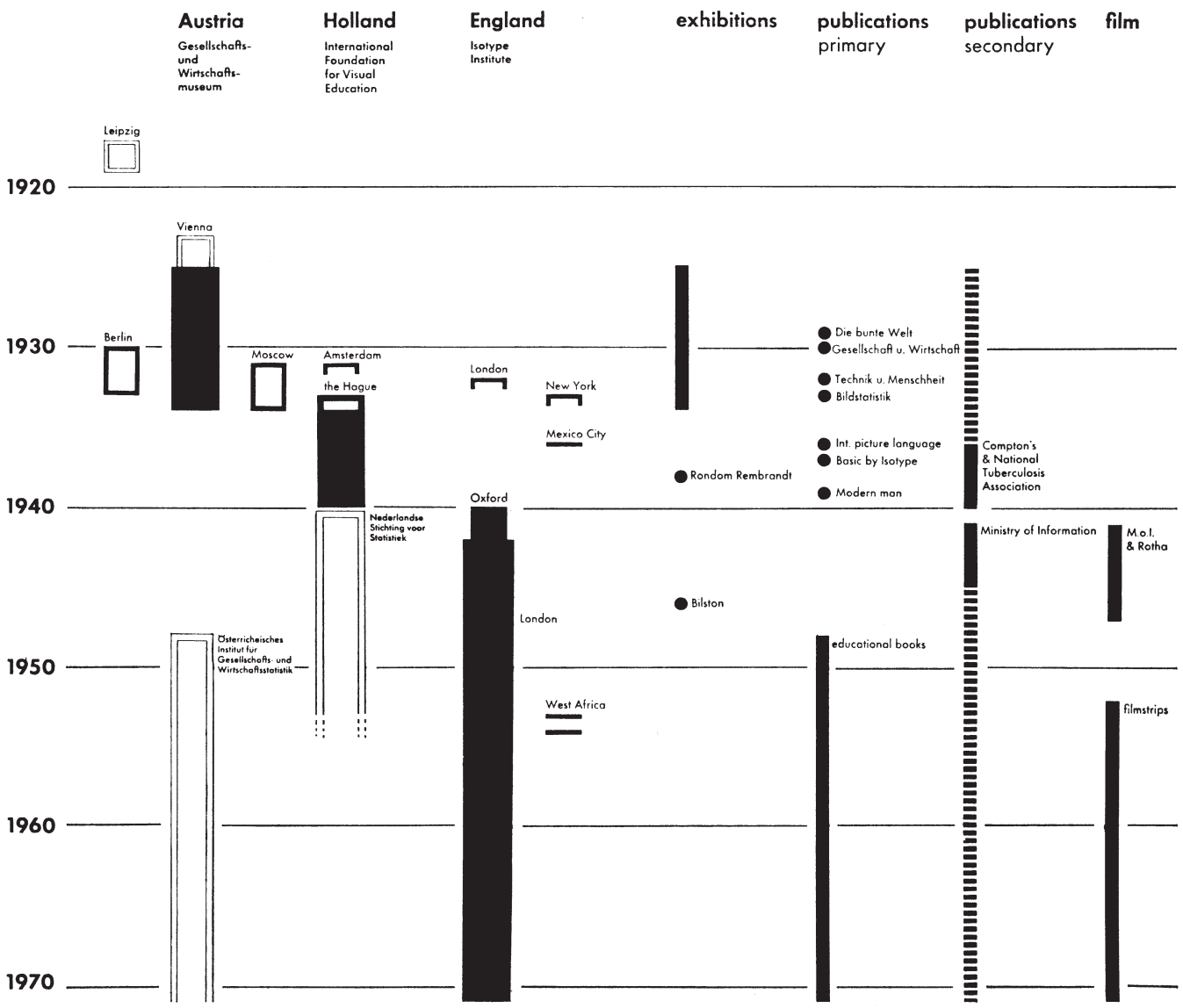
The Isotype Movement



The significance of Isotype

This exhibition marks the fiftieth anniversary of the founding of the Gesellschafts- und Wirtschaftsmuseum in Wien, a museum which was set up by Otto Neurath to explain to the general public of Vienna something about the social and economic issues of the day. This museum was the public arena in which the Vienna Method of pictorial statistics was developed, and out of it grew Isotype (International System Of TYpographic Picture Education). It was also fifty years ago that Marie Neurath (née Reidemeister), the longest working member of the Isotype team, began work at the Gesellschafts- und Wirtschaftsmuseum in Wien. It is a stroke of good fortune that an exhibition based on the Otto and Marie Neurath Isotype Collection, which was deposited in Reading University Library in 1971, could be organised in time to record this joint anniversary.

The story of Isotype is told very briefly in the exhibition itself and in the seven sections which form the catalogue of this publication. There is no shortage of information on the Neuraths and Isotype; some of those involved with the development of Isotype are still very active and, as a glance at the bibliography will reveal, much has already been written on the subject. This short essay attempts to do no more than draw attention to some of the most significant aspects of Isotype from the standpoint of the graphic designer. Those interested in Otto Neurath as a person and in his social and philosophical ideas are recommended to read Otto Neurath, *Empiricism and sociology*, edited by M. Neurath and R. S. Cohen (Dordrecht, Holland, and Boston, USA; 1973).

The term Isotype Movement has been used in connection with this exhibition to describe the activities and influence of Otto Neurath and his team and, after his death in 1945, those of Marie Neurath. This term is not altogether satisfactory, but since the word Isotype was not coined until the mid 1930s it is not strictly correct to use it on its own in relation to work produced before this time in Vienna and elsewhere. Seen from the standpoint of today the term Isotype Movement assumes an additional meaning because the principles of Isotype (or some of them) have been adopted by other designers, not all of whom have had direct links with Otto and Marie Neurath. On the other hand, it should be stressed that those who worked with Otto Neurath in Vienna in the 1920s would hardly have seen themselves as forming part of any large-scale movement. The approaches to graphic communication adopted in Vienna were very much the result of the enthusiasm, intelligence and tenacity of one man, and it is only retrospectively that they can be seen as forming part of an Isotype Movement.

Graphic design stemming from social needs

One of the most interesting aspects of the Isotype Movement is that it was begun by someone who was not trained as a graphic designer or artist. It is true that Otto Neurath gleaned all he could at an early age from the illustrated books and prints in his father's extensive library, but his only formal training in drawing was a course in perspective – an aspect of pictorial representation which he specifically rejected in Isotype work. What Otto Neurath did have, however, was the foresight to engage as team workers people such as Marie Neurath and Gerd Arntz who had received some visual training and were receptive to his general approach.

The brief biography of Otto Neurath on page 18 is sufficient to show that his formal education was primarily in the field of traditional academic subjects. When he was appointed director of a new Museum on War Economy in Leipzig towards the end of the First World War he would almost certainly have described himself – using the terminology of today – as a social scientist. It was in this capacity too that he became the General Secretary of a co-operative for one-family housing in Vienna and later, in 1925, director of the Gesellschafts- und Wirtschaftsmuseum in Wien. He therefore approached graphic design as it should be approached, as a means to an end rather than as an end in itself. The end as far as Otto Neurath was concerned was quite clear: to educate the people of Vienna and elsewhere in social and economic matters in order to pave the way for social change.

The Isotype Movement is, in my view, an excellent example of innovation in graphic design resulting from an attempt to meet social needs. A number of important developments in graphic design have stemmed from changes in society or attempts to change it, and have been associated with efforts to unify political or religious communities. Others have been associated with war and the need for efficient communication in battle – indeed, some of the most remarkable innovations in pictorial communication have been in maps, plans and charts designed for use in connection with war. But the Isotype Movement provides the best example I know

of graphic design innovations stemming from the need for social reconstruction.

In Austria after the First World War there was much that needed to be done. With the collapse of the old Habsburg Empire, Vienna and Austria as a whole were in difficult straits. They were deprived of resources, there were shortages of food and housing which threatened to undermine public health, and inflation was running at an alarming rate. It is against this background that we have to see Otto Neurath's contributions to graphic design. He wanted to bring to the man in the street an awareness of the social and economic issues of the time in Vienna, and to draw attention to these by making comparisons between the present and the past and between Vienna and other cities. 'When a Viennese citizen enters this museum,' wrote Otto Neurath of the Gesellschafts- und Wirtschaftsmuseum in Wien, '. . . he finds reflected his problems, his past, his future – himself. This does not mean that the museum limits itself to local interests; on the contrary, it provides the setting of world-historical relationships within which the individual discovers the decisive influences on his own fortunes. Take this matter of housing, for example: the aim is not to show what a particular building project looks like, but to help the citizen see the different types of homes that are included in the plan for the city's development, realize for what groups of the population these different types are intended, how they are going to modify the lives of people, to what extent they are going to help in improving health, reducing mortality – especially that of infants – and so on.'[1]

The central themes which concerned the Isotype Movement in its early days in Vienna – housing, health, social administration, and education – were also taken up in later periods and other countries. Health education, for instance, was taken up on an international front in the 1930s with the major publicity campaign to combat tuberculosis which was promoted by the National Tuberculosis Association of America. The theme of housing was returned to after the Second World War in England when Otto Neurath was involved with a housing project for Bilston Borough Council, and that of social administration in the charts explaining the Beveridge Plan and the campaign to show the people of the Western Region of Nigeria how their new Government and electoral system worked. The themes of housing, health, social administration and education were, of course, inextricably linked with one another and many Isotype charts were designed to show such relationships. A common factor in all of them was education. The interest in education runs right through the work of the Isotype Movement over a period of fifty years, and Otto and Marie Neurath must be seen as important pioneers in the field of visual education in a period which, initially, was not particularly receptive to the idea of learning through the eyes.

To those who are not closely connected with graphic design it may seem self-evident that a designer

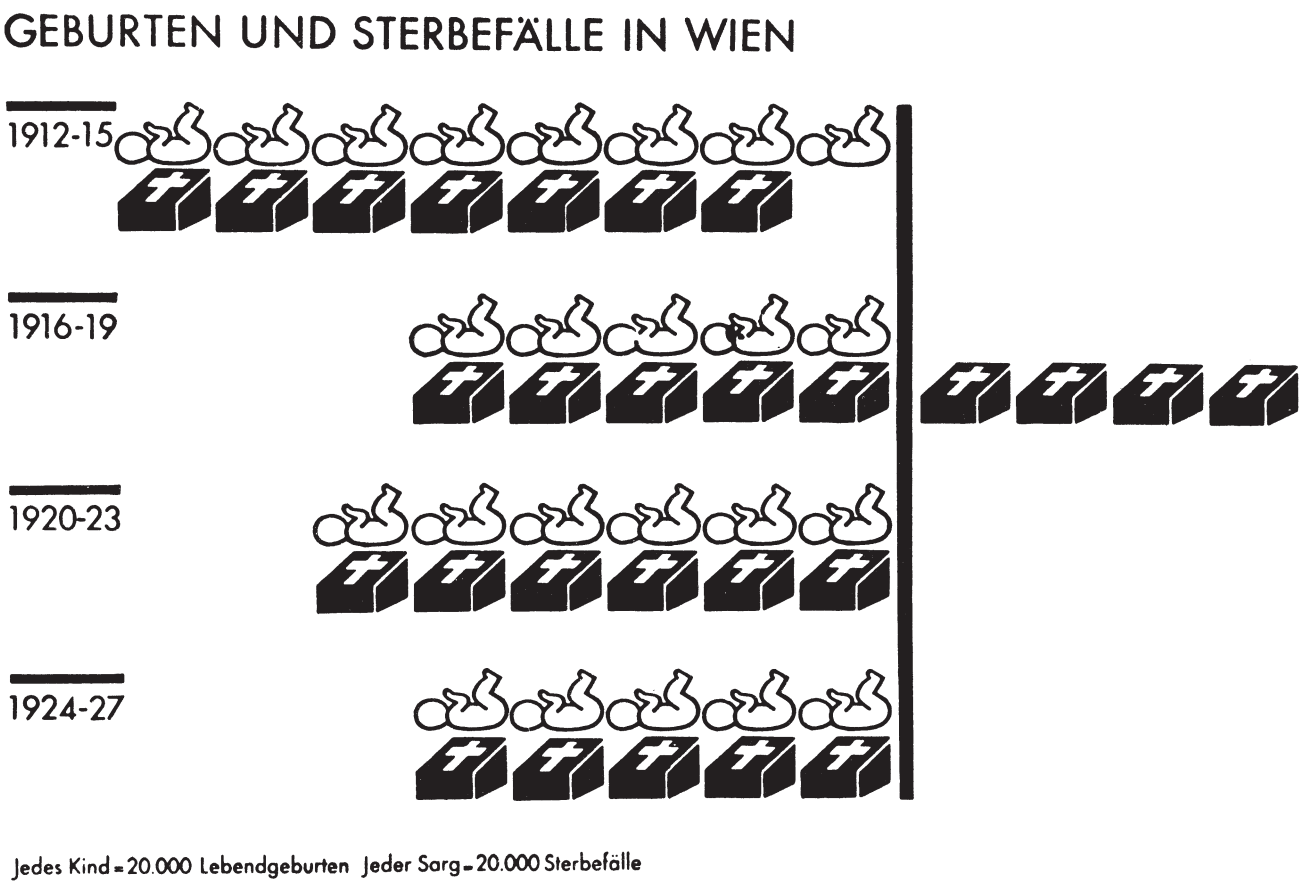


Chart design edby the Isotype team in Vienna in the 1920s, from *Bildstatistik nach Wiener Methode in der Schule* (Vienna, 1933)

should be concerned with fulfilling particular needs (and usually ones which have little or nothing to do with his desire to express himself); but this has not always been understood by designers. The significance of the Isotype Movement in this respect is that its members approached graphic communication with very clear objectives in mind and then set about trying to achieve them by a gradual process of trial and error. No passage in Otto Neurath's writing illustrates better his view that the designer should consider his responsibilities to society than a perceptive passage he wrote in connection with architecture in his book *Lebensgestaltung und Klassenkampf* (Berlin, 1928): 'The architect more than any other creative person must seek to anticipate the future. If he builds a house responsibly he must consider the changes of the immediate future, not only technical changes but also changes in the form of life.'[2]

Otto Neurath's belief in picture language

Otto Neurath made it quite clear in his writings that he saw picture language as an additional language – a helping language as he called it – to be used along with other languages according to circumstances. He recognised that there were some things that could not be said through pictures, and others that could be said only with great difficulty through them; but he also believed that in certain situations pictures could speak more clearly, and with a greater chance of their message being remembered, than numbers or words.

He strongly resisted the idea which prevailed at the time, and probably still prevails, that it is the written word that really matters and that pictures need not be taken very seriously. Throughout his life he was concerned with lucidity of expression in verbal language because he believed it was essential for effective communication; but he applied himself with equal dedication to the idea of lucidity of expression in visual language. He had come to grips with Basic English in order to write two small books for C. K. Ogden (*International picture language*, 1936; *Basic by Isotype*, 1937), and found much the same need for clarity of thinking when using picture language as when writing in Basic English: '. . . the picture language is an education in clear thought', he wrote, '– by reason of its limits.'[3] For Otto Neurath, picture language had a further advantage in that it was less emotive than verbal language because the images used had not acquired the overtones words had acquired.

The use of the acronym Isotype (International System Of TYpographic Picture Education) gives special emphasis to the international nature of picture language. This is, of course, an important aspect of picture language, and Otto Neurath's statement that 'pictures make connection, words make division' was primarily meant to underline the importance of picture language in an international context. The value of picture language has since been demonstrated in certain specialised fields internationally, such as road signs and the symbols associated with international travel; it is also true to say

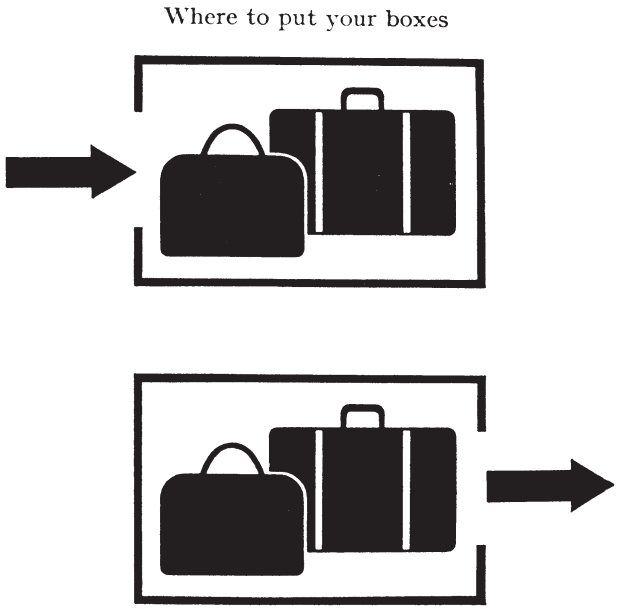


Illustration from Otto Neurath, *International picture language* (London, 1936)

that some of the difficulties involved in the use of any kind of international language are now better understood than they were forty years ago.

The usefulness of picture language from the point of view of international communication should not obscure its other, perhaps rather more important, attributes in terms of 'making connections'. Otto Neurath believed that picture language was effective across a wide range of ages and abilities and that a good pictorial chart could speak as clearly (though probably at different levels) to a young child as to an intelligent adult. As a member of the Vienna Circle and, later, founder of the Unity of Science Movement he also saw picture language as helping to satisfy the need for a common approach to knowledge which bridged the various specialist branches of learning. Moreover, he saw that the structure of picture language gives it some advantages over verbal language – which has to be linear when spoken and is nearly always presented in a linear manner when written. In picture language information can be presented in a linear fashion if need be, but it can also be presented in many different ways so that the user can make comparisons and see relationships between things more easily. Isotype, Otto Neurath claimed, '. . . makes use of the connection of parts not in one direction only, but in two, and the effect is a *language picture*.'[4]

In many ways the opportunity picture language offers for the making of comparisons was central to Otto Neurath's interest in it. On the simplest level, the visual presentation of two lines of quantities allows someone to see for himself that one item is bigger than another. On a higher level, whole patterns of growth can be compared one with another by reading visual 'profiles'. On the most complex level of all, as in *Gesellschaft und Wirtschaft* (1930), complete charts can be designed in

series so that they can be compared in a number of different ways. What is more, picture language facilitates the economic, geographic, historical, and social correlations favoured by those concerned with the unification of science.

The evolution of a syntax

Pictures had been used for the purpose of conveying information long before the development of Isotype. Picture language preceded the evolution of writing and a number of societies developed their own sets of rules in order to aid communication through pictures. Since the evolution of alphabetic writing in the western world pictures have, generally speaking, played a subordinate role to writing as far as communicating information is concerned. It is true that until the middle of the nineteenth century paintings usually told a story of some kind and relied on conventions of symbolism, composition, gesture and facial expression to convey their meaning; but there were few attempts to build up comprehensive picture languages before the present century. Comenius was not concerned with the structure of pictorial language, and even William Playfair, who developed a visual approach to the representation of quantities in the late eighteenth century which he called 'lineal arithmetic', does not appear to have adopted any firm conventions of treatment. Similarly, the numerous nineteenth- and early twentieth-century designers who presented statistics and other information through pictures appear not to have considered the need to work out overall approaches. By the end of the nineteenth century many novel approaches had been adopted in the field of picture language but, in general, it was as chaotic as written language was in pre-classical times when early Greek and Latin characters assumed a variety of orientations and the direction of reading and writing were not fixed.

The real significance of Otto Neurath's contribution in the field of picture language is that he saw the need to establish a set of conventions in order to make communication easier and more effective. These conventions were developed over a number of years and were only settled upon after being tested thoroughly through use. However, two basic rules were formulated almost from the beginning of the Isotype Movement. The first of these related to the presentation of statistics by means of pictures and held that a sign should be used to represent a certain amount of things and a greater number of such signs a greater amount of things. The second was a general rule that perspective should not be used. Perspective involves making objects of the same size smaller or larger according to their distance from the viewer, which means that they cannot easily be quantified; when something needed to be shown in three dimensions the Isotype team used models or isometric drawings. In accepting these two basic rules Otto Neurath was returning to the conventions of some of the earliest formalised systems of communication, and particularly to Egyptian wall painting and hieroglyphs which had influenced him profoundly. Thereafter a number of other rules and conventions were established by Otto Neurath and his

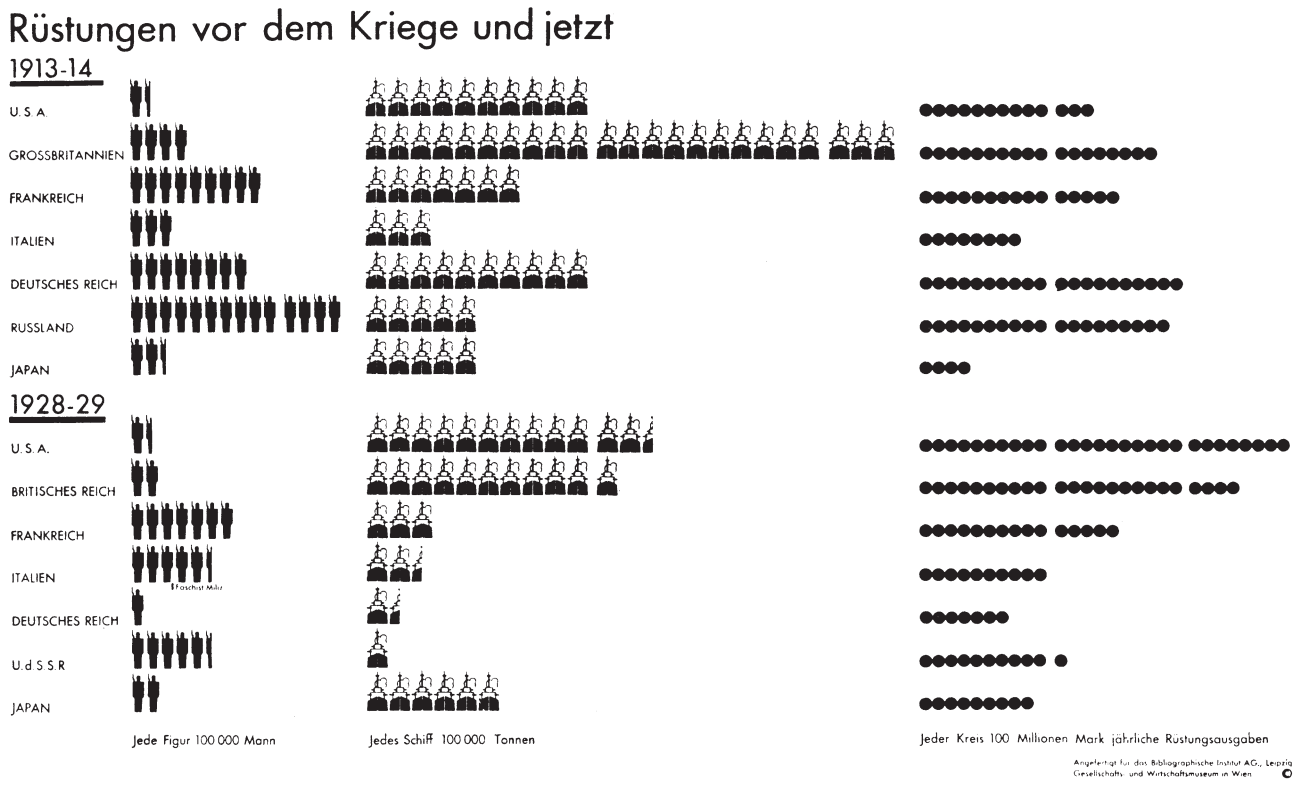


Chart from *Gesellschaft und Wirtschaft* (Leipzig, 1930)

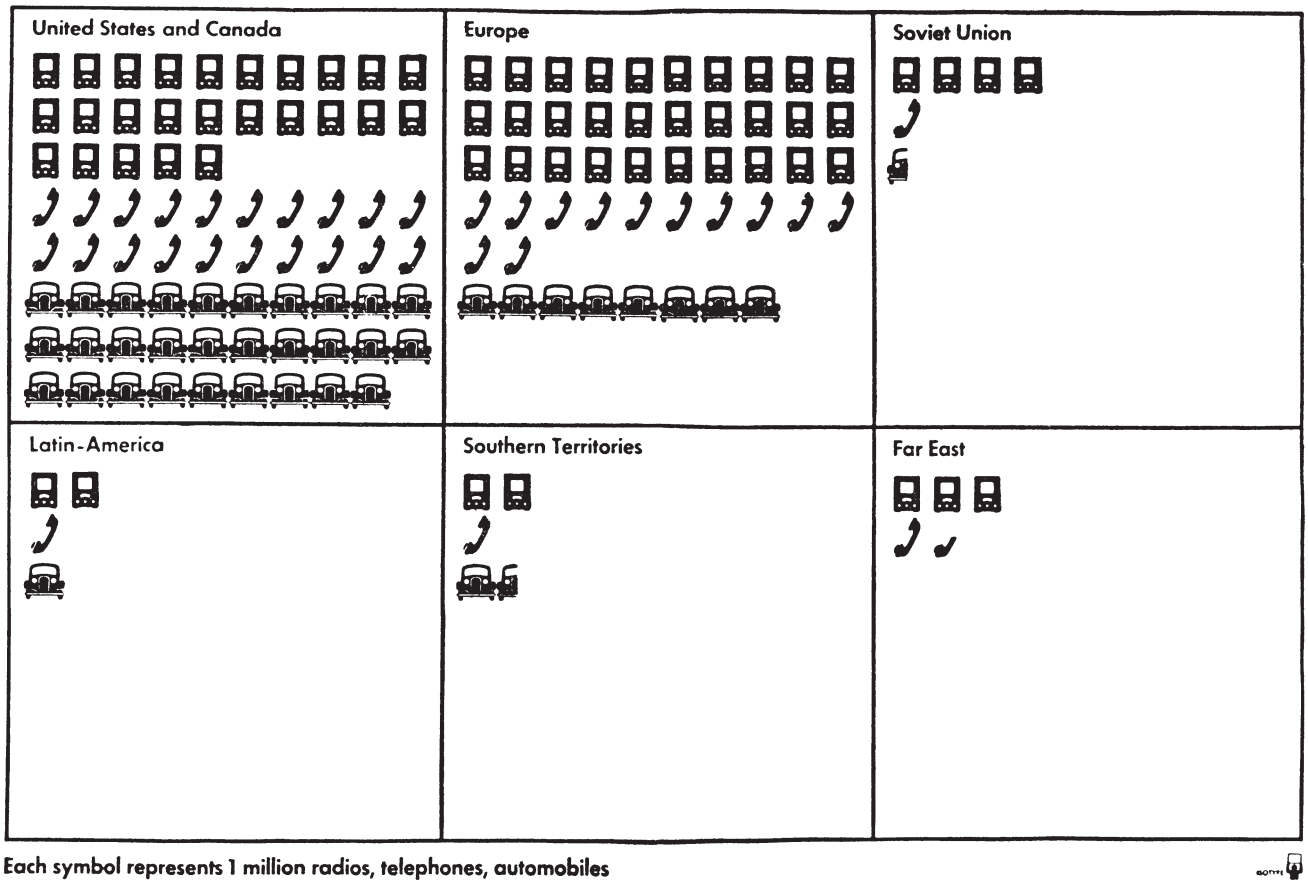


Chart from Otto Neurath, *Modern man in the making* (London & New York, 1939)

team. They are described briefly in the section of the catalogue called 'Principles of Isotype', and in more detail by Otto Neurath in his book *International picture language*.

Some people may feel that conventions of the kind adopted by the Isotype Movement limit freedom of expression unnecessarily; but consistency in approach is as desirable in picture language as it is in any communication system. Consistency helps the user to understand the meaning of a message because it allows him to get used to the way in which information is structured; it speeds up the assimilation of information; it enables comparisons to be made between work produced in different places and at different times; and it leads to an overall approach to the structuring of information which makes it possible to deduce meaning through context and treatment in much the same way that meaning is frequently deduced in verbal language. From the producer's point of view, consistency of treatment is also welcome because it simplifies the process of making marks and cuts out unnecessarily repetitious decision-making; moreover, it allows people to work more effectively in teams, which is essential if any large-scale enterprise is to be undertaken.

Some of the conventions adopted by Otto Neurath were modified over the years in the light of experience, and he made it clear that they were not necessarily good for all time. The overriding consideration was to design something that worked, and Marie Neurath found it necessary to modify some of the conventions which had been developed for use in Europe when she came to design material for use in the Western Region of Nigeria. This is not an indication of the weakness of the Isotype system; on the contrary, it emphasises that, like all effective languages, it has a basic structure which is strong enough to withstand modification.

Organisation of the team

In its heyday in Vienna in the late 1920s and early 1930s the Isotype team consisted of some twenty-five people, which is large for a graphic design team even by present-day standards. Otto Neurath was the inspirer, publicist, and key thinker of the Movement, but he remained closely involved with all the work being undertaken and was ready to be consulted on any matter, however trivial it may have seemed. The other members of the Isotype team in this period can be considered as falling into four main groups. First, there were the economists historians, and statisticians who collected all the data; second, the 'transformers' who were responsible for organising the information in visual terms so that it could be understood easily; third, the graphic artists who drew the symbols and other artwork and made final decisions relating to the placing of elements on a

chart; fourth, the technical assistants who did such things as paste down symbols, spray flat areas of colour, print, take photographs, make models, colour lantern slides.

Otto Neurath was successful in establishing an organisational approach to design which is interesting for two main reasons. In the first place, the actual structure of the team clarified the stages in the process of designing and introduced precise points when work could be evaluated and, if necessary, modified. Secondly, the formulation of graphic rules and conventions which could be taught enabled his team to work as a whole and led to consistency of treatment even though changes were made in the composition and size of the team. In establishing such a clear procedure and sets of rules in design work the Isotype Movement was doing what most design teams today accept as essential when undertaking large-scale design commissions.

The transformer played a central role in the Isotype team and this was one of the outstanding innovations of the Movement. The transformer occupied a position in the design process between the scholars who collected the data and the graphic artists who were responsible for the actual marks made on paper. He or she was a kind of visual editor. The task of the transformer was to organise the information so that it was presented as effectively as possible and was in accord with Isotype conventions. In the case of series of charts, it also involved organising the information in such a way that comparisons could be made between charts. Otto Neurath has described the transformer very aptly, and with characteristic social awareness, as the 'trustee of the public'. The transformer needed to be able to make judgements about the information itself and to have the visual ability (though not necessarily the manual skills) to find appropriate visual forms for it. At the outset Otto Neurath provided the data, made the transformations himself, and then handed them over to free-lance artists; but as he built up his team these

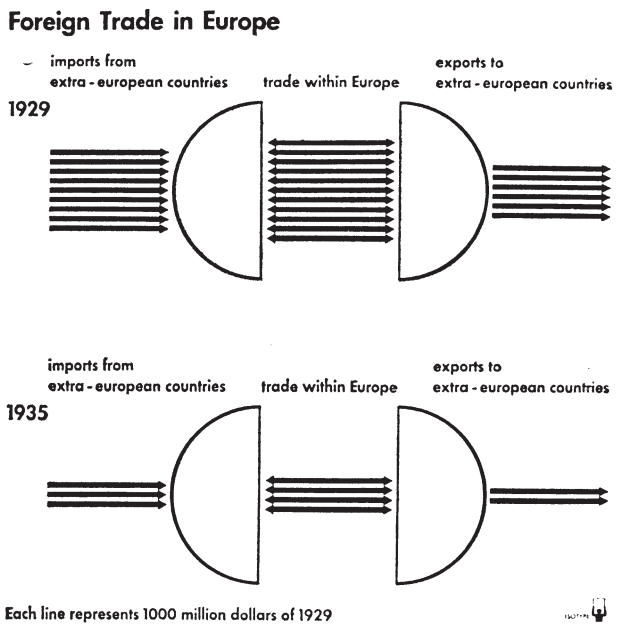


Chart from Otto Neurath, *Modern man in the making* (London & New York, 1939)

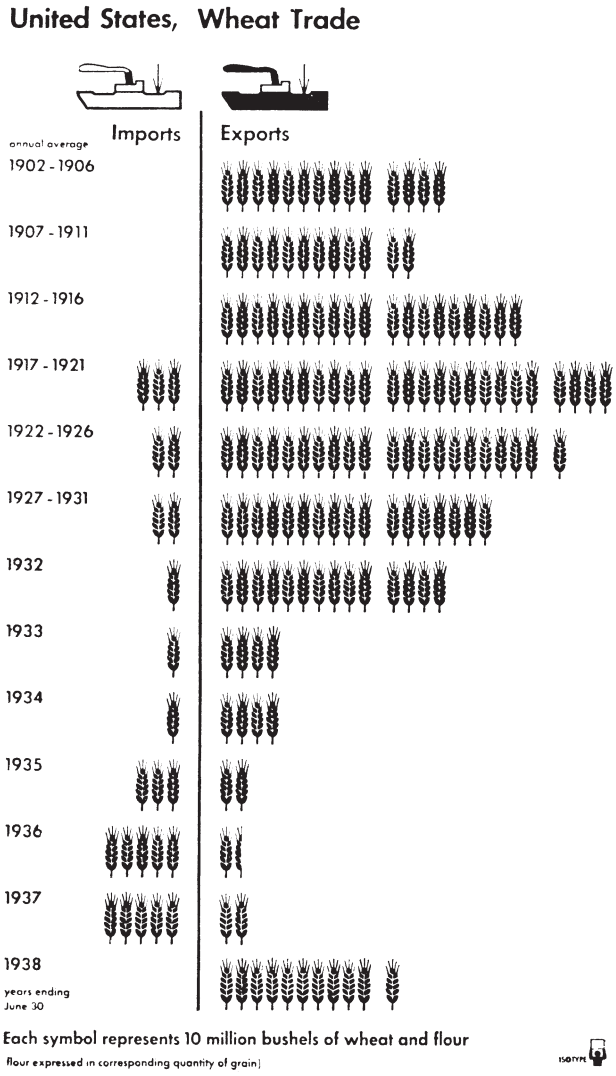


Chart from Otto Neurath, *Modern man in the making* (London & New York, 1939)

roles were taken over by a number of different people. Marie Neurath and Friedrich Bauermeister were the two transformers in the Isotype team in the 1920s. Marie Neurath, who was trained as a physicist and mathematician, and then spent a term at art school, was the team's longest working and most experienced transformer. She made all the transformations for *Gesellschaft und Wirtschaft* (1930) and for many other important publications. She worked closely with Otto Neurath for twenty years and after his death in 1945 carried on with the work in hand. In later years, when the team was very much smaller, she worked as he had done at the outset of the Movement, undertaking both the gathering of the information and the transforming.

The design of Isotype charts

When looking at Isotype charts today one is first struck, I think, by their modernity of appearance; and this impression is reinforced when charts designed for other publications, such as those in *Compton's pictured encyclopedia*, are seen in the context of typical graphic

design of the period. Why is this so? The answer lies, I believe, in the fact that the Movement was never really interested in style for its own sake, but was always mainly concerned with imparting information as simply and directly as possible. In settling on a pictorial approach to communication in the first place Otto Neurath believed he had found a language which had something of the unemotive quality of numbers, but which was fascinating enough to interest the layman. He was concerned that nothing should be included in a chart that was not essential to its meaning because he felt the inclusion of anything else might distract from the message and destroy its overall neutrality. The organisation of the various parts of a chart and their relationship to one another were determined entirely by the nature of the information and the people for whom it was intended. Otto Neurath's approach to graphic communication was therefore non-decorative, and it stemmed from the functionalist views on design of the period. All the same, the very best work of the Isotype Movement has a visual quality which justifies the use of the phrase 'the beauty of necessity' – an expression arising from the description by George Sturt of the attributes of a well-designed waggon.

Some visual features of Isotype charts stem from the clarity of thinking that underlies all Isotype work. For instance, the practice of ranging two sets of groups of items which have to be compared with one another along a central (vertical) axis, arises from the nature of the data. I know of no precedent for this Isotype practice, though it is one which is now widely adopted in typography. It is clear that this and other Isotype innovations were made only after considering a number of possibilities and trying them out. Members of the Isotype team had little or no formal training in the traditional methods of graphic communication, which meant that they were in a good position to think things out for themselves; and this is precisely what they did. In this respect the Isotype Movement deserves to be considered as one of the pioneers of modern graphic design. In my view it occupies much the same position in relation to pictorial communication this century as the pioneers of the New Typography do to verbal communication.

Otto Neurath was, of course, well aware of what was happening generally in the field of design in other parts of Europe. He travelled widely in connection with his work, visited exhibitions, and read voraciously (at one stage he estimated that he read on average two books a day). He was in fairly regular contact with the staff of the Bauhaus at Dessau through his own work and through the lectures he gave there as a visitor. He knew El Lissitzky personally, and Jan Tschichold, one of the father figures of the New Typography, worked with the team for a very short period while *Gesellschaft und Wirtschaft* (1930) was in preparation. He was also very quick in adopting Paul Renner's newly designed sanserif typeface, Futura, for all Isotype charts. The views on design of members of the Bauhaus were certainly well known to Otto Neurath because he poked fun at some of their approaches to architecture; it is hard to believe therefore that a man of his intense curiosity and love of discussion did not pick up something of the ideas of those associated with the New Typography. Though the precise dates of Tschichold's involvement with the Isotype Movement are not known, he was working with the team (in a fairly peripheral capacity) shortly after his seminal book *Die neue Typographie* (Berlin, 1928) was published.

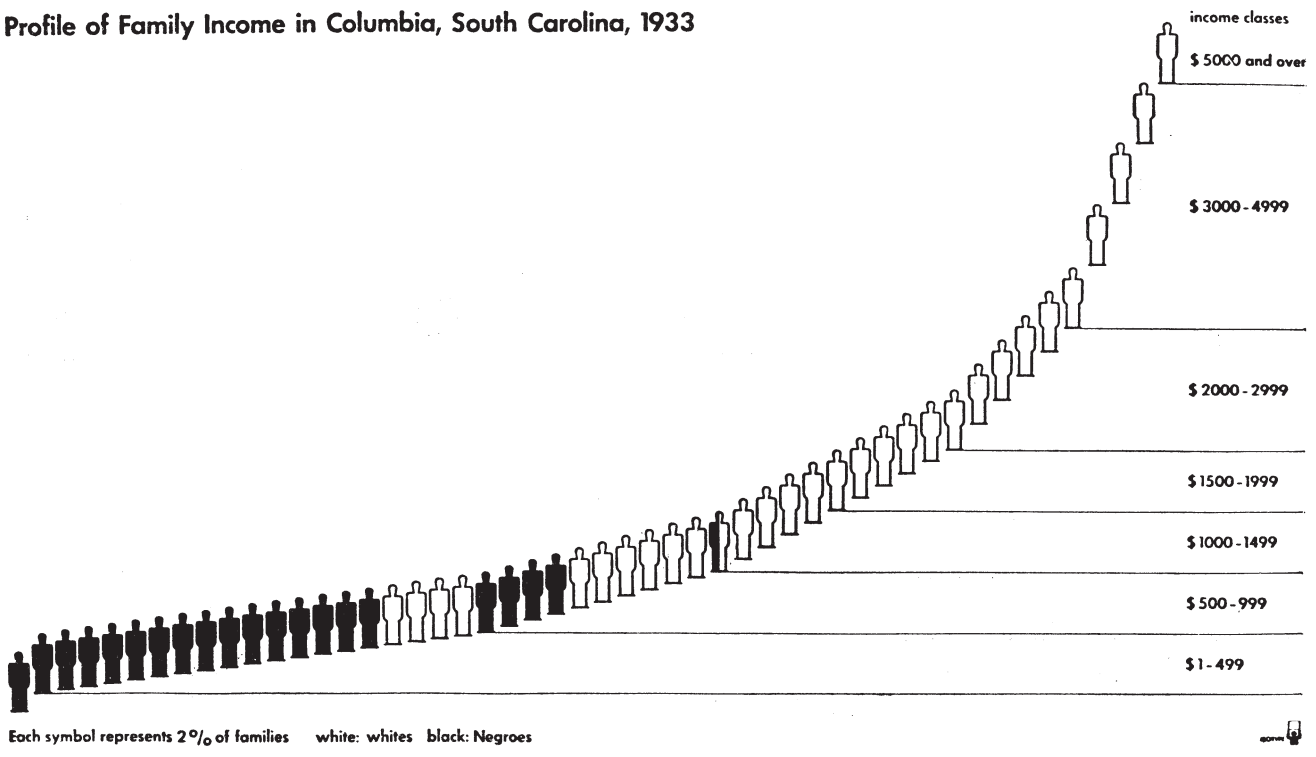


Chart from Otto Neurath, *Modern man in the making* (London & New York, 1939)

The key period for the development of the characteristic Isotype approach to the design of charts was the late 1920s when the team was concentrating attention on its most ambitious publication, *Gesellschaft und Wirtschaft* (Leipzig, 1930). The importance of the contributions of Marie Neurath, who was responsible for the transformations of all charts for this publication, and of Gerd Arntz, who joined the team on a full-time basis in 1928, should be mentioned here. Much of the quality of the work of the Isotype Movement from a visual point of view was due to them, and Otto Neurath's debt to them is explicitly and generously acknowledged in his book *Modern man in the making* (New York and London, 1939).

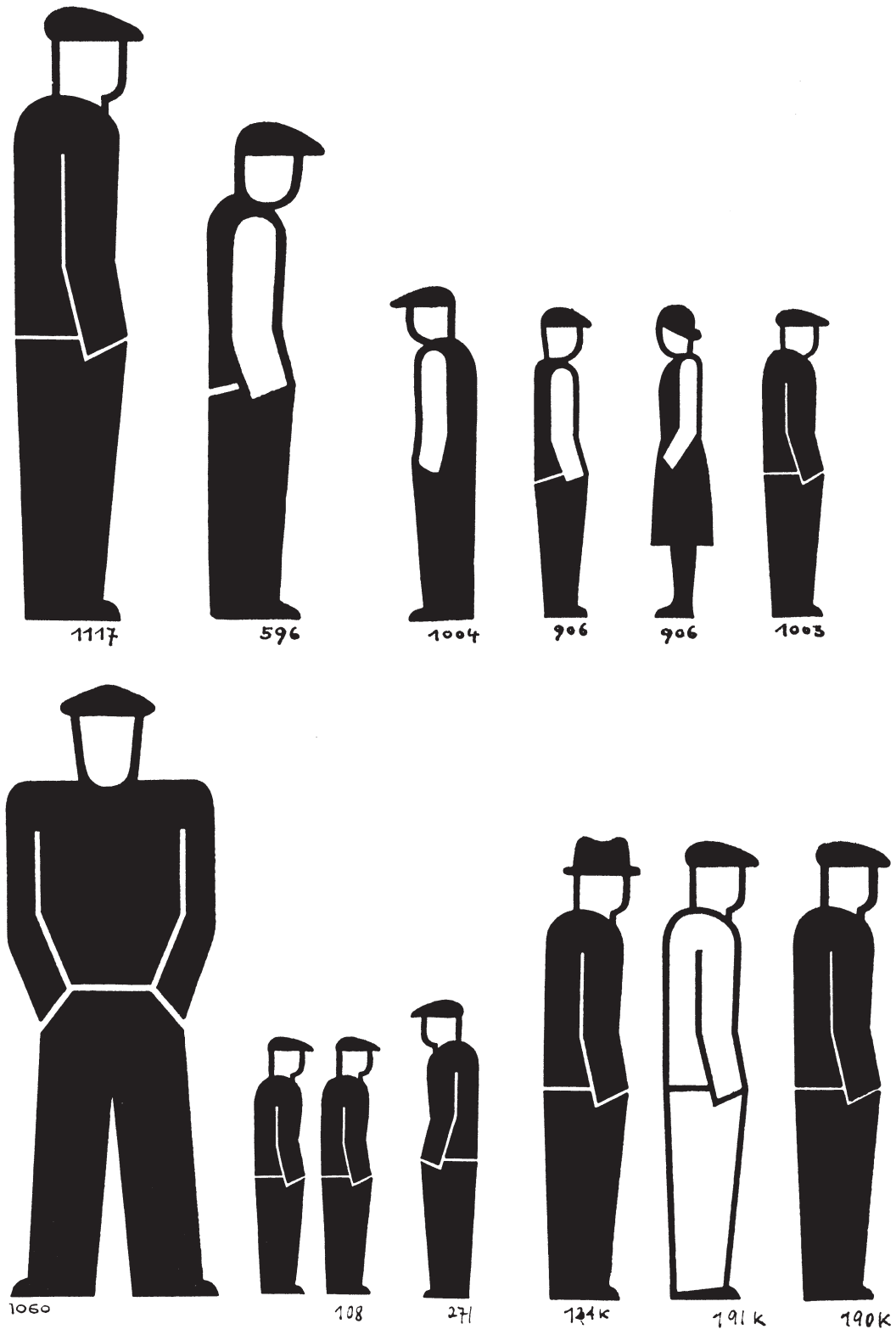
The visual quality of Isotype work is difficult to describe, and can probably be fully understood only by those who have tried to produce similar things themselves. It is seen most obviously in the way in which the elements of a chart are spaced so that the viewer is helped to 'read' the information in the way or ways that were intended. It is also seen in the drawing of the symbols, which show the importance of selecting essential characteristics and suppressing inessential ones, and in the choice of colours and tones. Like work of quality in any field, however, Isotype charts have a beguiling simplicity which conceals the time and effort that must have gone into their production.

The design of the symbols which appeared on Isotype charts from the late 1920s onwards was the joint work of Otto Neurath and Gerd Arntz. Otto Neurath had seen some of Arntz's woodcuts in an exhibition in Düsseldorf in 1926. These prints included a variety of highly simplified figures, drawn more or less in silhouette, and Otto Neurath realised at once that Arntz was the person he wanted to produce the symbols for his charts. Previously the symbols had been drawn by hand or cut out of paper, but soon after Arntz became involved with the Isotype Movement they were produced from lino-cuts. For a few years Arntz's contribution to the team was limited to the sending of work to Vienna, but in 1928 he joined the team on a full-time basis and had special responsibility for the design of the symbols.

Great care was taken to make sure that the symbols could be easily recognized, were distinguishable from one another, and that they could be placed happily side by side in rows. Emphasis was given to those characteristics which revealed the nature of the object, animal, or person being represented, while still keeping in mind the need for simplicity and dignity in the silhouette of the symbol. In addition, outline versions were needed and some symbols had to carry other symbols to qualify their meaning. The fact that Isotype symbols are so simple, even inevitable looking, reflects great credit on their designers. The outsider viewing Isotype symbols today is usually quick to remark on the changes in the forms of cars, aeroplanes, and dress since the 1920s, and it is true, of course, that symbols for some things tend to date quickly – and much more quickly than words. Otto

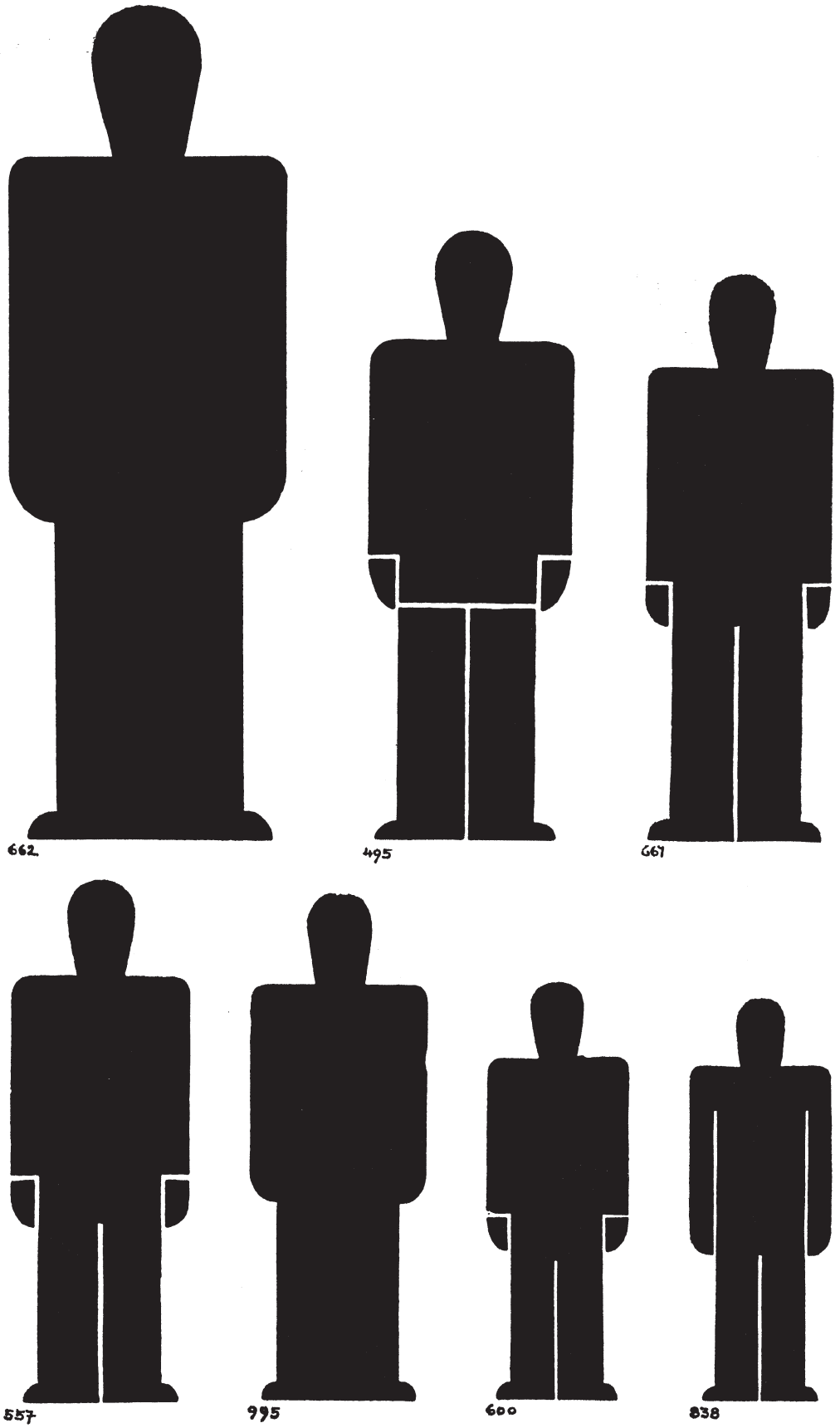
Woodcut by Gerd Arntz, 1926

Arbeitsloser



Sheet from the Symbol Dictionary compiled between about 1928 and 1940

Mann



Sheet from the Symbol Dictionary compiled between about 1928 and 1940

Neurath was well aware of this and wrote '. . . the Isotype signs are dependent on their times like all these old sign-languages. Later times will see what their special qualities are and what the conditions were which made them.'[5] On the other hand, the briefest survey of a selection of symbols in use today for 'man' and 'woman' shows how trivial and lacking in authority symbols can be when the main consideration is to look modern, and emphasises how intelligently Isotype symbols were designed.

Influence

In one sense the influence of the Isotype Movement has been wide and can be seen today by anyone who travels, reads newspapers and magazines, looks at television, or is familiar with the kind of work done by children in schools. Some of the methods of graphic communication developed by the Isotype Movement are now accepted as part of the currency of graphic language, though they are rarely used as sensitively or intelligently as they were by Otto Neurath and his team. There are also a number of bodies still active today which stem directly from the Isotype Movement (see the catalogue section 'Influence of Isotype'). But for all the general influence it has undoubtedly had, the pioneer work done by Otto Neurath and his team in Vienna in the 1920s has for the most part been forgotten.

Those who have heard of the Isotype Movement usually know its work in the field of international symbols. But though the International Organization for Standardization has been concerned in recent years with rationalising symbols for international use, in general, the essential message of the Movement that there should be standard ways of representing things has been ignored. What can be more irresponsible in this context than the re-design every four years of a new set of symbols for the Olympic Games? Some designers cannot resist inventing new symbols; and in recent years the need for a clearly understood graphic language which is retained and reinforced through learning from one Games to the next has been ignored because of national pride and design arrogance.

The lasting influence of the Isotype Movement is probably seen most clearly in the field of graphic statistics. During and immediately after the Second World War statistics were quite frequently presented in the form of Isotype charts; and in more recent years new approaches to teaching and learning and the increasing use of visual media generally have been responsible for a revival of interest in graphic statistics.

The development of an international means of communication based on the use of standard symbols, and the presentation of statistics by the repetition of units which stand for particular quantities, form only a relatively small part of the Isotype contribution to graphic communication. The major undertakings of the Isotype Movement, *Gesellschaft und Wirtschaft* (1930), the exhibition 'Rondom Rembrandt' (1938), Otto Neurath's book *Modern man in the making* (1939), and the series of schoolbooks *Visual history of mankind* (1947-8) all extend the range of graphic language in different ways. *Gesellschaft und Wirtschaft* showed, among other things, the possibility of producing a co-ordinated series of charts which can be compared one with another in a number of different ways; 'Rondom Rembrandt' demonstrated the value of using graphic approaches in an historical field which, at first sight, might have seemed unsuited to them; *Modern man in the making* was conceived in terms of a thorough integration of text and charts; and *Visual history of mankind* revealed the value of intelligently selected and accurately drawn images as a basis for discussion and learning in schools. The real lessons of the Isotype Movement are probably to be learned only after a careful study of such major undertakings which show the importance of the team's general approach to design. This is the most significant contribution of the Movement and, in my view, is likely to prove the most influential in the long run.

The output of the Isotype Movement as a whole draws attention to two things which are of special interest to many designers today. First, it demonstrates that successful designing depends to a large degree on clarity of thinking; secondly, it provides support for the view that the graphic designer's primary role is to serve the needs of society. These points were made more succinctly by Lancelot Hogben in a review of Otto Neurath's *Modern man in the making* when he described it as combining 'all that is best in Descartes and the *Daily Mirror*'.

Michael Twyman

---

1 'Museums of the future', *Survey graphic*, vol. 22, no. 9, 1933
2 Translated and reprinted in Otto Neurath, *Empiricism and sociology*, edited by M. Neurath and R. S. Cohen (Dordrecht and Boston, 1973), p. 257
3 *International picture language* (London, 1936), p. 22
4 Ibid, p. 62
5 Ibid, p. 106