18 TRANSFORMING THE NATURAL HISTORY MUSEUM IN LONDON

Isotype and the New Exhibition Scheme

Sue Perks

> *The transformer is someone who is working on behalf of the audience and intermediary, someone who mediates between the experts and the lay audience you're trying to communicate with. It seems strange, you would think haven't museums always been doing that? And I think manifestly not when you look at the work that had been done. Often, exhibitions, mounted by subject specialists … were for a specialist to show other specialists that they were fully up-to-date with their subject. No thought was given to the audience at all.*
>
> Miles 2008

In 1975 the Natural History Museum in London took a leap of faith when it adopted the 50-year-old concept of the transformer in the development of its "New Exhibition Scheme." This way of working has had a fundamental influence on the design of educational exhibits ever since. The original role of the transformer stems from Isotype (the International System Of TYpographic Education) originated by Dr. Otto Neurath in 1925 for use at the Gesellschafts- und Wirtschaftsmuseum (Social and Economic Museum) in Vienna. The transformer mediated between academics and designers to create accessible charts and exhibits. Neurath's charts were designed to educate and inform the citizens of "Red Vienna" about important social and political matters, under the auspices of the Social Democratic regime (1919–1934).

The International Handbooks of Museum Studies: Museum Media, First Edition.
Edited by Michelle Henning.
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Half a century later, Roger Miles and his team at the Natural History Museum (hereafter NHM) used the role of the transformer to devise the New Exhibition Scheme in response to their need to fulfill the 1753 mandate that stated that exhibitions existed "for the general use and benefit of the public." According to Miles, it was fair to say that, before the New Exhibition Scheme, the needs of the audience were not being considered by either museum curators or designers, who were guilty of "packaging" displays rather than providing the audience with accessible exhibits. Miles referred to the frustration of the educator within museums as they tried to make academic exhibits accessible when in reality they were only of interest to other curators and the educated public (Miles 2008).

Roger Miles and Mick Alt cited the Isotype transformer as one of the three main contributing factors that went into the formulation of the New Exhibition Scheme (Miles and Alt 1979, 158–162). Transformation was adopted to attempt to communicate effectively with a largely undefined general audience and to enhance a visitor-friendly approach in the design of new exhibitions. Miles considered that the Isotype transformer was the "inspiration" behind the scheme; and the NHM's adoption of the role during the 1970s has been much documented (Kinross 1979; 1981; Kraeutler 2003; 2008; Neurath and Kinross 2009). But why was this historic role considered relevant for the design of audience-friendly exhibitions? And how was the role of the transformer applied and adapted to work on a much larger scale for a 1970s audience? Common themes that bridge the 50 year gap are a sound emphasis on education, integrity in conveying information, and the need to communicate effectively with the audience. Evidence to show how the museum implemented these themes and adopted transformation can be found in official documents, journals, papers, and publications in the Natural History Museum Library and Archives in South Kensington.

The New Exhibition Scheme ran from 1975 to 1991, beginning as a radical experiment to shake up the way that the NHM related to its audience. Despite media controversy and internal struggle, what began as an experiment culminated in the controversial almost object-free exhibition *Human Biology: An Exhibition of Ourselves*, which opened to great acclaim in 1977, swiftly followed by *Introducing Ecology* in 1978. Experience gained from designing and producing these early phases of the New Exhibition Scheme formed the basis of "museum technology," a pragmatic body of evidence-based knowledge that Miles developed to design educational exhibitions for further phases of the scheme, ultimately solving the museum's problem of remaining progressive and fulfilling their educative mandate (Miles and Tout 1979).

This chapter will examine how and why the NHM adopted this 50-year-old methodology – conceived in Vienna for a social and economic museum under very different political circumstances. It will also discuss how the museum redefined the role of the Isotype transformer for a 1970s audience in the context of a

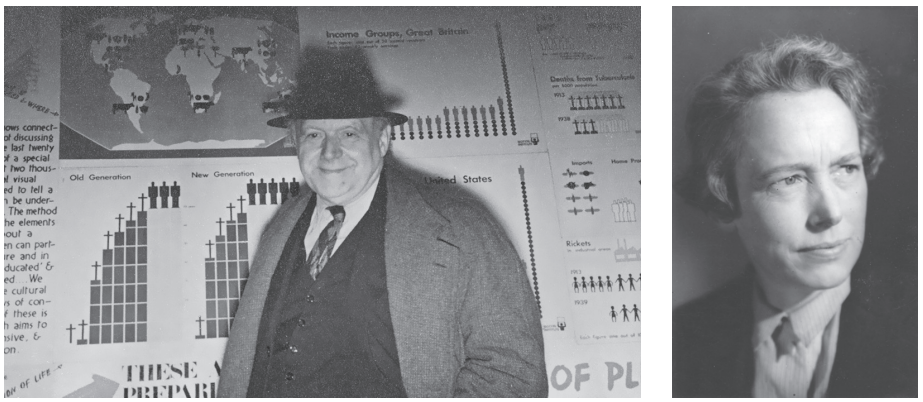

FIGURE 18.1 (a) Otto Neurath, 1944. (b) Marie Neurath.
Courtesy of the Otto and Marie Neurath Isotype Collection, Department of Typography & Graphic Communication, University of Reading.

British national museum, concentrating on the collaborative relationship between scientist and designer – the transformation partnerships and the extended teams that supported them.

The origins and definition of the transformer

Dr. Otto Neurath (Figure 18.1a) became the first director of the Gesellschafts- und Wirtschaftsmuseum in 1925 (hereafter GWM) and primarily formulated the principles of Isotype (then known as the Vienna Method) to explain sociological and economic issues to working-class Viennese citizens using a system of visual statistics. The GWM formed part of the Social Democrat experiment to blend culture and politics in Red Vienna from 1919 to 1934. Neurath's particular aims were to establish a museum to educate and inform citizens of their rights and to provide unbiased information on important social issues (Gruber 1991, 84).

It has been argued that Neurath gained his initial ideas on social museums from examples set by the ambitious world expositions of the nineteenth century, the outdoor hygiene and science exhibitions of the early twentieth century, and the Musée Social, which presented ideas on the welfare state in turn-of-the-century France (Vossoughian 2008, 49). But Neurath began to develop more focused ideas on visual communication in a social context in his role as director of the Museum of War Economy in Leipzig in 1916. There he began to incorporate visual statistics into his museum displays. Neurath's work on the visual dissemination of social facts continued in 1921 when he became general secretary of the Austrian Housing and Allotment Association.

The success of the GWM and the Vienna Method – developed as a simple picture language for use in the museum, attracted many home and overseas visitors,



FIGURE 18.2 The Gesellschafts- und Wirtschaftsmuseum, Vienna ca. 1927. Courtesy of the Otto and Marie Neurath Isotype Collection, Department of Typography & Graphic Communication, University of Reading.

all eager to find new ways to present visual information. Rudolf Modley, the popularizer of the pictogram in America during the 1930s, interned at the GWM in the late 1920s, and commented on the large number of Americans who visited the museum between 1927 and 1934. He described it as a "classroom in social science for thousands of residents and visitors" (Modley and Lowenstein 1952, 6). American visitors included representatives from the newly founded Chicago Museum of Science and Industry (one of the first of America's many science museums), keen to use Neurath's Vienna Method in their own museum.

The many thousands of local visitors to the GWM enjoyed a convivial atmosphere and late evening and weekend opening hours where they could see informative, entertaining charts and simple interactive self-testing devices to reinforce the concepts put forward. Charts were arranged in bays to allow small groups to informally discuss content with friends and family and to form opinions based on the visual arguments presented. Apart from the main museum in the New Town Hall, the GWM (Figure 18.2) had sub-branches in accessible places so that it was easy for all working people to visit in their leisure time.[1]

The GWM formed a constantly changing platform showcasing the work of the Vienna District Municipality, where the audience was treated as an equal partner, rather than as an uneducated underclass, by providing accessible, visitor-friendly displays. Neurath used the medium of the museum to communicate his ideas on housing, hygiene, health, and social and economic developments. He was against the amassing of collections, only ever exhibiting three-dimensional objects to support statements made in the charts on display, never as stand-alone *objets d'art*.

Audience opinion was monitored and charts were adapted in response to visitor feedback. Neurath and his team were among the first museologists to monitor feedback in this way (M. Neurath and Kinross 2009, 25–26). The museum was at the height of its popularity during the late 1920s and early 1930s, employing 25 staff in a prime central Vienna location, with 500 square meters of exhibition space. The Social Democrats, as sponsors of the museum, promoted measures to improve the education system and encouraged the collaboration of schools and museums. School tours were welcome, and Marie Neurath's (née Reidemeister) training as a teacher proved useful in facilitating the association.

Marie Neurath (Figure 18.1b) was the first employee of the museum in 1925 and, along with Otto Neurath, became one of the first transformers. In a 1974 article entitled "Isotype" she outlined the role of the transformer (M. Neurath 1974). This was reprinted in the Natural History Museum's in-house training manual for transformers *The Transformation Reader* (1979):

> It is the responsibility of the "transformer" to understand the data, to get all necessary information from the expert, to decide what is worth transmitting to the public, how to make it understandable, how to link it with general knowledge or with information already given in other charts. He has to remember the rules and keep to them, adding new variations where advisable, at the same time avoiding unnecessary deviations which would only confuse. (M. Neurath 1974, 13)

Otto Neurath's transformer or "trustee of the public" was responsible for acquiring and extracting facts from information supplied by the subject expert and for having enough general knowledge, integrity, and graphic skills to turn the information into a chart, using repeated Isotype symbols to represent magnitude. The transformer translated academic or statistical information into rough visuals of charts and made decisions on all major details such as the graphic form of the argument, the quantity represented by each pictogram, the use of guide images (*Führungsbilder*) to reinforce the message, color coding, titling, captions, and annotation. This design would then be handed on to the graphic artist who assembled and pasted up final artwork, which consisted of linocut printed symbols and printed letterpress type set in Futura font.

In the context of the New Exhibition Scheme at the Natural History Museum, the transformer's role was to bring complex scientific facts and ideas to life in an entertaining and educative way for a wide lay audience – in simple terms, to turn the form of information chosen by the expert into a form that most suited the learner, through the combined skills of designer and subject expert, curator, or scientist. Miles's thoughts on transformation had their roots in Neurath's definition of the transformer, but the outcome was not governed by a formal visual system and was produced by a team equipped with far greater technological resources. It must be remembered that Miles could not have considered such a radical departure from traditional methods for designing exhibitions without the funding, infrastructure,

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and staffing that only a national museum could offer. In addition, while the GWM comprised only 500 square meters of exhibition space, the NHM during the mid-1970s comprised 14,000 square meters of exhibition space.

For the transformers at the NHM during the 1970s and 1980s, the process began with an equal partnership of scientist and three-dimensional designer. Initially, the scientist transformer's job was to make the designer understand the facts so they could use their communication skills to make the information accessible. The designer transformer's job was to understand the content provided by the scientist and translate it into educative, visually attractive graphic solutions suitable for a lay audience. The museum employed three-dimensional designers as designer transformers (even though the work would have been better suited to graphic designers, as "skilled professional communicators"[2]). The resulting rough visuals were then passed to graphic designers, illustrators, and model makers to produce artwork for the production of exhibits. The museum graphic design teams during the 1970s and 1980s were based in west London, 15 miles from the designer–scientist transformation partnerships at the museum in central London. Miles (2008) admits that early on they were a little hazy about where the weight of responsibility lay for graphic interpretation. For this reason, exhibits in the New Exhibition Scheme, particularly early on, were highly ambitious in their use of three-dimensional design, but less so in two-dimensional terms.

A need for change

A good illustration of the reasons why the NHM needed to change its ideas on how a national museum should communicate with its audience can be found by looking back at issues of *Museums Journal* from the late 1950s to the early 1980s; they paint a lively picture of museums struggling to come to terms with the problem of making displays more accessible to the visiting public. During the 1950s, very few museums in the United Kingdom employed full-time designers. Numbers had not significantly changed at the end of the 1960s, but they swelled during the mid-1970s as museums recognized the need for designers – used not as display technicians but as equal team members in a challenging, expanding role. By the end of the 1970s *Museums Journal* was discussing the employment of "communicators" as the way forward for museum design. During the Museums Association Annual Conference in 1970, discussion took place not so much on *whether* or not to employ a designer, but on *how* to use designers in museums (Belcher 1970, 63–66).

The traditional 1950s method for delivering museum exhibits was for the curator (or scientist) to supply facts, select relevant exhibits, write text and titles, and then hand everything over to the graphic designer. It was the function of the graphic designer to make everything look attractive and neat; specify the typography for the labels, main introductory text, and headings; produce or commission illustrations; and fit it all into the case – a role described as "window dressing" by

museum commentators of the time. As more museums gradually began to employ in-house designers, two divided camps emerged; the designer was employed to service the graphic needs of the curator and not seen as a valued part of the process of formulating exhibits. It was apparent that the museum curator and the museum designer had little in common, and approached their work from very different perspectives.

Two Museums Association Annual Conferences held in 1970 and 1972 (Bristol City Museum and Art Gallery and Guildhall Museum, London), chaired by Michael Belcher (then head of the Exhibition Section at the NHM), reported on the role of the designer in museums from varying viewpoints (Belcher 1970, *63–66*; 1972, 58–62). Delegates summarized situations that could impede communication and lead to poorly functioning educational exhibits:

- dominance of designer *or* curator;
- curators who employed designers as extensions of themselves;
- scholarship seen as a barrier to communication;
- failed dialogue between curator and designer.

The need for a mediator between curator and designer was discussed, envisioned in the role of scriptwriter, content editor, interpreter, or communicator which was to be incorporated into the museum design process. Delegates discussed how to structure information by dividing it into easily accessible sections along with who should be responsible for ultimately communicating with the audience. The eminent Viennese art historian and museum scholar Alma Wittlin had referred to this need to structure information in *Museums: In Search of a Usable Future* (1970), highlighting the fact that curators did not necessarily possess pedagogical skills and that a wider team was needed to effectively engage with the audience – in particular a communicator. She suggested that subject matter specialists should take a fresh look at how they conveyed facts to a lay audience and embrace the communication process, rather than hiding from it. She called for "public authenticated information" to be delivered by teams of scholars, communicators, and designers. Wittlin also berated the fact that, "At present, communicators have not yet entered the realm of museums, and a condition of imbalance exists due to the dominance of either curator or designer" (1970, 210). She referred back to Neurath's museum, stating that: "'Relationships,' in the form of comparison or of evolution, were the keynotes in the presentation of information in the Museum of Social Science (Gesellschafts- und Wirtschaftsmuseum), Vienna" (Wittlin 1970, 159).[3]

At the *Museums Journal*'s second design conference in 1972, museum designer Robin Wade suggested that designer and curator should take equal responsibility for the display of the exhibit. He pointed out that neither designer nor curator was wholly qualified to communicate effectively with the visiting public and highlighted the need for a professional interpreter, possibly in the guise of an editor with a journalistic background. Wade went on to describe the special nature of

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museum design and how museum professionals should embrace the discipline of communication rather than adhere strictly to more traditional roles:

> The designer must overthrow the tendency to design for beautifully composed glossy magazines, and must not neglect the intellectual content of display. The curator, for his part, seems often to be obsessed with scholarship. But neither curator nor designer is necessarily the best person to interpret the collections to the public – maybe an editor with a journalistic background is required. (Wade 1972, 62)

In summary, what was needed was a role to "bridge the gap" between display and academic staff. At the same conference, Margaret Hall from the British Museum described how this position could work:

> Someone else is perhaps needed to interpret the information, to process and edit it, and present it to the public. He would be a useful addition to the design team and also most useful in an educational role; perhaps academic curators should be the source of information and should not present it directly to the public. (1972, 62)

In 1975 Sir John Wyndham Pope-Hennessy (then director of the British Museum) also referred to the problem of curators with a far too intimate knowledge of their collection being unable to take an overview: "And if he is a hidden pedant, then practically anything is liable to occur. No one should underrate how obstinate substantial scholars are" (Pope-Hennessy 1975). David Gosling, exhibition designer and latterly head of design at the NHM from 1975 to 1984, suggested that the activities of a NHM designer before 1975 amounted to no more than "sugaring the academic pill" and exhibitions were "organised along the lines of textbooks suitable for graduate students" (1980, 66). He considered that the designer's brief was rarely formulated and exhibits were often developed in an ad hoc way, with texts and specimens presented to the designer by the specialist for arrangement in cases. The following quotation from Miles sums up the balance of professional input that he considered was required to take ideas for a visitor-centered approach to museum design forward. It is essentially a description of the transformation partnerships that Miles introduced to the NHM in 1975:

> If the specialist is concerned to *communicate* his knowledge and expertise, and if the designer is concerned with *design for communication*, then they share substantial common ground. This is also the ground of the educationalist; so all three are engaged in the same pursuit. The problem now becomes getting all three together, so no one is over shadowed. (Miles 1981, 116; emphasis original)

Ideas emanating from discussions found in publications such as *Museums Journal* and conferences went toward the realization that things had to change at the NHM. The British Museum Act of 1963 had officially divided the collections of the

British Museum from those of the British Museum (Natural History). After the split, the renamed Natural History Museum became much more acutely aware that it was failing to live up to the 1753 Act that had originally brought about its existence, which stated that its purpose was to entertain and benefit the general public (Clarke and Miles 1980).

Until 1968 the heads of botany, geology, mineralogy, palaeontology, and zoology had enjoyed independent control over their own areas of the museum, which appeared to have lost any coherence as a unified body. The museum trustees recognized that the galleries and public areas of the museum were perceived as dull, overly technical, and badly in need of updating, and requested that the director, Frank Claringbull, make recommendations for their redevelopment.[4]

A number of different factors now needed to be considered alongside the display of specimens in museum design – television, universal education, and the development of mass media were changing the world and the public had more leisure time to make use of it all – but museum workers were slow to recognize the developing social importance of museums as places of entertainment and learning. Concurrently, there was a huge growth in the dissemination of scientific knowledge and more experimental approaches were emerging in the presentation of biology, which challenged the NHM to explore interconnections and relationships between exhibits, rather than simply placing them in cases with taxonomic details.

According to Wittlin, museums in the United States during the 1960s were "progressing in great strides" in the founding of new museums and increasing visitor attendance (1970, 174–175). Several main trends were emerging: an increasing interest in ecology and biology in museums of natural history, the fostering of links between museums and schools, a new emphasis on research, the shift from presenting a static to a dynamic view of the natural world, and a desire to make museum environments reflect the content of the exhibits. It is unlikely that a national museum of the calibre of the NHM would have been unaware of these international trends in their desire to bring displays up to date in a more dynamic environment.

By the early 1970s it was acknowledged that the NHM's exhibitions were failing because they were conceptually static, overly subject-focused, and inconsiderate of the needs of the lay visitor. It was also recognized by the museum and scholarly community that the intrinsic role of the museum was changing from being simply a storehouse of objects to a more questioning study of the world. The NHM needed to adapt its scholarly voice to reach out to a nonspecialist audience in an entertaining manner. The visiting public could see TV programs on natural history, so museums had to work much harder to attract audiences. E. V. Gatacre's paper "The Limits of Professional Design," read at the Museums Association Annual Conference on July 8, 1976, summed up the changing museum audience when he discussed how Pope-Hennessy, director of the British Museum, had described his public as having "responses determined by the television screen, unaccustomed to looking intently at static images" (Gatacre 1976, 96).

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The development of the New Exhibition Scheme

In December 1968 Claringbull, on behalf of the museum trustees, took the radical first step to update the galleries. He started by removing control from the heads of the five science departments, and took sole responsibility for the galleries. This was the first initiative toward the formation of the New Exhibition Scheme.[5] Work began in earnest to develop the scheme, initially through an exhibition panel chaired by Claringbull, which included 12 members of the scientific staff and the education officer. In February 1972 the museum trustees approved a paper entitled "British Museum (Natural History): A Proposal for a New Approach to the Visiting Public," and a unified policy for exhibition development was formally activated. The failings of the current exhibition policy were clearly described in this 1972 proposal:

> The present exhibition fails because it is primarily concerned with the diversity of nature, and omits three-quarters of its rightful subject matter. It is piecemeal and conceptually static, neglectful of natural processes and interactions, and reflects to its loss the division of the Museum into five separate departments. (Miles 1975, E)

Claringbull set up small working parties to investigate four different themes (man, ecology, life processes and behavior, and evolution and diversity) and the decision was made to mount a pilot project. The New Exhibition Scheme was officially launched with an exhibition based on the life history of man, with the working title "Being and Becoming." To ascertain the right level to pitch the content for the pilot project, visitor surveys were staged, which identified the audience as the "interested layman" – not the academic. This was a revelation, as previously the museum had been largely unaware of who their audience consisted of. Focusing on the needs of the audience was a significant change; as Miles said, they moved from "concentrating purely on the subject matter, to realising it was more about communication than it was about biology. The key was shifting from being subject matter oriented to visitor-oriented."[6]

Miles has cited the three main factors which went into the design and final realization of the New Exhibition Scheme: Otto Neurath and Isotype, educational technology (developed by the Open University), and Karl Popper's trial-and-error approach to problem solving. Originally, the NHM learned about Isotype and the transformer from the Open University (which was established during the late 1960s to bring degree-level learning to those unable to attend traditional campus universities). In the early 1970s Claringbull contacted the Open University in relation to developing ideas on distance learning. The Open University had been using educational technology to design literature and course units to develop "active learning," a technique evolved from learning techniques used in World War II to train troops of mixed abilities.

Michael Macdonald-Ross from the Insitute of Educational Technology at the Open University played a key role in introducing transformation to both the Open

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University and later the NHM. During the early 1970s Macdonald-Ross and his small team of consultants were researching methods of communication to enhance distance learning techniques for the design of new course literature. As part of his initial research, Macdonald-Ross approached Prof. Michael Twyman in the Department of Typography and Graphic Communication at the University of Reading, where Marie Neurath had recently deposited the Isotype Institute archive. Macdonald-Ross was impressed with what he saw, and took his ideas on Isotype and transformation back to the Open University. With Rob Waller, he wrote the paper "The Transformer" (Macdonald-Ross and Waller 1976), an examination of the role – which they considered had lain dormant for nearly half a century – and a call to arms for graphic designers to collaborate with other disciplines.[7]

At the NHM, educational technology was used to design the production system needed to develop and implement the New Exhibition Scheme and to structure scientific information by breaking it down into smaller, manageable sections, to avoid oversaturation of material and to encourage the active participation of the visitor. Miles stated that programmed learning (the ability to deliver self-paced infomation in small bites, which gives the audience immediate feedback) had alerted the museum of the need to establish a clearly defined purpose, aims, objectives, structure, story line, and a starting point which matched the visitor's existing knowledge, but educational technology was used as the tool to provide a more "systematic, problem-solving approach to education" (Miles and Alt 1978, 160). He considered it particularly useful when dealing with mixed ability teaching and the self-paced learning required by museums with an undefined audience (Miles and Alt 1978).

The NHM was initially interested in how the Open University was approaching the problem of distance learning. An Open University biologist, Beryl Crooks, was seconded to the museum for six months in March 1974 to facilitate the rewriting of a new outline for "Being and Becoming." Behavioral objectives were applied to each individual planned exhibit (a technique used in educational technology to identify exactly what the audience should have learned before moving on to the next exhibit). Preliminary work on the content and treatment of the first brief identified far too many overall and specific behavioral objectives for the average museum visitor to digest in one visit, which highlighted the problem of using this method as a theoretical basis for designing educational exhibits (Miles 1986, 228). Overcomplexity made the scheme unworkable, overly subject-focused, and not at all visitor-focused. Otto Neurath had been well aware of this dilemma, as he stated:

> Of course, as in everything educational, success in this field is secured by giving up something else; in order to create pictures that can easily be remembered one has to omit many details. But that only proves the maxim that he who knows best what to omit is the best teacher, and one who can omit nothing from his demonstrations should not be a teacher at all. (1973, 220)

It was clear that a more condensed overview of biology and a simplification of the content were needed to make the museum audience engage with the science. Crooks's input had not served to clarify the situation. The NHM was still struggling to identify a valid visitor-centere approach for the design of its galleries. It was at this point that Macdonald-Ross suggested to Miles that Isotype might be a worthwhile area to investigate to progress the New Exhibition Scheme.

On Macdonald-Ross's recommendation, Alan Tout, an educational technologist, began work with the museum in November 1974 and set out a new schedule for exhibit development and a new team structure. On January 1, 1975, Miles was appointed head of the newly formed Department of Public Services (DPS), created through the merging of the existing Exhibition Section with newly employed science, editorial, and design staff. Miles was responsible for the management all of the museum's biological galleries with the main task of bringing the New Exhibition Scheme to fruition.

Miles was clearly inspired by Isotype. On June 24, 1975, as a consequence of a growing interest in Neurath's museum work, he arranged for 28 members of the newly formed DPS team to visit University of Reading Library to see the exhibition *Graphic Communication through ISOTYPE*, followed by a seminar given by Prof. Michael Twyman.

New recruits to the Department of Public Services contracted ca. 1975–1980 attended an intensive two-week training session where they were introduced to the principles of Isotype through the *Transformation Reader*. This was a 28 page A4 document produced in-house at the museum, compiled by Roger Miles, assisted by Rodney Eastwood (British Museum 1979). Its aim was to provide a framework from which to create communicative exhibits. It featured a collection of writing by prominent authors on many aspects of exhibition design, learning theory, educational technology, planning, and communication including Otto and Marie Neurath, Michael Tywman, Michael Macdonald-Ross, Rob Waller, Alma S. Wittlin, and other communication experts. In the introduction Miles defines transformation as "that process by which relevant knowledge, usually of a specialist nature and known only to a minority, is made available to a wider audience by using forms capable of being comprehended by non-specialists" (British Museum 1979, 2). It forms a key piece of evidence to show the extent to which the principles of Isotype were adopted by the NHM. The *Transformation Reader* introduced Isotype through extracts from Otto Neurath's *International Picture Language* (1936) and extracts from Marie Neurath's *Instructional Science* (1974). It also contains a passage from Alma Wittlin, "Hazards of Communication by Exhibits," in which she lists factors leading to the failure of communication in exhibits: intellectual overload and deficit, sensory monotony, and sensory overstimulation (British Museum 1979, 4–9). Transformers from the 1970s and 1980s still quote "The Enchanted Loser" (Figure 18.3) as a warning to avoid designing exhibits that are so visually overpowering that the underlying educational concept is lost. The *Transformation Reader* also included a large number of extracts derived from the Open University, which suggests how closely Miles was considering their ideas on distance learning and educational technology.

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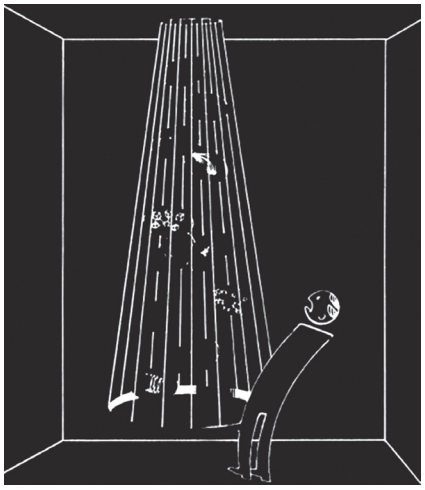

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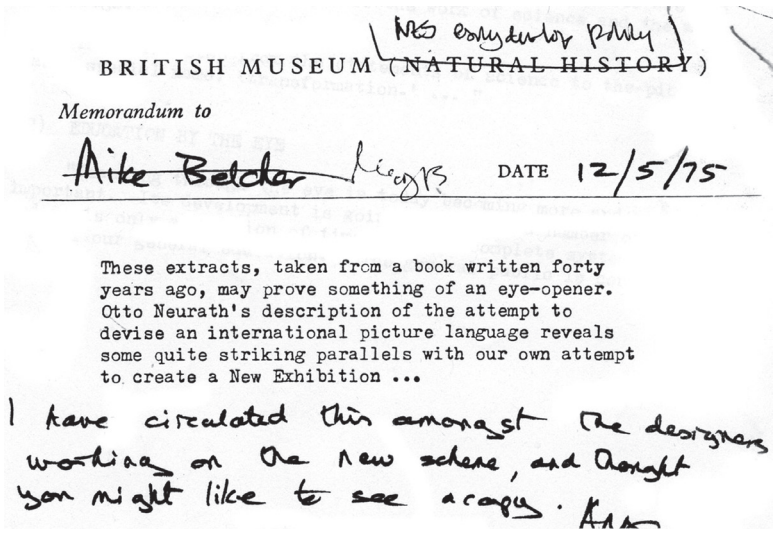
FIGURE 18.3 Alma Wittlin's "The Enchanted Loser" from the *Transformation Reader*. The original caption reads: "Enchanted by the rich design, the viewer turns into all enchanted loser – he never discovers that the pretty mobiles represent cells in the human body." Courtesy of the Trustees of the Natural History Museum, London.

The *Transformation Reader* also discussed how to achieve the style of graphic language found in Isotype. Interviews with NHM transformers from the 1970s and 1980s reinforce the fact that Neurath's original graphic language (depicted in Figure 18.1a) was at least considered and followed, if the material was thought to be appropriate (although they clearly found it difficult to relate to themes of a nonstatistical nature). Richard Meakin, a designer transformer recalls that only certain types of comparative information proved suitable for the strict application of the original principles of Isotype's graphic language, but that the clarity, simplicity, and elimination of unnecessary detail inherent within the Isotype system were certainly adhered to. Examples of the graphic language found in the *Transformation Reader* provided clear guidelines for how to produce archetypical simplified, comparative diagrams with horizontal arrangements of same-sized units, and the text also discussed adaptations to the principles.

Isotype not only provided the inspiration for the New Exhibition Scheme, but also gave the NHM a set of rules to design exhibits that clearly communicated with their audience. Miles reprinted an extract from Marie Neurath's *Instructional Science* in which she stated:

> The rules … are the concern of that step in the total process of production, which we called "transformation." From the data which are given in words and figures a way has to be found to extract the essential facts and put them into picture form. It is the responsibility of the "transformer" to understand the data, to get all necessary information from the expert, to decide what is worth transmitting to the public. (M. Neurath 1974, 136)


BRITISH MUSEUM (NATURAL HISTORY)

Memorandum to

DATE 12/5/75

These extracts, taken from a book written forty years ago, may prove something of an eye-opener. Otto Neurath's description of the attempt to devise an international picture language reveals some quite striking parallels with our own attempt to create a New Exhibition ...

I have circulated this amongst the designers working on the new scheme, and thought you might like to see a copy.

FIGURE 18.4 Memo from NHM Archives (originally attached to copies of pages from Neurath's *International Picture Language*) which evidences how Isotype was an informing factor in the formulation of the New Exhibition Scheme.
© The Trustees of the Natural History Museum, London.

Marie Neurath also emphasized the adaptability of the principles of Isotype, which is particularly relevant to museum designers struggling to come to terms with what appeared to be a very rigid set of rules, designed for a very different time and place (British Museum 1979, 10).

The influence of the principles of Isotype manifested themselves in many layers of the museum's working practices. A memo from Anne Bedser (editor) to Mike Belcher (exhibitions) of March 7, 1975, illustrates the fact that Isotype was being incorporated into the working methods of the museum (Figure 18.4). There is also documented evidence that Isotype shaped the team structure in the Department of Public Services (centering on the process of mediation between subject specialist and designer). In a 1993 paper, "Too Many Cooks Boil the Wroth – Exhibits, Teams, Evaluation," Miles presented the diagrams shown in Figures 18.5a–c.

Figure 18.5a shows the traditional curator/designer model used at the museum before the New Exhibition Scheme was introduced in 1975. The "expert," or curator, is ultimately responsible for the exhibit. Miles's definitions of the roles of the curator ("selects objects and writes labels"), the designer ("makes things look good"), and the teacher ("makes the best of things after the opening") could be thought of as rather tongue in cheek, but are very much in line with common museum practice of the time. The introduction of Neurath's 1925 team model (Figure 18.5b) seems all the more radical when compared with this traditional approach to designing museum exhibits. Miles's 1975 team model (Figure 18.5c) links the exhibit researchers and exhibit designers to parallel the role of the

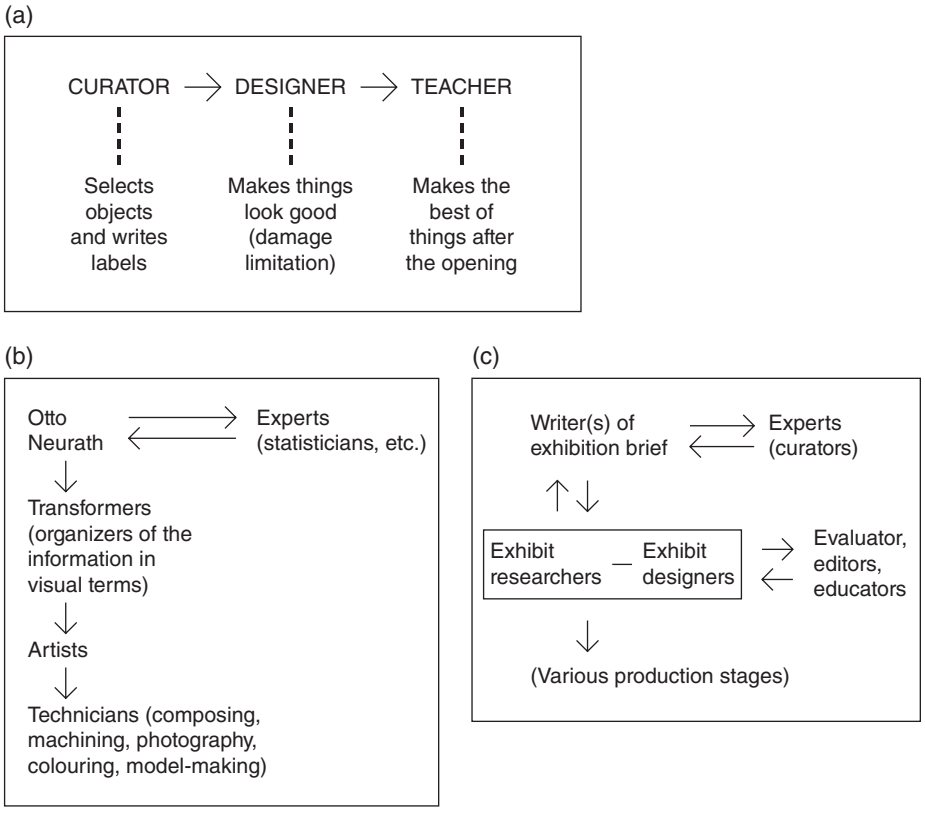


FIGURE 18.5 (a) Traditional curator/designer model used at the NHM before the New Exhibition Scheme was introduced in 1975; (b) Neurath's team model from the Gesellschafts- und Wirtschaftsmuseum, 1925–1934; (c) Miles's post-1975 NES team model. Diagrams from Miles (1993).
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transformers – the "who were responsible for organising the information in visual terms" (Twyman 1975, 11). He refers to the exhibit researchers and exhibit designers as transformers within the text of this paper, but not in the diagram. Both team models have "experts" at the top of the table and both make use of transformers – Macdonald-Ross and Waller's "skilled professional communicators" (2000, 178) – to bridge the gap between subject expert and the general public, working in a 1:1 partnership. The subject expert is not solely responsible for the exhibit. There are differences in the structure of both Miles's and Neurath's team models, mostly due to the fact that there are far more processes involved in Miles's model (evaluators, editors, and educators) but it is obvious that they both rely heavily on the meeting of academic and designer minds in the transformation process.

Miles and Tout were the key decision-makers and architects of the New Exhibition Scheme, along with Brian Lewis, professor of educational science at the

Open University, who was brought in to help with the practical implementation of the New Exhibition Scheme. Lewis argued:

> The teaching points must be fully explained. Misleading statements and irrelevant scholastic displays must be eliminated. There must be no mistakes, non-sequiters [*sic*], gaps or other defects in the argument. All written materials need in fact to be well structured and self-explanatory and pitched at the right level of difficulty. Even this may not be enough. Unfortunately, it is all too easy to be clear and accurate with respect to subjects that most visitors regard as being irrelevant and unimportant. Some effort must therefore be made to arouse in the visitor a sense of excitement and purpose. In the very act of imparting knowledge, the instructional materials must explain why the knowledge is worth having and how it fits into the broader scheme of things. (1980, 154)

Some of Lewis's ideas on educational technology concurred with the principles of Isotype and Neurath's thinking on museums, in particular, the problem of oversaturation of information ("less is more"). Lewis stated that, "If museums took their educational remit more seriously, they would exercise a self-denying ordinance on the selection of exhibits" (1980, 154). He also believed that analogy underpinned all other methods of communication, referring the visitor to a known idea to enable them to understand a more alien concept. Miles and Alt also associate transformation with analogy and problem solving:

> In developing the Exhibition Scheme we are attempting to apply the concept of transformation in wider fields than Isotype charts and diagrams, including three-dimensional design, but still with its basic meaning. We particularly associate it with the construction of analogies or conceptual bridges, whether in the form of graphics models or interactive devices. (Miles and Alt 1978, 161)

Miles and Alt cite a particular exhibit on the cerebral cortex as being a good example of the NHM's adapted use of transformation. The composition of the brain is illustrated using a crumpled sheet of newspaper – an analogy, a method used in educational technology. Using analogous concepts to succinctly tell a story is a far more economical aid to understanding than applying unwieldy amounts of behavioral objectives. Miles considered that the visitor would learn more from fewer well-designed exhibits than from filling the space with mediocre ones. This concurs with Neurath's ideas on a good teacher's ability to edit information, and leave out the rest (Neurath 1936, 27).

Ideas taken from Karl Popper, the Viennese philosopher of science, underpinned the theoretical trial-and-error approach to the New Exhibition Scheme, taking small steps at a time and emphasizing the importance of evaluation. Popper advocated refinement through continual evaluative testing, but in practical museum terms this was uneconomic and impracticable (Miles and Tout 1979, 210). The trial-and-error approach was not new to American museums. Miles visited several science centers and museums in North America[8] and Australia during 1976, and was impressed with what he found.

The Exploratorium in San Francisco had opened its doors in 1969, and evaluated exhibits by placing roughly finished interactive prototypes in the exhibition spaces accompanied by museum staff called "Explainers" who were able to observe the public's responses to the exhibits. Through constant evaluation, exhibits were adapted and improved. The Lawrence Hall of Science (Berkeley) used graphic-based mock-ups and more formal evaluation procedures housed in a special evaluation space; final exhibits would be built in response to the evaluation. Miles favored the Lawrence Hall of Science model – as the pilot project was an experimental exhibition and had to be completed within a set time frame.

As well as the effective use of evaluation, Miles was inspired by the North American use of interactive exhibits, the participatory attitude toward the visiting public, and the emphasis placed on contemporary physical and biological science, technology, and industry rather than on objects from the past, all of which he incorporated into the New Exhibition Scheme.[9] The former London Geological Museum (now part of the NHM) had mounted a much acclaimed permanent exhibition in 1972, *The Story of the Earth*, which had broken the mold in the United Kingdom for creating spectacular immersive scientific exhibitions. However, according to Miles, it was the Exploratorium, which based itself on the philosophy that science should be fun and accessible for people of all ages, that formed one of the three main influences behind the formulation of the New Exhibition Scheme.

Because it was unlikely that everything would be right at the first attempt at using such an experimental approach to the design of educational exhibits, and there was so little time for formative evaluation (except in the case of a few mock-ups), final exhibits were put on display and amended if necessary through summative evaluation. The museum installed closed-circuit television to allow visitors to be observed as they viewed the exhibition (Miles 1986, 234). An annual visitor survey was established to monitor the makeup of visitors and their responses to the new exhibitions, and the results were published in *Museums Journal* every four years (Alt 1980). Miles believed that this approach to evaluation was unique among British museums during the mid-1970s; it led to the museum becoming known as a pioneer in this field – although there is evidence that evaluation was used at the GWM 50 years earlier from the late 1920s to 1934 (M. Neurath and Kinross 2009, 25).

The Hall of Human Biology

On May 24, 1977, the pilot project *Human Biology: An Exhibition of Ourselves* (Figure 18.6) was opened by the secretary of state for education, Shirley Williams. The director pronounced it "Stunning, a foretaste of a revolution" (Miles 1986, 231). The exhibition was introduced as an experiment to test out museum technology – Miles's new approach to the design of educational exhibits. *Human Biology* was widely acclaimed by the public, who flocked to see it, leaving other galleries virtually empty. Visitor levels continued to rise, reaching over three million in 1977, and visitor surveys indicated that it was the most popular permanent exhibition

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FIGURE 18.6 The Hall of Human Biology, ca. 1977, Natural History Museum, London. (For a color version of this figure, please see the color plate section)
© The Trustees of the Natural History Museum, London.

that the Natural History Museum had ever produced. The museum felt that it had justifiably begun to realize its aims and objectives for the New Exhibition Scheme in the creation of an enjoyable, visitor-centered approach.

Professional acclaim centered on the fact that *Human Biology* was considered to be a new, adventurous departure from the traditional method of designing exhibitions which, as an exercise in museum design, made fascinating viewing for curators. It covered new ground in dealing with human biology on such a large scale, using biological ideas and processes rather than collections of objects. The lack of real specimens gave *Human Biology* one of its most distinguishing traits – which, as Miles pointed out, stemmed from the nature of the subject matter rather than any desire to do away with traditional museum realia. It was constructed as a new stand-alone modern interactive environment within the museum, hiding all references to the gothic interior. The content had a strong narrative basis, broken down into "mind-sized chapters" of tightly structured groups of largely interactive exhibits, forming separate but interconnected episodes. Visitor surveys indicated that the content was memorable and succeeded in both educating and enthralling visitors. The visitor was no longer a passive onlooker, but a participant in a journey based on intelligible language and analogous concepts. The structure of the learning hierarchy was based around a rational arrangement of ideas, to help the visitor explore and be motivated to find out more. Content was pitched at two levels, the

majority suitable for a 15-year-old, with a secondary level accessed through raised island exhibits known as "Enrichment Assemblies" (which were subsequently scrapped as they failed to indicate that they presented more advanced knowledge, were inaccessible to disabled users, and posed a safety hazard).

But there was also widespread criticism of *Human Biology* from museum professionals, much of it centering around the huge budget spent on an experimental concept, coupled with an element of envy that Miles had been given such freedom to produce this radical new approach to exhibition design. This was perhaps also tinged with the fear that curators might be forced to produce exhibitions in this new style, restructure their own galleries, and lose their power bases. Miles's ideas were also viewed by some as paying homage to fashionable 1970s liberalism, which offended conservatives. The "Letters to the Editor" pages of *Museums Journal* from 1977 to 1979 outline much of the praise (some of it veiled) along with the outright criticism leveled at *Human Biology*. Museum critic Tony Duggan identified technical imperfections and ambiguous concepts in *Human Biology* and felt that its staging in such an important architectural setting was money badly spent. But, although he had reservations, he did view *Human Biology* as the physical realization of what museologists had been talking about for the last 10 years:

> From the professional point of view, the Hall is mandatory viewing for all curators. The role of the educationalist in museums has been one of the great debating points over the last ten years. This Hall, with so many unusual exhibits presented with the philosophy, which differs radically from that of traditional curatorship, reveals something of what the educationalists have been trying to tell us (and sell us) for a long time. (Duggan 1978, 5–6)

Alison Whyman of the Hunterian Museum praised Miles for his visitor-centered approach, stating that *Human Biology*

> represented the first time that a museum in Britain had designed an exhibition in a scientific manner, attempting to define the essential characteristics of its audience and aiming to fulfill a specific purpose, i.e. the communication of various biological ideas. (1979, 36–37)

In general, Miles was praised for his application of current research in psychology and education, the designer–scientist transformer partnerships, visitor participation, and museum technology, which he had developed through a combination of theoretical, inspirational, and practical influences. Some museum commentators, initially critical of *Human Biology*, had a change of heart after seeing the exhibition for themselves:

> I have followed the growth of the new exhibition policy at the British Museum (Natural history) with much interest, knowing it would have implications for our

> own programme of exhibit renewal. Initially, on reading the policy for the new exhibition scheme I was instinctively opposed to the whole policy, since the display was too concept, and not specimen based. After spending over one whole day in the Hall of Human Biology, however, and observing the way in which the public is fascinated by this new approach, I suffered conversion, and came away convinced that the new methodology of the scheme was of profound importance for all museums wishing to educate as well as entertain. (Rolfe 1978, 194)

But opinion was heavily divided and some extremely harsh criticism emerged. *Human Biology* was likened to a "cheap disco" and a "hideous portent of modernization yet to come" (Miles 1986), and seen as lacking actual exhibits in a traditionally exhibit-rich institution. Miles's response to this was that *Human Biology* was an experimental exhibition. Further exhibitions in the New Exhibition Scheme (e.g., *Introducing Ecology*) did make extensive use of the collections within the museum.

Philip Doughty (general secretary of the Geological Curators Group) famously described the exhibition as "a kind of lewd offal-shop nightmare [that] escaped curatorial control and fell into the hands of pure, tasteless communicators" (1978, 56). Richard Fifield (1977), museum critic for *New Scientist*, considered *Human Biology* to be "tainted" and to hamper visitor comprehension by its inconsistent terminology, likening the new display conduits to a fairground "tunnel of love." *Human Biology* and *Introducing Ecology* (which swiftly followed) were also criticized by science historian Frank Greenaway, who was concerned about a national museum giving "elementary instruction" – dumbing down content. He stated:

> We should all give some degree of assent to this until faced with a museum gallery which resembles a modern popular science text, all graphics and VDUs with museum objects incorporated, not as items in a traditional collection but just as illustrations to the product of a "script-writer." (Greenaway 1983, 8)

But some of the most scathing comments came from curator and museum critic Patrick Boylan in 1979. He criticized the display policy, the fact that Miles had not made early working papers more accessible, the philosophical approach, the misuse of public funding, and the misguided attitude to academic research. Boylan objected to the fact that the NHM, as one of the foremost international institutes for research was allowing its scientists to be taken away from their academic activities to partner designers in constructing exhibitions outside their traditional areas of expertise. He did not consider Miles's visitor-centered approach to be new, or the claim that the museum was one of the first to be designed in a scientific manner, or that the look was in any way original. He considered *Human Biology* to be self-consciously "modern tasteful" in style – "pure Middle Class 'Habitat'" – and that Miles was overly concerned with educational psychology and learning theories, remarking that the museum was reinforcing "fashionable, mildly liberal, educational and social theory and practice" (Boylan 1979).

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Boylan articulated the position of the museum scientists aptly in this 1979 critique of the New Exhibition Scheme, stating that previously the museum's public galleries had been "regarded as a closely integrated adjunct of the curatorial and research programme of the Museum … funded out of the annual Research Council's parliamentary vote" (Boylan 1979). Miles, in defense, makes the point that the new way of constructing exhibitions was based on scientists fitting into the framework of exhibition design, no longer taking overall responsibility for it (1987, 183). The once powerful position of the scientist-curator had been severely downgraded from team leader to equal team member. Trained scientists were not all happy to relinquish their research activities for a more general educational role within a content development team even if it was a fixed secondment. This reinforced Miles's case for the introduction of open-minded "skilled professional communicators."

Boylan was critical of scientists being taken away from core research to take part in communicating science to the public – the transformation partnerships, and the

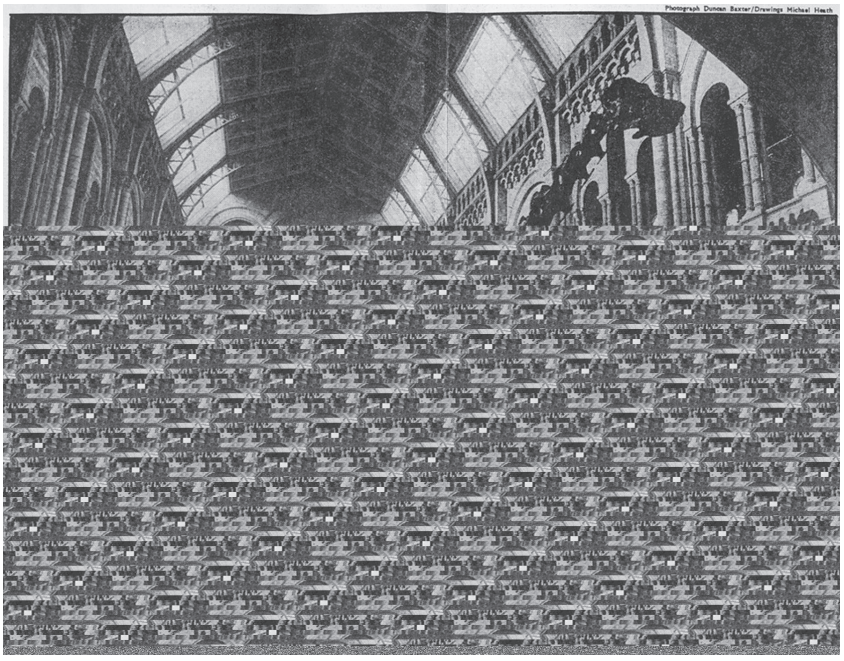

FIGURE 18.7 "Survival of the Fittest in SW7," *Sunday Times Weekly Review*, May 24, 1981. Photo: Duncan Baxter; drawings: Michael Heath. Reproduced by permission of the Sunday Times/Newssyndication.com. This cartoon illustrates a NHM centenary report by Bryan Silcock which highlights the "seething disputes" occurring in a "museum whose real business is science." It shows the different parties involved in the argument: (*left to right*) traditional curators, NES exhibit designers, a veiled attack on Miles (a fossil fish expert), an attack on schemes which did not respect Waterhouse's architectural interior, and finally a poke at anti-Darwinian theories.

diminishing of power of the scientist in the museum environment. He expressed the fears of many museum curators at that time – that they too would be forced to adopt similar expensive and radical approaches in their own institutions.

In July 1978 Miles gave a lecture about *Human Biology* at the Museums Association's Annual Conference in Edinburgh and "very strong views" were expressed in response to his visitor-centered approach (Densley 1978). Miles was criticized for being wasteful of massive budgets in a time of stringent financial constraints. Delegates considered the experimentation healthy, but agreed that a smaller pilot exhibition would have sufficed to introduce this new style of working. Miles's answer to the criticism was that *Human Biology* could only be regarded as an experiment to show the way forward. It was not perfect. The project continued to cause controversy well into the 1980s, as can be seen in the 1981 cartoon from the *Sunday Times Weekly Review* (Figure 18.7).

The influence and legacy of Isotype at the Natural History Museum

The majority of the designers in Miles's designer–scientist transformer partnerships came from three-dimensional design backgrounds (although Richard Meakin was originally a medical illustrator and designer of statistical diagrams). Dierdre Janson-Smith (recruited in 1979 as part of the second wave of transformer partnerships) answered an advertisement for a "content developer with a science background." The title "transformer" did not appear within job advertisements of the time, but appeared frequently within documents found in the museum archives. Janson-Smith recollects that Miles had considered bringing in existing museum curators who were more interested in communication than research, but was forced to look outside the museum for the right staff, with "no museum agenda and open, malleable minds."[10]

From the evidence of the *Transformation Reader* and interviews with transformers, it is apparent that the transformation partnerships were broadly encouraged to use some of the principles of Isotype as a starting point: primarily the hierarchical ordering of information and use of comparison. Neurath's charts attempted to present unbiased factual information so that the audience could then draw their own conclusions. Exhibits found in early phases of the New Exhibition Scheme also tried to set out unbiased factual information, but their primary function was to educate and entertain. Miles's extended use of comparison included analogy and metaphor, techniques borrowed from educational technology, instead of adhering to the Isotype principle that objects should be clearly expressed in immediate terms. The "Cortex" exhibit (cited as an effective example of this kind of analogous exhibit) is still present in *Human Biology* after over 30 years. Museum audiences in the 1970s were visually sophisticated through media exposure to the metaphor (a staple technique used in advertising), so Miles had to try much harder

to capture and retain his media-conversant audience and to compete with television and the other national museums on his doorstep.

Miles's style of presenting graphic material is very different from Neurath's; and, while there is tacit evidence of the use of Isotype graphic language present in a few exhibits, in general NHM transformers considered this approach rigid and unsuitable for anything but statistical information.

As one ex-NHM scientist transformer stated:

> I found it very exciting, to be asked to think hard how to "transform" information into something that a non-scientist could understand. The approach was, I can now see, extremely didactic – what we were taught was grounded firmly in learning theory, and the aim was very much to get across what you needed to get across … With a lot of feedback from our in-house educational technology / visitor survey team, we were taught that we needed to develop exhibits that attracted and held visitors for long enough for them to absorb what we wanted them to learn. Transformation was about hooking and holding them, starting where they were. Our concept of engaging with the visitor was a lot less sophisticated – we were in a way being taught long-distance learning techniques … We were introduced to "the enchanted loser" – one of the images in the book [*Transformation Reader*] that I remember very well – the basic message being that less is more, that crowded displays with loads of objects and labels actively hindered communication. I am sure this must be a key influence of Isotype.[11]

Conclusion

One of the most significant principles that Miles borrowed from Isotype was to view the subject matter from an audience's perspective, rather than from the subject expert's perspective. Fidelity to material and viewer was respected above all, as it was with the GWM team – it could also be said that both museums, in theory, share the Natural History Museum's founding 1753 mandate of being "for the general use and benefit of the public." The New Exhibition Scheme, like the GWM, was designed to be socially inclusive, and both museums were noncommercial and had an educational basis. They also shared the primary purpose of disseminating social knowledge in an enjoyable and convivial setting. The New Exhibition Scheme was designed as a set of visual arguments clearly set out in words, moving and static imagery, and interactive exhibits, building in complexity as the viewer moved through the gallery. Empirical experiences formed through participating in interactive tasks, considering questions posed and facts presented, led the audience to a more informed position. Visitor testing revealed that *Human Biology* audiences retained far more facts than audiences of other more traditional object-based exhibitions at the museum (Alt 1980, 10–19). It is not difficult to see why the museum became known as a pioneer of evaluation during the 1970s and 1980s.

Diedre Janson-Smith considers that, through the process of transformation, the designer was able to take an equal part in the communication process rather than being an accessory to it, and that the most important legacy of Isotype was to give the designer a critical role in the design of educational exhibits. As a scientist transformer, she had to first explain the scientific content to her designer partner so they could understand it, and find a way to coherently explain it to the audience. Alan Ward, a designer transformer, considered that Isotype brought an "information-based" approach to the design of educational exhibits, addressing the interpretation of subject matter, and turning it into a form that was accessible to the museum visitor. He also stated that the introduction of the transformer partnerships brought designers and scientists into a close working relationship, and required them to view the information from a layperson's perspective rather than from the perspective of the expert (or taxonomist).[12] The adoption of transformation helped take ultimate control away from the curator, through the equal status of the designer–scientist partnerships. Knowledge became visitor-oriented and not subject-oriented. The museum lost its "window dressers" and gained professional communicators.

In his article in *Museums Journal* on the design of New Exhibition Scheme Phase 6, *Man's Place in Evolution*, David Gosling (1980) illustrated the practical effect of the principles of Isotype on the NHM. He thought that the integration of biologists and designers (the transformer partnerships) into a full-time exhibition development team was the first step in rectifying gaps in visitors' knowledge. The combination of the two disciplines of design and science engendered a mutual respect between the partners, and they in turn provided a change in emphasis from the needs of the teacher to those of the learner.

Isotype scholar Robin Kinross (1981) described transformation as a "fruitful influence" on designers and all those concerned with graphic presentation of information. He considered that the NHM had a real understanding of the historic principles behind Isotype and was able to produce a new body of work, applying the principles of Isotype in new surroundings, under very different circumstances.

Miles gave many papers and spoke widely on museum technology from the mid-1970s to the late 1990s. *The Design of Educational Exhibits* (1982), written in collaboration with Alt, Gosling, Lewis, and Tout, was one of the first publications to discuss the design and implementation of a system for the delivery of didactic exhibitions in a national museum context. It offered practical guidelines on how to design educational exhibits based on the pragmatic ideas developed during the formulation of the early phases of the New Exhibition Scheme. Since then many books have been written on aspects of museology, and formative and summative evaluation has become an integral part of the development of new exhibitions. Evaluation forms one of the key legacies of the visitor-centered approach developed at the museum, which Miles considers shifted to the nearby Science Museum in the mid-1990s.[13]

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Miles remained as head of the Department of Public Services from 1975 to 1991, during which time 10 permanent exhibitions (or phases) were produced. The New Exhibition Scheme became the "Exhibition Scheme" and the visual appearance of the exhibitions became more traditional, as artifacts and specimens were integrated into the original experimental specimen-light concepts. The designer–scientist transformation partnerships continued to form the backbone of the Department of Public Services, and Miles's notion of museum technology became more firmly established within the NHM and was widely discussed in papers, conferences, and journals.

However, by the late 1980s the once enthusiastic transformer partnerships appeared to have run out of steam. Fueled by media controversy, stringent budgetary constraints, and internal power struggles, they were no longer producing the innovative exhibitions characterized by the early phases of the New Exhibition Scheme. The scientists and designers who worked on exhibitions for any length of time gradually lost their inspiration and enthusiasm against a background of declining resources and less creative freedom. The Department of Public Services needed revitalization, but in a Civil Service work environment it was difficult economically to inject fresh talent. Since the inception of the New Exhibition Scheme, the museum scientists had been wary of their loss of power and, although initially some were enthusiastic, many never fully appreciated being taken away from their research. Experience also showed that only a few scientists were actually suitable for the role of scientist transformer and the museum's pool of talent was too small to sustain such a mode of operation. So the museum moved toward employing new scientists. This move was made with the blessing of the five keepers, who in any case did not like losing their best scientists for up to two years at a time. Miles was forced to admit that the relative security found in a government post was not conducive to sustaining creativity over long periods of time (Miles 1996; 2007).

In 1989 the new Conservative government under Margaret Thatcher brought in museum admission charges. The NHM had to concentrate on marketing itself to find sponsorship from major corporations rather than relying on public funding. Funds were diverted away from exhibitions and staff restructuring took place, with a raft of redundancies, including the majority of the transformation partnerships that had previously formed the backbone to the New Exhibition Scheme. Internal disputes and political battles forced the Department of Public Services to disband in 1991.

Transformation has been shown to be a significant factor in new ways of designing educational exhibits at the NHM; but its effects are more far-reaching, and ideas that were thought of as radical during the 1970s (as they were in the 1920s) now appear logical and commonplace to today's museum designers. For transformation to take place effectively, an understanding between the partners was essential, which was sometimes haphazard owing to the personalities involved. Not all transformer partnerships enjoyed fruitful relationships, and the resulting transformation was not always as erudite as it could have been.

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Macdonald-Ross stated that all systems of communication, from Isotype to operational research and educational technology stem from basic communication strategies, which he defines as "the human organisation of learning which has been in existence for centuries."[14] Both Neurath and Miles assembled their own versions of this notion. In much the same way that Neurath had taken elements from philosophy, sociology, pedagogy, "education by the eye," and a whole host of other disciplines to construct Isotype, Miles took aspects of Isotype and combined them with educational technology, operational research, evaluative studies, philosophy, education, and cybernetics to construct museum technology.

It could be said that through the application of museum technology – Miles's experimental new museum philosophy based around sound pedagogical issues and a visitor-centered approach – the Natural History Museum succeeded in reinterpreting its original mandate as a social institution to educate the public. It could also be said that transformation formed a key role in making this happen. Transformation also helped to raise the profile of designers within museums from "window dressers" in the 1960s, to transformers of complex information during the 1970s and 1980s, and has given the inquiring designer a far more important role in the development and design of educational exhibits.

The legacy of transformation in a contemporary museum context lies in the methodology used by museum professionals, but today it is more likely to be known as "interpretation" and to involve teams of academics, scriptwriters, editors, audience advocates (a nondesign role which ensures that exhibitions remain visitor-centered), designers (used in a more traditional role), technicians, and support staff. Interpretation is most effective when editors are able to visually conceptualize academic information and vividly relay ideas to designers who can, in turn, enhance and refine the graphic outcome.

Ex-transformers (designers and scientists) now function as independent design consultants and interpreters working with large museums and visitor attractions in the United Kingdom and further afield. They admit to taking the visitor-centered, Isotype-inspired approach they gained from the New Exhibition Scheme with them. The NHM currently employs staff engaged in the planning and formulation of exhibitions, but currently no NHM employee bears the job title "transformer" and designers employed by the museum currently take on a more traditional graphic design role.

The legacy of transformation in the Natural History Museum (and originally derived from Neurath's Isotype at the GWM) is far-reaching. Ideas that appeared radical to the museum community during the 1970s now appear commonplace; it is unthinkable today that an exhibit would be designed without the close collaboration of designer and subject expert, as Miles reinforced in a recent interview. Museum transformers also clearly illustrate how important transformation was to museum professionals. Transformation as a method was disseminated when the Department of Public Services closed and ex-NHM transformers populated the wider museum community, taking their New Exhibition Scheme experience forward into new

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museological environments. The museum has outsourced all major exhibitions since 1991, many to organizations employing ex-NHM transformers:

> The work at the Natural History Museum was the basis of all I have done since, really, and I have long been grateful for it. However, while it may have been the truth it wasn't the whole truth, neither was it new. And, given that the idea spawned a whole industry, I'm constantly amazed by how often one sees "The Rules" ignored, or as I suspect, not known.[15]

Acknowledgment

I would like to extend very special thanks to Dr. Roger Miles for his profound scholarly advice on this essay and his patience and enthusiasm.

Notes

1 Neurath describes in detail how the GWM was configured (1973, 214–233).
2 An expression used by Macdonald-Ross and Waller (1976).
3 Wittlin also cited Neurath's 1936 book *International Picture Language* in the footnotes (1970, 278). Her essay "Hazards of Communication by Exhibits" featured in the *Transformation Reader*, the Natural History Museum in-house training manual for transformers (British Museum Department of Public Services 1979).
4 Dr Roger S. Miles, interview with author, September 1, 2008.
5 Dr Roger S. Miles, interview with author, September 1, 2008.
6 Dr Roger S. Miles, interview with author, September 1, 2008.
7 They revised this paper in 2000 (Macdonald-Ross and Waller 2000). It shows how Neurath's ideas have been updated and why they were still appropriate many years on.
8 On the North American stage of this study trip, Miles was first introduced to the evaluative work of Harris Shettel and his strategies for determining exhibit effectiveness.
9 See "Preliminary Report on a Visit to 18 Museums in North America and Australia, January and February 1976," generalized observations by Roger Miles, February 25, 1976, NES PP 1976. Miles visited museums in Washington, New York, Cleveland, Chicago, Milwaukee, San Francisco and Oakland, Toronto, and Perth (*Annual Report 1976–77* (1976), DF 935/28, Natural History Museum Archive).
10 Dierdre Janson-Smith, email message to author, 2008.
11 Dierdre Janson-Smith, email message to author, 2008.
12 Alan Ward, email message to author, 2008.
13 Dr. Roger S. Miles, interview with author September 1, 2008.
14 Michael Macdonald-Ross, interview with author June 25, 2008.
15 Susan Jones, scientist transformer, email message to author, 2008.

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