automatically classify and file documents; (6) automatically retrieve documents for consultation and present them either direct to the enquirer or via a machine enabling written additions to be made to them; and (7) mechanically manipulate at will all the listed items of information in order to obtain new combinations of facts, relationships of ideas and new operations to be carried out with the help of numbers (Otlet 1934, 391).²⁰

Otlet understood that his 'mechanical brain' did not yet exist, so one can imagine his surprise when a 'cerveau mécanique' was presented in 1937 at the World Exhibition at Paris. He immediately contacted its maker, Georges Artsrouni, who had

20 English translation quoted from Rayward 1990, 1.

received the patent for this invention as early as 1933.²¹ Artsrouni's invention was basically a mechanical translator in the form of a typewriter (Corbé 1960; Dumas 1965; Hutchins 2004).²² However, it could be used as an automatic telephone book, a train timetable, a city guide, a dictionary in all languages, a table of logarithms and as an instrument to get information about commercial telegraph codes. It had a memory for dictionary entries, a keyboard for entering words, a search mechanism and a means of displaying results in series of windows on the 'clavier' or keyboard. Reading the parts that Otlet underlined in Artsrouni's letters to him, one can see that he was especially interested in the idea that these various kinds of data could be represented directly and automatically on the cylinder of the typewriter. But despite Otlet's interest in this forerunner of computer-based mechanical translation systems and of what are now being called 'startpages', which serve as portals to practical information, we will see from his visualizations that the 'cerveau mécanique' he had in mind was clearly more than that. It was to be a 'collective brain' for organizing and disseminating knowledge on a world wide basis.²³

Internationalization/Globalization of Knowledge (Armchair Travelers)

Otlet's ideas about the world-wide dissemination of knowledge initially took institutionalized form: the International Institute of Bibliography, the Union of International Associations, the slowly elaborated component of the Mundaneum or Palais Mondial physically housed in a wing of the Palais du Cinquantenaire in Brussels (Rayward 1975). These buildings with their international collections and international organizations to be globally effective had to be linked to create '*le réseau*' (a network). This network would link the world's citizens in a hierarchical structure from a personal office, via many different forms of Mundaneum (from small to large) to the World City, which would be an architectural reality (see Figure 7.4).²⁴

Otlet kept on piecing together ideas for such institutionalized forms for the rest of his life; however, as indicated above, he very early on had speculated about other more immaterial ways that knowledge might be distributed globally.

In his *Traité de documentation* he suggested the use of the telephone, telephotography and radio-telephotography for communication among scientists dispersed in conferences all over the world (Otlet 1934, 236–7). In *The Encyclopedia Universalis Mundaneum* he visualized this teleconferencing idea in combination with other media such as the gramophone, film, radio and television. This multimedia

21 Mons Mundaneum contains a document in which Artsrouni describes 'Le cerveau mécanique'. On the heading of the typescript we read Exposition Internationale Paris 37 – Classe 49 bis Mécanographie – INV 52-14.

22 See also Hutchins's website on machine translation for a vast bibliography: <<http://ourworld.compuserve.com/homepages/WJHutchins/>>. I would like to thank Michael Buckland for his comments and for sending additional information on the 'Cerveau mécanique' of Georges Artsrouni.

23 This collective brain is described in Otlet 1934, 391.

24 Mons Mundaneum, EUM II Thèmes 2 Documentation A. Atlas 1 Version finale, boîte 3 farde 14 document 8504. See further, Rayward 2003, 6–7.

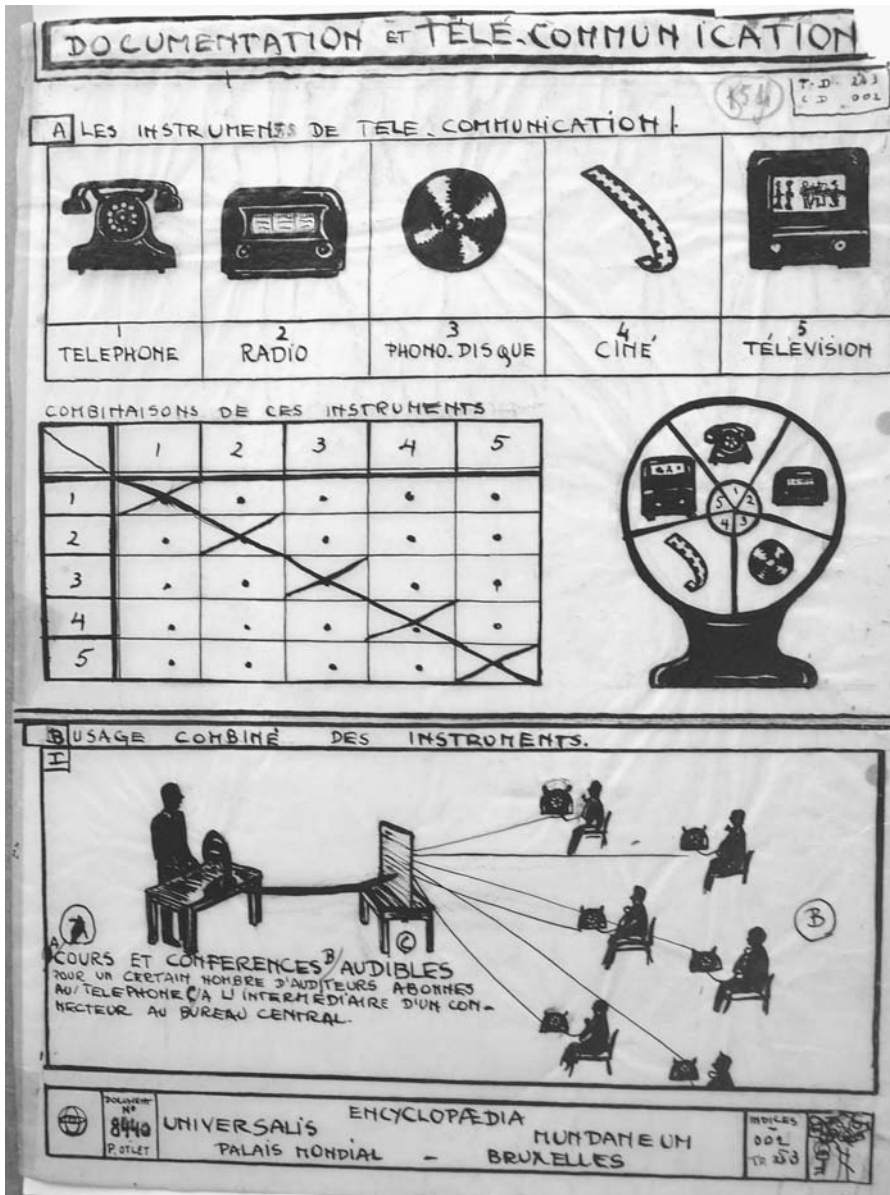


Figure 7.5 Otlet, telecommunication with multimedia. EUM 3-14.
 © Mundaneum

However, in another image Otlet visualized a combination of a wired and a wireless system to facilitate intellectual work.²⁶ It is not clear whether Otlet had

²⁶ Mons, Mundaneum, EUM II Thèmes 13 Varia, boîte 8 farde 74 document 3805 – 1944.04.

LE TRAVAIL INTELLECTUEL

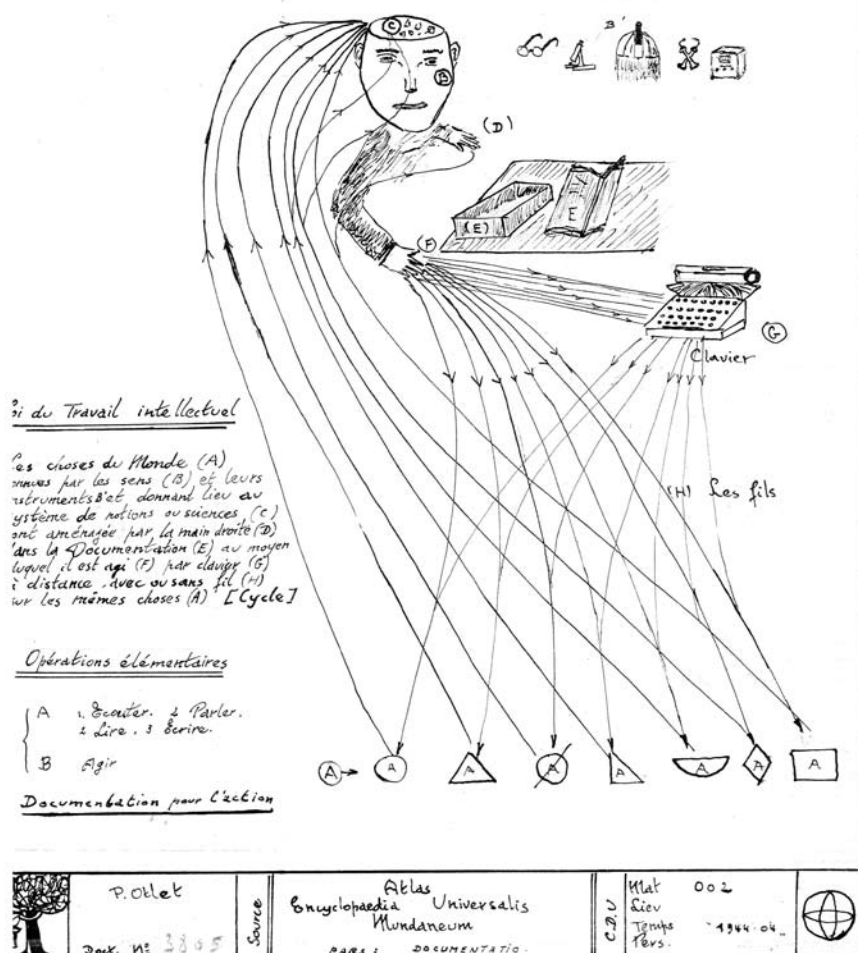


Figure 7.6 Otlet, ‘clavier’, manual and mechanical operations. EUM 8-74.

© Mundaneum

Artrouni’s ‘*cerveau mécanique*’ in mind, but the apparatus indicated as the ‘clavier’ is not just a normal typewriter; rather it was connected to a remote documentation centre (see Figure 7.6).

While this image depicted the connections of the scholar with the documentation centre, a 1943 sketch shows the link between the Mundaneum and the individual citizen of the World City participating in a universal civilization. This sketch of

the Mundaneum reveals Otlet's ideas about globalization in a wireless variant (see Figure 7.7).²⁷

We see the Mundaneum once again in the spiral form that had been adopted in the design of Le Corbusier; however, this time the Mundaneum is depicted not just as a museum building to show the visitor the accumulation of knowledge over time, but also as a transmitter of knowledge by sound ('radio-telephone') and by image ('radio-television'). Moreover the sketch is a visualization of what Otlet wrote in *Monde* (1935):

an instrumentation acting across distance which would combine at the same time radio, x-rays, cinema, and micro photography [and the since then invented television]. All the things of the universe and all those of man would be registered from afar as they were produced. Thus the moving image of the world would be established – its memory, its true duplicate. From afar anyone would be able to read the passage that, expanded or limited to the desired subject, could be projected on his individual screen. Thus, in his armchair anyone would be able to contemplate the whole of creation or particular parts of it (Otlet 1935, 391).²⁸

This is an astonishing image when one contemplates Tim Berners-Lee's statement: 'My original vision for a universal web was an armchair to help people to do things in the web of real life' (Berners-Lee, 1999, 178).

Continuity and Discontinuity in Otlet's Visualization of the *Plan Mondial* and in Berners-Lee's Road Map to the Semantic Web

So far we have seen that Otlet's architecture of knowledge (material and immaterial, or physical and metaphorical) involved a hierarchical order. Its building blocks consisted of documents of various kinds (texts, images, photographs, sounds) that were ordered by the structure of a classification system, the UDC. However, it is also clear that for Otlet knowledge structures were not completely static, but needed space for modification and transformation. The first transformation he envisaged, the replacement and synthesis of text by images, would leave the classification system, the framework of the knowledge building, completely intact. The outcome of the second transformation, however, the substitution of the book by telephone, radio and television, is less predictable. The directness of these media makes it hard to order freely incoming information immediately within the UDC. Some uncontrolled information might shake the pillars of Otlet's knowledge building, but in the end order would be restored. To understand this tension between transformation and control Otlet's definition in *Monde* of 'the ideal' is revealing:

The ideal resembles a regular, but elastic sphere. Deformed and compressed, the sphere forms itself according to the pressures on it. Thus, the ideal can only regain its integral form when the circumstances that caused its deformation are eliminated (Otlet 1935, 363).

²⁷ Mons, Mundaneum, EUM III Mundaneum F. Cité Mondiale 3 Calques boîte 14 farde 120, p. 136.

²⁸ Translation, Rayward 1990, 1.

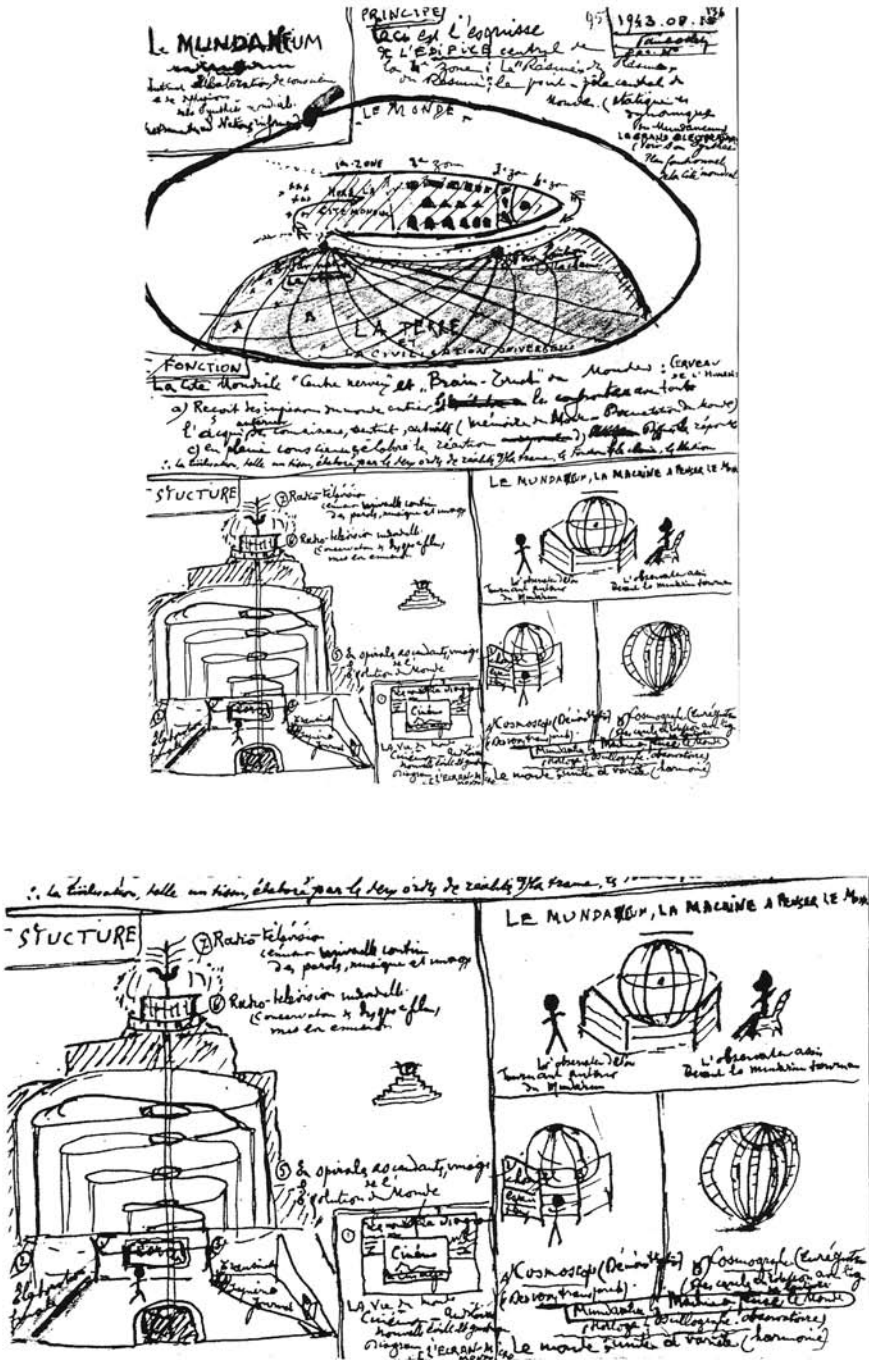


Figure 7.7 Mundaneum transmitter of knowledge (1943) (detail). EUM 14-120. © Mundaneum

The same tension characterizes Otlet's views about the globalization of knowledge. The distribution of knowledge in the image discussed above showed the world citizen linked to the '*civitates mundaneum*' by a well defined, continuous path. However the wireless transmission of images and sounds in the latest sketch of the Mundaneum that Otlet made in 1943, a year before his death, implies bypassing the classification system. Information would be traveling at different speeds and in different directions leading to discontinuity.

It is not clear to what extent Otlet was aware of this tension between control and change, between continuity and discontinuity, that was reflected in his images of knowledge organization and dissemination, but it seems that he was experimenting with the issue in at least one of the visualizations of the '*Plan Mondial*' (see Figure 7.8).²⁹

In this image the three visible sides of a cube represent (1) the domains of knowledge, (2) the organizational sectors (public, private, associations), and (3) the instruments (world knowledge, world plan, world federation, world constitution etc.) that had to be embraced within the *Plan Mondial*. This cube is shown as moving along three axes: x (degree of reach), y (space) and z (time), which would continuously change the relationship among the data. This mobile representation seems to come close to modern computer simulations where the user can navigate through time, space and contextual information with simple movements of the mouse. However, Otlet's axes are not gliding scales, but are in reality subdivided into structured administrative levels (from local to global), in the six continents and in distinct historical periods. Otlet's classification system and hierarchical order of knowledge stood in the way of his achieving a dynamic visualization that would have reflected a potential similar to that of modern computer interfaces.

Berners-Lee discussed this problem in relation to the Semantic Web. In 1998 he wrote:

The Semantic Web is what we will get if we perform the same globalization process to Knowledge Representation that the Web initially did to Hypertext. We remove the centralized concepts of absolute truth, total knowledge, and total provability, and see what we can do with limited knowledge.³⁰

The web structure he has in mind is certainly different from Otlet's centralized-hierarchical '*reseau*' (network). Nevertheless when we take a closer look we recognize similar contradictions within Berners-Lee's model of the Semantic Map. Like Otlet, Berners-Lee is using an architectural metaphor. In 1998 he described the

29 Mons, Mundaneum, EUM III Mundaneum F. Cité Mondiale 3 Calques boîte 14 farde 120 p. 144.

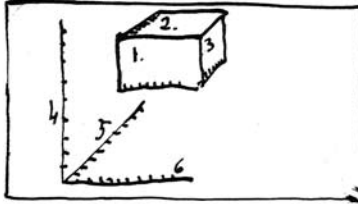
30 Berners-Lee, T. *Design Issues*, 'What the semantic web can represent', paragraph: 'Knowledge Representation goes global', <<http://www.w3.org/DesignIssues/RDFnot.html>> [last modified 17 Sept. 1998]: See further Berners-Lee, T., *Design Issues*, 'Preface: Architectural and philosophical points', <<http://www.w3.org/DesignIssues/Preface.html>> [updated 6 Jan. 1999] and Berners-Lee, T. (1998), 'The World Wide Web and the "Web of Life"', <<http://www.w3.org/People/Berners-Lee/UU.html>>.

LE PLAN MONDIAL

I - Toute formation sociale est une synthèse (combinaison) des divers éléments suivants dégagés par l'analyse sociologique (distinction).

<p>① Les domaines</p> <p>11) Le physique 12) L'économique 13) Le social 14) Le politique 15) L'intellectuel 16) Le religieux</p>	<p>② Les secteurs</p> <p>21) Public 22) Associations 23) Personnes.</p>	<p>③ L'instrumentation.</p> <p>31) Le but. (C.U) 32) Science mondiale. 33) Principes mondiaux. 34) Plan mondial. 35) Fédération mondiale 36) Constitution mondiale</p>
<p>④ Degré d'étendue.</p> <p>41) Local. 42) Régional. 43) National. 44) Continental 45) Mondial.</p>	<p>⑤ Espace:</p> <p>51) Europe. 52) Asie. 53) Afrique. 54) Amérique. 55) Océanie 56) Polanie.</p>	<p>⑥ Temps.</p> <p>61) Préhistoire. 62) Antiquité. 63) Moyen-Age. 64) Renaissance. 65) Temps contemporains</p>

On peut figurer ces six ordres de données par un cube aux trois dimensions (1,2,3) et mobile suivant trois grands axes (4,5,6).



I - Quel que soit l'aménagement qui interviendra après la guerre, la Cité Mondiale aura une raison d'être dans cet aménagement et il sera inévitable quel qu'il soit d'instaurer un plan mondial. Ainsi le voudra cet ébranlement du monde, les exigences nouvelles, les nouveaux objectifs dès qu'on voudra les fonder sur des bases doctrinales.

II - Ce plan mondial intéresse le plan même de la Cité (plan idéologique et urbanistique) et il est désirable qu'on le trouve inscrit dans le dit plan de la Cité.

Figure 7.8 Dynamic visualization of the Plan Mondial. EUM 14-120.
© Mundaneum

development toward the Semantic Web as 'a road map for the future, an architectural plan untested by anything except thought experiment'.³¹

If we look at the visualization of the 'stack pattern' of the Semantic Web Architecture adopted by the W3C, we recognize a similar pyramidal structure of components to that of Otlet. Despite Berners-Lee's recommendation to remove

31 Berners-Lee, T., *Design Issues*, 'Semantic Road Map', <<http://www.w3.org/DesignIssues/Semantic.html>> [updated 19 Oct. 1998].

centralized concepts of absolute ‘truth’ from the design schemes for the Semantic Web, it might be argued that this ‘stack pattern’ contains positivist elements comparable to the knowledge representations of Otlet. Berners-Lee’s image shows a hierarchy of concepts with ‘trust’ and ‘proof’ at the top.³² Another visualization by Berners-Lee of ‘applications connected by concepts’ shows interrelations among time, space, people, technology etc. in a one-dimensional structure.³³ Probably to avoid any form of hierarchy, Berners-Lee chose the format of the ‘subway map’ of the London Underground. However the junctions that appear in this subway map of 2003, where more applications and concepts meet, are of course more important points of exchange in his decentralized web than other points (and therefore might be read as hierarchical). A closer look at the visualization of time and space in Berners-Lee’s subway map suggests a tension between continuity and discontinuity similar to Otlet’s representation in *Le Plan Mondial*. Time and space are represented by continuous lines, connecting within the same one-dimensional structure discontinuous processes like workflows.

If these observations are correct, we may conclude that in both the models of knowledge organization linked with European modernism in the first half of the twentieth century and those that are assumed to reflect the ‘postmodern’ information society of today, continuity and discontinuity are revealed as standing as it were next to each other (compare Foucault 1970). This conclusion raises the question as to whether the distinction between modernism and postmodernism, if it exists, can be sufficiently defined by the continuity and discontinuity dichotomy of which much has been made (Lyotard 1984; Hanafi 2005). I would like to suggest some possible directions for exploring this dichotomy further when comparing the world of European modernism with the postmodern global information society.

If we follow Berners-Lee’s prediction that the exchange of information by means of the World Wide Web would be improved by new forms of graphics, it might be useful to analyze more critically than has hitherto been the case how the global information society is visualized. The visualization models of Otlet and Berners-Lee in my view show striking similarities, despite the undoubtedly genuine attempts of the latter to avoid any form of hierarchy and centralization in his knowledge organization schemes. But these attempts at visualization and what is signified by them might benefit from a more extended historical analysis of the diagrams, schemas, maps, sign languages and other forms of visualizations put forward by the European pioneers of the global information society.

A second direction to explore might be the impact of European modernism on views on the global information society in America. In our introduction we noted that the birth of the internet and the World Wide Web in the historiography of the global information society primarily has been situated in the United States. So far we have discussed the views of several European scientists and architects before World War II who shared the belief that modernization of knowledge organization and architecture,

32 This visualization of the Semantic Web Architecture was presented by Berners-Lee at XML in 2000 in Vienna: <www.dajobe.org/talks/sw-vienna/slide10.html>.

33 <http://www.w3.org/2003/Talks/1023-iswc-tbl/slide_10-0.html>. Applications connected by concepts.

both influencing each other, could lead to a better world society. However, such views were also present in the United States. This raises the question as to whether American protagonists of modernist knowledge organization and architecture were in fact influenced by Europeans or whether in America after World War II, when most of the European pioneers of a global information society we have mentioned here – Geddes, Otlet and Neurath – had died, a completely new, independent search would start for ways to think about the organization and dissemination of knowledge on a world-wide basis.

Epilogue: The Reception of European Modernism and the Information Society in America

Before World War II several of the European modernist architects, such as Walter Gropius and Mies van der Rohe, moved to the United States, presumably taking with them versions of the ideas we have discussed above. Other thinkers about knowledge architecture like Geddes and Neurath (and less actively Otlet) were always on the lookout for contacts with American scholars who had similar ideas. While we have discussed the relations among architecture, knowledge and globalism in the context of ideas about the expression of modernism in Europe, I think it would be useful to speculate how these ideas might be related to ideas about modernism in the United States and to ideas about the advent of a postmodern global information society more generally. For example, the scholar Lewis Mumford was in contact both with evolutionist thinkers such as Patrick Geddes and with modernist architects in the United States of his time.

Mumford is not only interesting in providing one of the first critical accounts of the limitations of diagrams and schemes in the representation of knowledge, so dear to the hearts of the European thinkers we have been discussing, but also for his role in how European modernist ideas were received and superseded in the United States.³⁴ In his posthumous publication *The Geddesian Gambit*, for example, Mumford explored the change in his relationship with his former ‘master’, Patrick Geddes. Among other things, Mumford criticized Geddes’s rigid views about the nature of synthesis and his limited graphic vocabulary:

Synthesis is not a goal: it is a process of organization, constantly in operation, never finished. An attempt to produce a single synthesis good for all times, all places, all cultures, all persons is to reject the very nature of organic existence [...] Geddes never realized how static his system had become or how limited and stultifying was his graphic vocabulary [...] But as Geddes presented his graph of life, he left nothing to chance and nothing to the correction or elaborations of other minds. Though he persistently asked for ‘criticism’ and ‘collaboration,’ what the system itself demanded was converts (Novak 1995, 361).

Much of what Mumford says might well apply to the visualization techniques of not only those we have been calling the European pioneers of the Global Information

³⁴ For a recent article that deals with perception of European diagrams in the work of the American architect Louis Kahn, see Shanken 2006.

Society but also to the designers of the World Wide Web. The issue continues to be how to find visualization techniques that can deal with the complexity and fluidity needed for the representation of knowledge on a global scale – techniques which Otlet and the others discussed above were experimenting with in the pre-World War II period.

Mumford used the term ‘American modernism’ as opposed to ‘European modernism’ and put Louis Sullivan and Frank Lloyd Wright forward as its protagonists. In Christopher May’s study, *The Information Society as Mega-Machine*, we see a first attempt to assess the relevance of Mumford’s views on the megapolis and the invisible city for communication technologies and the networked society (May 2000). Here are partial views that suggest a whole in need of further study.

In the work of Buckminster Fuller, to take another example, we recognize a focus on technological means, an interest in ‘world education’ and a belief in a global society that can be planned and created that are similar to the ideas that animated Otlet, Geddes, Neurath and other Europeans. Is it useful to compare Otlet’s development of a ‘*Plan Mondial*’ for a civilized society resting on new forms of knowledge organization, for example, with Buckminster Fuller’s inventory of human knowledge that led to the creation of a World Resources Inventory? In 1972 Fuller and others established the World Game Institute, which developed, in their own words, ‘the world’s largest and most accurate map of the world, one of the most detailed and substantive databases of global statistics available anywhere and educational resources designed to teach interdependence, collaboration, respect for diversity, and individual participation in a global society’.³⁵ Where have we heard this story before?

After World War II, US practitioners of architecture, town planning, documentation and information science explored ideas of relationships between architecture and the information society that were in some way similar to European thinking about modernism, universalism and the organization and visualization of knowledge before this war. If this is so, it would be certainly useful to study the reception in the United States of this thinking in order to provide in a new perspective on US developments in the information society in the post-war period.

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³⁵ For this historical account of the development from Buckminster Fuller’s World Game, via World Peace Game toward o.s. Earth Global Simulation, see <http://www.osearth.com/ws_history.shtml> [copyright 2004].

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