Exhibit 1
MAPS AN
THEORII

Books in the Imagining nature series throughout by their titles only.
1.2 Of exactitude in science

... In that Empire, the craft of Cartography attained such Perfection that the Map of a Single province covered the space of an entire City, and the Map of the Empire itself an entire Province. In the course of Time, these Extensive maps were found somehow wanting, and so the College of Cartographers evolved a Map of the Empire that was of the same Scale as the Empire and that coincided with it point for point. Less attentive to the Study of Cartography, succeeding Generations came to judge a map of such Magnitude cumbersome, and, not without Irvorrence, they abandoned it to the Ri-gour of Sun and Rain. In the Western Deserts, tattered fragments of the Map are still to be found, sheltering an occasional Beast or beggar; in the whole Nation, no other relic is left of the Discipline of Geography.

From Travels of piousworthy man (1658)
by J. A. Suárez Miranda
(Jorge Luis Borges, A universal history of infancy, 1975, p. 131)

As we experience space, and construct representations of it, we know that it will be continuous. Everything is somewhere, and no matter what other characteristics objects do not share, they always share relative location, that is, spatiality; hence the desirability of equating knowledge with space, an intellectual space. This assures an organization and a basis for predictability, which are shared by absolutely everyone. This proposition appears to be so fundamental that apparently it is simply adopted a priori.

A. H. Robinson & B. B. Petchenik, The nature of maps: essays towards understanding maps and mapping, 1976, p. 4

Malcolm Lewis, a historical geographer, has made some interesting suggestions about the relationship between language and spatial consciousness:

Unlike the 'here and now' language of the other higher primates, human language began to bind 'events in space and time within a web of logical relations governed by grammar and metaphor'.* Wittgenstein's proposition that 'the limits of my language mean the limits of my world' remains valid.† One could go further and say that the origins of language and the growth of spatial consciousness in man are closely interrelated. The cognitive schema that underlay primitive speech must have had a strong spatial component. Not all messages were spatial in content or manifestation, but many would have been, and these would have helped to provide the structural as well as the functional foundations of language. It has been argued that these foundations helped to promote

the ability to construct with ease sequences of representations of routes and location... Once hominids had developed names (or other symbols) for places, individuals, and actions, cognitive maps and strategies would provide a basis for production and comprehension of sequences of these symbols... Shared network-like or hierarchical structures, when externalized by sequences of vocalizations or gestures, may thus have provided the structural foundations of language... In this way, cognitive maps may have been a major factor in the intellectual evolution of hominids... Cognitive maps provided the structure necessary to form complex sequences of utterances. Names and plans for their combination then allowed the transmission of symbolic information not only from individual to individual, but also from generation to generation.‡


This apparently fundamental role of space in ordering our knowledge and experience raises two different, but related, kinds of difficulties in exploring the nature of maps. Firstly it is difficult to explain the nature of maps without resorting to map-like structures in the explanation. This difficulty is a consequence of the inherent spatiality of maps, the very reason that they are so often employed as a base metaphor for language, frameworks, minds, theories, culture and knowledge. The second difficulty is that while spatiality may indeed be fundamental to all cultures, what actually counts as the 'relative location' of particular objects may not be quite so basic and may constitute one of the variables that differentiate the way cultures experience the world. That is to say, in any culture, what counts as a natural object and its spatial relations, rather than being an invariant characteristic of the world, may instead form part of that culture's world view, episteme, cognitive schema, ontology, call it what you will.

Those who are imbued with what is sometimes called ‘the Western world view’ think of objects as having fixed characteristics and defined boundaries (see Putting nature in order, pp. 48–53) and as having a position specifiable by spatial co-ordinates (see Imagining landscapes, p. 60). It may well be that Western ontology is in part reinforced by the centrality of maps in Western thinking and culture. Therefore, because of this possible circularity, one must be careful not to take one’s own view as definitive of all maps.

There are many notoriously problematic issues, as well as some unexplored ones, bound up in such questions as ‘What is the relationship between the map and the territory?’ and ‘When is a map not a map but a picture?’. Many of these problems are reflected in the apparent cogency of Korzybski’s dictum ‘The map is not the territory’ (Science and sanity, 1941, p. 58). After all, if the map were identical with the territory it would literally be the territory. It would have a scale of an inch to the inch and, apart from anything else, it would be unworkable as a map since you would have to be standing on it or in it. Lewis Carroll described such a map in Sylvie and Bruno concluded. In this fantasy, a Professor explains how his country’s cartographers experimented with ever larger maps until they finally made one with a scale of a mile to a mile. ‘It has never been spread out, yet’, he says. ‘The farmers objected: they said it would cover the whole country, and shut out the sunlight! So now we use the country itself, as its own map, and I assure you it does nearly as well.’

Two general characteristics of maps emerge from such seemingly whimsical examples as Jorge Luis Borges’s cartographic empire (see item 1.2) and the Bellman’s blank chart (see item 1.3). Firstly, maps are selective: they do not, and cannot, display all there is to know about any given piece of the environment. Secondly, if they are to be maps at all they must directly represent at least some aspects of the landscape.

We may divide the types of representation in maps into two different types: iconic representation (which attempts to directly portray certain visual aspects of the piece of territory in question) and symbolic representation (which utilises purely conventional signs and symbols, like letters, numbers or graphic devices). For example, look at item 6.1 and try to distinguish those elements of the map which are representational (iconic) from those which are entirely reliant on arbitrary convention (symbolic).

J.B. Harley and David Woodward have recently proposed an all-embracing definition of maps: ‘Maps are graphic representations that facilitate a spatial understanding of things, concepts, conditions, processes, or events in the human world’ (J.B. Harley & D. Woodward (eds), The history of cartography, vol. 1, 1987, p. xvi). For our purposes we can take a working definition of a map as a graphic representation of the milieu, containing both pictorial (or iconic) and non-pictorial elements. Such representations may include anything from a few simple lines to highly complex and detailed diagrams.
Exhibit 3
MAPS AN PICTURE

3.1
Bedolina petroglyph, Valcamonica.

3.2
Giedighe petroglyph, Valcamoni

3.3
Wall painting at Çatal Hüyük
Before we attempt to discuss the difference between maps and pictures, we need to look again at the question 'What is a map?'. It is claimed that the Bedolina and Giadighe petroglyphs at Valcamonica (2500 BC) (ITEMS 3.1 and 3.2), and the wall painting at Çatal Hüyük (6200 BC) (ITEM 3.3) are amongst the oldest examples of maps. Exactly how old they are is really not important since they are old enough that we have no direct knowledge of the culture in which they were made. What is it that makes it reasonable to claim they are maps? What do we mean when we say they look like maps?

They appear to portray a particular landscape. They have a partly plan-like character, that is, they seem to have a bird’s-eye viewpoint. They appear to be only partly iconic, having some symbolic elements with a degree of regularity. We can read the petroglyphs as showing paths, fields, houses and people. Beyond this it is difficult to speculate, since we have no clue as to the purposes of those who drew them. The question of purpose seems crucial, because we would be less willing to call them maps if they clearly had a pictorial, religious, ritual, symbolic or magical function. Yet these different functions need not be incompatible.
In the case of the two clay tablets from Nippur (1500 BC) and Nuzi (2300 BC) (items 3.4 and 3.5), though they are of great antiquity, we assume that the cultural continuity and similarities with our own notions of maps are sufficient to identify them as such. They appear to have the clear purpose of representing an identifiable piece of landscape. What features on the tablets would lead to this conclusion?
"What a picture is" is probably one of those deceptively simple questions that philosophy can never answer, but perhaps we can settle on a couple of points. Many pictures are presumably representations of a particular subject or part of the landscape from a particular point of view. The point of view is taken as having at least some significance and may indeed be the dominant aspect of the picture. Whereas maps, though they have a point of view in the sense that they are representations of parts of the landscape, deny or suppress that point of view. This is one of the conventions which we described in Exhibit 2 as 'transparent'. Maps have been thought to be objective in that they are independent of the view of a particular observer. This reveals another of the reasons that theories are held to be analogous to maps:

Theoretical understanding is supposed to disengage us. Theoretical understanding is nonperspectival and therefore treats all locations in space or time as theoretically equivalent (it allows no epistemological privilege to any spatiotemporal framework).

Joseph Rouse, *Knowledge and power: toward a political philosophy of science*, 1987, p. 70

However, as we shall see, this notion of maps as non-perspectival representations will not do. It is not just that maps do have a perspective, or that the perspective is taken for granted, it is rather that the disengagement hides the privileging of a particular conceptual scheme. Maps, in this sense, are pictures. They are pictures with different and additional functions and purposes to those of perspectival representation. Pictures may sometimes be entirely subjective, but maps, to be capable of transmitting information, have to be intersubjective.
4.1

Chippewa Indian land claim presented to the US Congress in 1839.

This is the leading inscription, and introduces the relation to the President.

No. 1. A picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation. The Indian is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 2. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 3. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 4. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 5. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 6. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 7. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 8. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 9. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 10. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 11. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.

No. 12. The picture of the Indian, who, before his death, is said to have received the charge of the nation from his father. The Indian, in this picture, is seated, and is seen from the side. The picture is a symbol of the union of the nation.
BRINGING THE WORLD BACK HOME

contemporary Western society. Malcolm Lewis, who has written extensively on American Indian maps, points out that they 'differed from post-Renaissance European maps in two fundamental respects: geometrical structure and the selection and ordering of information content'. European maps have a projective geometry based on a co-ordinate system. Indian maps are topologically structured 'conserving connectivity between the parts but distorting distance, angles and, hence, shape'. European maps have standardised representation, but Indian maps served specific functions in particular contexts (M. Lewis, 'Indian delimitations of primary biogeographic regions', 1987, p. 94).

It is often argued that maps are scientific and that what makes them so is that they embody, as does science, statements that are true, independent of the context in which they are made (for example, E=MC²). Such statements are called non-indexical. Indexical statements are those that are dependent for their truth on their context. For example, the Chippewa Indian land claim presented to Congress in 1849 (ITEM 4.1) is recognisably a map, but the information it conveys can only be understood within the cultural specifics of the circumstances that it portrays and cannot be generalised beyond that context. That so-called 'primitive' maps serve specific functions in particular contexts clearly makes them indexical, though ITEM 4.2 rather ironically shows that context boundaries may be transgressed quite readily on occasions. The temptation is to assume that modern projective maps are non-indexical. This would mean both that the

4.2
'Map drawn by Indians on Birch-bark' (1841). Note the accompanying sketch and note. The note reads: 'Forwarded to the United Service Institution in the hope that it may shew young officers how small an effort is needed to acquire that most useful art, Military Sketching, since even Savages can make an intelligible plan.'
position of objects on such a map could be ascertained without reference to a point of view, and that statements about their position could be read directly off the map, without any exposure to the forms of life in which they are embedded. That is to claim that they could be understood independently of their context of use, the world view, cognitive schema or the culture of the mapmaker. In this exhibit, we suggest that this distinction is overdrawn, and that all maps are in some measure indexical, because no map, representation or theory can be independent of a form of life.

In order to understand why it is that all maps are indexical, let us first consider some examples of early maps: the Marshall Island stick-charts (ITEM 4.3) and the Inuit coastal chart (ITEM 4.4). Without a full understanding of the forms of life in which they are embedded, we cannot read them, though for their makers they provide useful information. Red Sky's migration chart (ITEM 4.4), though distorted and indexical, is clearly readable once we compare it with a Western map (ITEM 4.4). Non Chi Ning Ga's Missouri map (ITEM 4.2) is an American Indian map which differs from a modern map of the same area (ITEM 4.4) only in the details. These examples show that so-called 'primitive' maps are in fact comparable with modern Western maps in many respects.
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4.4
Carved wooden coastal charts carried in their kayaks
by Greenland Inuit (Eskimo). The middle two form
a single map: the shorter piece represents a stretch
of coast and the larger, islands offshore. Both are
read continuously along each side.
4.5
Red Sky's migration chart drawn on a birchbark scroll 2.6 m long. It portrays the migration of the southern Ojibway Indians in mythical times.

4.6
Contemporary Western geographical interpretation of Red Sky's chart.

4.7
Manuscript map of the upper Mississippi and lower Missouri presented by Non Chu Ning Ga, an Iowa Indian chief, as part of a land claim in Washington, 1837.

4.8
Contemporary Western interpretation of Ning Ga's map.
HYDROGRAPHY FROM NON CHI NING GA'S 'MAP' OF 1837

Contemporary Western interpretation of Non Chi Ning Ga's map.
The ability of indigenous peoples to draw accurate maps is also shown in the example of Wetalltok's map of the Belcher Islands (ITEM 4.9). White explorers of Hudson's Bay were unsure of the existence of the Belcher Islands and were somewhat sceptical of the Inuit claims about them (see ITEM 4.10). They were put on Western maps merely as a matter of guesswork until Wetalltok drew a map of them in 1895. Eventually Flaherty's expedition in 1912–16 established the accuracy of Wetalltok's map of a very complex bit of topography (see ITEM 4.11).

It would seem, then, that many apparently 'primitive' maps are just as capable of conveying useful information as are Western maps. So let us now return to the question of whether Western maps are non-indexical by examining the way they structure information using a projective geometry based on a co-ordinate system. The introduction of perspective geometry in Renaissance Europe had a revolutionary impact:

Following the discovery of perspective geometry, the position of man in the cosmos altered. The new technique permitted the world to be measured through proportional comparison. With the aid of the new geometry the relative sizes of different objects could be assessed at a distance for the first time. Distant objects could be reproduced with fidelity, or created to exact specifications in any position in space and then manipulated mathematically. The implications were tremendous. Aristotelian thought had endowed all objects with 'essence', an indivisible, incomparable uniqueness. The position of these objects was, therefore, not to be compared with that of other objects, but only with God, who stood at the centre of the universe. Now, at a stroke, the
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4.11
Map of Belcher Islands after Flaherty's expedition, confirming the accuracy of Wetland's map.

special relationship between God and every separate object was removed, to be
replaced by direct human control over objects existing in the same, measurable space.
This control over distance included objects in the sky, where the planets were
supposed to roll, intangible and eternal, on their Aristotelian crystal spheres. Now
they too might be measured, or even controlled at a distance. Man, with his new
gonometrical tool, was the measure of all things. The world was now available to
standardisation. Everything could be related to the same scale and described in terms
of mathematical function instead of merely its philosophical quality. Its activity could
also be measured by a common standard, and perhaps be seen to conform to rules
other than those of its positional relationship with the rest of nature. There might
even be common, standard, measurable laws that governed nature.

James Burke, *The day the universe changed*, 1985, pp. 76–7

It was not until the early 1400s that Ptolemy's *Geographia* arrived in Europe, the same
period in which Brunelleschi developed perspective geometry and its application in
architecture. The *Geographia* mapped the entire world and presented all the known
information in a standardised and consistent way with grid lines of latitude and
longitude (see Item 7.1). This metrication meant that all points were commensurable: that
is, distances and directions could be established between one place and any other.
Further, unknown places could be given co-ordinates. It was the synthesis of perspective
gometry and Ptolemy's work that enabled the imposition of a grid on the known world.
Once that grid was imposed, the mathematician Toscanelli was able to argue plausibly
that sailing westwards across the Atlantic was a shorter voyage to the Spice Islands than
the traditional route around the Cape of Good Hope and on to the East. Thus
Columbus 'discovered' America even though in 1492 he was convinced that Cuba and Japan were one and the same.

There is of course nothing in reality that corresponds to such a grid; it is a human construct, and hence arbitrary, conventional and culturally variable. Ptolemy (AD 90–168) located his grid by designating the Fortunate Isles (Canary Islands) as the prime meridian, because they were the western extremity of the known world. Spanish and Portuguese cartographers used the Tordesillas line (see item 10.2). The use of grids originated in China, probably with the work of Chang Heng in the 1st century AD. Although none of his mapwork survives, his biographer, Tshai Yung, wrote that he 'cast a network about heaven and earth and reckoned on the basis of it' (R. Temple, The genius of China, 1989, p. 30). Subsequently the grid was in continuous use in China, and one of the two early maps inscribed in stone at Sian in 1137 is covered by a well-defined grid (item 4.12). Phéi Hsiu, the 3rd-century Chinese cartographer, laid down the use of the grid as one of his six principles of scientific cartography, claiming that 'When the principle of the rectangular grid is properly applied, then the straight and the curved, the near and the far, can conceal nothing of their form from us' (in P. D. A. Harvey, The history of topographical maps, 1980, pp. 133–4). The Romans used a grid system called 'centuration' by which they came close to turning 'all Europe into one vast sheet of graph paper' (S. Y. Edgerton, 'From mental matrix to Mappamundi to Christian Empire', 1987, p. 22). The British use the National Grid system and in Australia the Australian Map Grid is used.

Even the system of lines of latitude and longitude are conventional: 'At an international conference held in Washington in 1884 it was agreed by many countries that subsequently 0° of longitude would be assumed to pass through Greenwich [England]. This meridian is now widely, though not universally, used for mapmaking' (A. G. Hodgkiss, Understanding maps, 1981, p. 30). For a grid system to work it has to be literally conventional. Grid systems require real conventions, negotiations and agreements. In order to bring the distant and the large to your table top you need perspective geometry, reproducible and combinable representations, a grid and the agreement of your fellows. The power of maps lies not merely in their accuracy or their correspondence with reality. It lies in their having incorporated a set of conventions that make them combinable in one central place, enabling the accumulation of both power and knowledge at that centre. The significance of Ptolemy's Geographia was not just its use of a grid: it was also an atlas which enabled the co-ordination of maps of individual lands into one map of the world. Similarly, the map of China (item 4.12) was constructed as a pathwork of local maps drawn from itineraries.

In Exhibit 5 we shall be considering Aboriginal Australian bark paintings as maps. These have the appearance of being incapable of being combined in the European or Chinese way. Their maps appear to have no grid, no standardised mode of
representation. Nonetheless it is possible for Aboriginal people to know about, and to travel across, unknown, even distant, territory. Their knowledge is in fact combinable because it is in the form of narratives of journeys across the landscape. Aborigines inculcate and invoke conventions just as we do, through conferences and agreement. They call them business meetings; anthropologists call them ceremonies and rituals. Songlines (which are accounts of journeys made by Ancestral Beings in the Dreamtime) connect myths right across the country. One individual will only 'know' or have responsibility for one section of the songline, but through exchange and negotiation, the travels of the Ancestors can be connected together to form a network of dreaming tracks. These may be constituted as bark paintings or song cycles.

The strength of the distinction between indexical maps and non-indexical maps will seem even less cogent when we come to consider the use of maps as instruments for navigation in Exhibit 9. It will then be seen that in order to find our way about we need at least a mental map, or a cognitive schema, and an indexical image of the landscape, and that we can never navigate with non-indexical statements alone.

That maps consisting entirely of non-indexical statements cannot be used for practical purposes involving direct interaction with the material world such as navigation constitutes another similarity with scientific theories. Scientific theories consist of non-indexical universal statements about reality, and as such cannot be applied directly to a particular circumstance, or be confirmed or falsified by particular items of evidence. Scientific theories always need additional assumptions and qualifications, or specification of conditions in order to apply in practice. Strictly speaking, scientific theories could be said to be, on the one hand, useless, or, on the other hand, false, in the sense that they can never apply without modification to a particular circumstance. If, for example, you wish to calculate the orbit of a planet around the sun, Newton's laws of motion and gravitation, or even Einstein's laws, are not sufficient. You have to assume that there are no other forces at work, that there are no unobserved bodies in our solar system, that space is empty, that planets are effectively point masses, that there are no effects of the system acting on itself and so on. Then you have to live with the fact that in the case of Mercury, for example, the predicted orbit does not completely fit the observations. It seems that scientific theories gain their non-indexicality at the expense of their applicability.

Another way of capturing the notion of indexicality is to recognise its connections to 'forms of life'. All indexical statements are embedded more or less explicitly in a form of life. Non-indexical statements attempt to transcend or deny a form of life. In the attempt to maximise the objectivity of scientific theories and to display them as universal truths they are increasingly distanced from their forms of life and consequently lose their connection to the world. This, however, does not make them either useless or powerless. They gain great strength and efficacy in the social and cultural domain. Once again this point is illustrated by maps as we shall see in Exhibits 8, 9 and 10.
5.4

The central white area is the sand bank Nawuyu. It stretches out at the mouth of the river, the area of the crocodile’s tail in item 5.2. The dugong (two Ancestral Beings) feed on the sea grass on the edge of the sand bar Gamata. In doing so they leave the holes depicted around the white area.

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red on white—the goannas

This dhukap portrays the e and named by the Ancestor leafy grove, the two sisters, walking sticks. The name e and re-emerge from the gro both ends of the animals. 'water dreaming', which is structure unchanged—it con carries the idea that, while structure of the knowledge
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walking sticks of the two sisters who used these to make the holes

armbands with strings

freshwater goannas—the two sisters

red on white—the goannas

white on white—water and bubbles

the two waterholes, Mirrana, at the place Balana

5.5 Water goannas and water dreaming; moiety—Dhupwa; clan—Djapu; painter—Djamika Munungurr, 1985.

This dhuluy portrays the episode in which a Dhupwa place, Balana, was created and named by the Ancestors, the two Djankawu sisters. In this place, a green leafy grove, the two sisters, the water goannas, made the water holes with their walking sticks. The name of the water holes is Mirrana. The sisters both enter and re-emerge from the ground here, shown by the fact that the holes are at both ends of the animals. The background patterning, the mutji, represents the 'water dreaming', which is a metaphor for the way knowledge continues in its structure unchanged—it continually bubbles up in the same place. The pattern carries the idea that, while for each generation knowledge is revealed anew, the structure of the knowledge is always there, continually bubbling up.
Exhibit 9
MAPS—A WAY OF ORDERING OUR ENVIRONMENT

Just as maps can provide us with new knowledge by ordering it spatially, so do they provide ways of ordering and knowing our physical environment—the territory. Consider again a passage from Exhibit 1:

As we experience space, and construct representations of it, we know that it will be continuous. Everything is somewhere, and no matter what other characteristics objects do not share, they always share relative location, that is, spatially; hence the desirability of equating knowledge with space, an intellectual space. This assures an organization and a basis for predictability, which are shared by absolutely, everyone. This proposition appears to be so fundamental that apparently it is simply adopted a priori.


An essential way to look at what is implied in concepts like Robinson and Petchenik's 'spatiality' or Lewis's 'connectivity' is to explore their relationship to doing things in the material world—to consider how it is that we navigate or find our way about.

It might be thought that the ultimate evidence of the superiority of Western maps is their use in navigating on unknown waters or in unknown territory. If they are informed by a theory of projective geometry that takes account of the transformations involved in presenting a three-dimensional surface on a two-dimensional one, if they use a highly systematic representational mode, if they are drawn with great accuracy, then one can find one's way across otherwise featureless or foreign terrain. Conventional wisdom has it that 'primitives' do not have maps in the proper sense since they are familiar with the territory that they invariably traverse with great skill. It is sometimes said that such maps as they may have are just ritual objects, aides-memoire, messages of some sort or records of past events. Such views take no account of how we actually navigate today, how we navigated before modern maps were invented or how so-called 'primitive' maps are read or used.

The compass rose (item 9.1), which appears on so many maps, is now often seen as a mere decorative space filler, a hangover from the days when maps were more like illuminated manuscripts than communication devices. In fact, the compass rose 'is a very abstract model, a cognitive schema, of the relations of direction to time, of solar time to lunar time, and of time to tide. [To use a Micronesian term, it is an etak of medieval navigation]' (p. 266). It enabled medieval sailors to navigate successfully without literacy, writing, sophisticated instruments, the scientific method or Western schooling. They managed to negotiate the coastal waters of Europe and eventually Africa and the rest of the world without having either a map or foreknowledge. They achieved this by having a thorough understanding of the cognitive schema (C. O. Frake, 'Cognitive maps of time and tide among medieval seafarers', 1985, pp. 254–70).
To predict the tides requires a theory of the tides, a method of determining, recording and correlating solar and lunar time, and a memory of the lunar tidal schedule (the establishment of the port) for every locality. Piaget himself could not have designed a better task for testing formal operational thinking. The medieval sailor met this task ingeniously by appropriating a cognitive schema for spatial orientation—the compass rose—as an abstract device for recording and calculating time and tide.

* * *

He who wishes to learn to calculate the tides must first know all the points of the compass with its quarter points and half points, since this is the essential foundation of this matter and without it there can be no certainty.

Portuguese sailing directions, c. AD 1500
(Charles O. Frake, 'Cognitive maps of time and tide among medieval seafarers', 1985, p. 262)

In order to find our way successfully, it is not enough just to have a map. We need a cognitive schema, as well as practical mastery of way-finding, to be able to generate an indexical image of the territory. **ITEM 5.2** is a map of Juan Fernandos Island. To identify the island, you have to generate an image of what the island looks like from your position, as in the landfall sketch at the top. Thus indexical images are required in addition to the supposedly non-indexical information on the map (A. Gell, ‘How to read a map: remarks on the practical logic of navigation’, 1985, pp. 271-86). Though having a map makes the task of navigation a lot easier, it is not essential if you have a cognitive schema and practical mastery.

If we recall the Aboriginal bark paintings in Exhibit 5, we find it extremely difficult to see any topographical representation in them. The key map characteristic of spatiality or connectivity seems absent or sacrificed to the interests of symmetry or aesthetics. Reading them requires the acquisition of a large body of esoteric knowledge. However, David Lewis's example of the explanation given of a map of a journey he took with some Australian Aborigines shows that relative spatial location is indeed preserved. (Read **ITEM 5.3**.) It is accomplished through the telling of a myth that 'connects' the salient features of the landscape in the way the travellers experienced them. In other words, the bark painting can be read as a map only if you have a thorough understanding of the forms of life of Aboriginal culture. Likewise, European maps are not autonomous. They can only be read through the myths that Europeans tell about their relationship to the land.

![Map of Juan Fernandos Island](image)

**9.2**
Map of Juan Fernandos Island, with a view of the island as seen from an east-north-easterly direction at the top (1754). Made by J. Bellin after the voyage of Admiral Anson.