

**How do people perceive the world around them?
Why should their perceptions differ?**

In this work Tim Ingold offers a persuasive new approach to understanding how human beings perceive their surroundings. He argues that what we are used to calling cultural variation consists, in the first place, of variations in skill. Neither innate nor acquired, skills are grown, incorporated into the human organism through practice and training in an environment. They are thus as much biological as cultural. To account for the generation of skills we have therefore to understand the dynamics of development. And this in turn calls for an ecological approach that situates practitioners in the context of an active engagement with the constituents of their surroundings.

The twenty-three essays comprising this book focus in turn on the procurement of livelihood, on what it means to 'dwell', and on the nature of skill, weaving together approaches from social anthropology, ecological psychology, developmental biology and phenomenology in a way that has never been attempted before. The book is set to revolutionise the way we think about what is 'biological' and 'cultural' in humans, about evolution and history, and indeed about what it means for human beings – at once organisms and persons – to inhabit an environment. The Perception of the Environment will be essential reading not only for anthropologists but also for biologists, psychologists, archaeologists, geographers and philosophers.

Tim Ingold is Professor of Social Anthropology at the University of Aberdeen. He has written extensively on the comparative anthropology of hunter-gatherer and pastoral societies, human-animal relationships, language and technology, human ecology and evolutionary theory. He has edited the Companion Encyclopedia of Anthropology (1994) and Key Debates in Anthropology (1996).


Anthropology / Material Culture / Psychology / Biology

11 New Fetter Lane,
London EC4P 4EE


20 West 35th Street,
New York NY 10001

www.Routledge.com
Printed in Great Britain

ISBN 0-415-22832-8



9 780415 228329



Cover photography © Mark Adams

The Perception of the Environment
Essays in livelihood, dwelling and skill

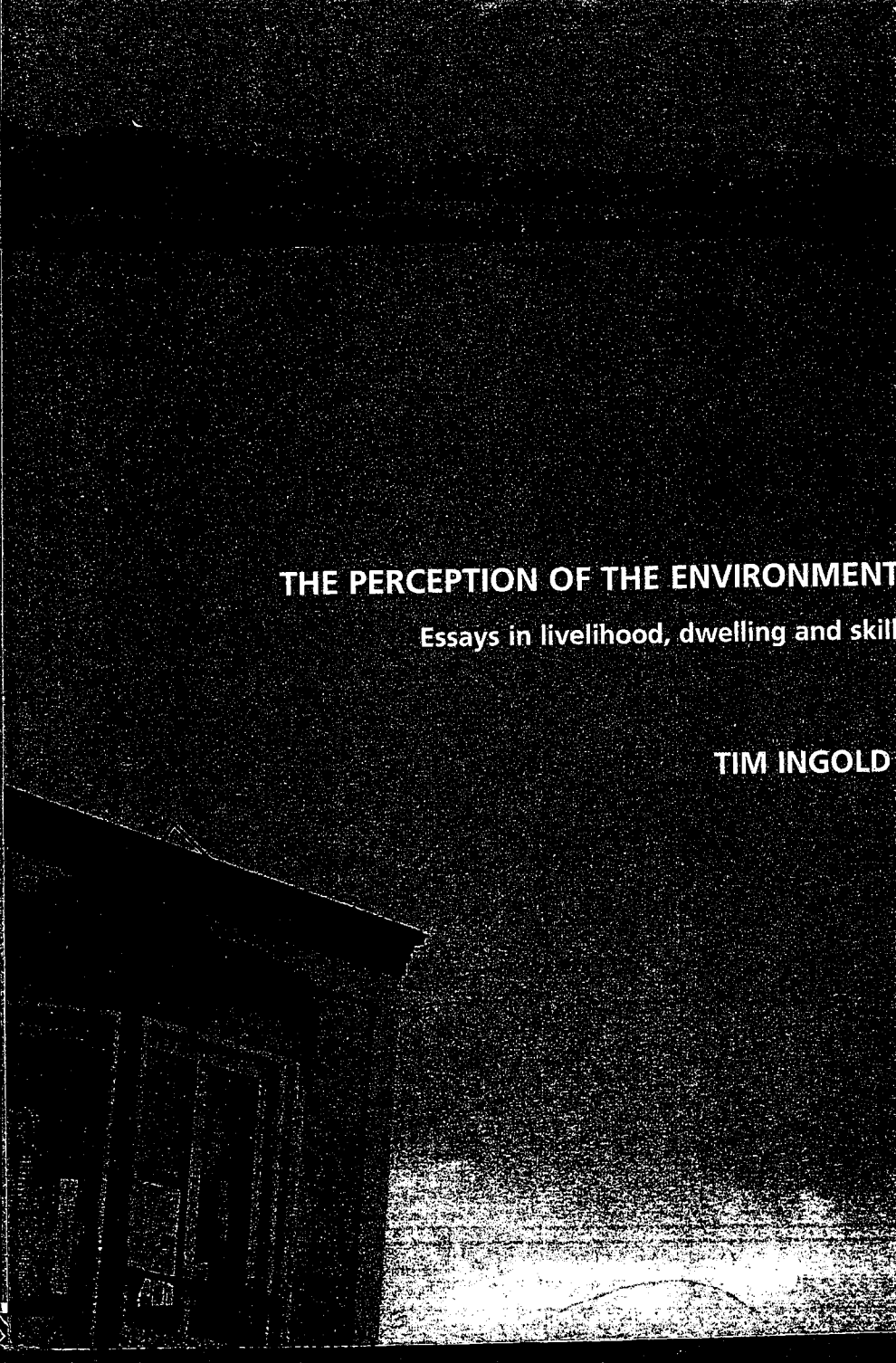
TIM INGOLD



THE PERCEPTION OF THE ENVIRONMENT

Essays in livelihood, dwelling and skill

TIM INGOLD



*For Anna and Susanna,
in memory of my mother,
L. M. Ingold (1910–1998)*

First published 2000

by Routledge

11 New Fetter Lane, London EC4P 4EE

Simultaneously published in the USA and Canada

by Routledge

29 West 35th Street, New York, NY 10001

Routledge is an imprint of the Taylor & Francis Group

© 2000 Tim Ingold

Typeset in Garamond by Florence Production Ltd, Stoodleigh, Devon

Printed and bound in Great Britain by

TJ International Ltd, Padstow, Cornwall

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publishers.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data

A catalogue record for this book has been requested.

ISBN 0-415-22831-X (hbk)

ISBN 0-415-22832-8 (pbk)

Chapter Twenty-one

'People like us'

The concept of the anatomically modern human

INTRODUCTION: THE ORTHODOX VIEW

Let me begin with a rather facetious question. Why did Cro-Magnon Man not ride a bicycle? I shall first elaborate on the answer that will surely seem obvious: it is not that he lacked the basic anatomical prerequisites to perform such a feat, but simply that he lived in an era long before anything as ingenious and complex as a bicycle had been developed. And even if it had, given the nature of the terrain and the prevailing mode of subsistence, a bicycle would probably have been of little use to him. In other words, although biologically prepared to take to the saddle, the cultural conditions that would make cycling a practicable option were not yet in place. I intend to show, however, that this answer is seriously flawed, and that the search for a more satisfactory alternative forces a fundamental revision of our most basic notions of evolution, of history and indeed of humanity itself. In particular, I shall argue that the idea of the 'anatomically modern human', the pivot around which all these other notions revolve, is an analytic fiction whose principal function is to cover up a contradiction at the heart of modern evolutionary biology.

Cro-Magnon Man, unearthed by Louis Lartet in the village of Les Eyzies, France, in 1868, has of course acquired the mantle of the prototypical 'modern', albeit by no means the earliest representative of its type in the fossil record. Compared with its predecessors – the 'archaic' Neanderthals and, before that, *Homo erectus* – this type was recognisably different: a kind of man, as William Howells wrote, 'who was entirely like ourselves' (1967: 240). In contemporary palaeoanthropology, the Cro-Magnons are included, along with all subsequent and present-day human populations, within the single sub-specific taxon *Homo sapiens sapiens*. And the implication of such categorisation is that, at least so far as their biological endowment was concerned, these Upper Palaeolithic people fell well within the existing range of variation of the sub-species. Had they been born in our own time, and grown up in a society like our own, they would undoubtedly have been able to do all the things we can: read and write, play the piano, drive cars, ride bicycles, and so on. That is, they had the *potential* to do all these things, a potential that nonetheless remained unrealised in their own lifetimes.

Now I should like to return to Howells's characterisation of the Cro-Magnons, as people 'entirely like ourselves', bearing in mind that at this stage of the argument my purpose is to spell out what I believe to be the orthodox position in current anthropology. Somebody might object that they were not like us at all. They did not, after all, live in cities, read books, write scientific monographs, play the piano or drive cars. To this kind of objection, two responses are immediately forthcoming. One is to point out that the objection rests on a narrow and ethnocentric view of who 'we' are, a view that would exclude a

large proportion even of contemporary humanity. In comparing Upper Palaeolithic people to ourselves, the reference is to humankind in its global distribution, irrespective of cultural variation. The other response is to qualify the sense in which the people are said to have been 'modern'. This should not be confused with conventional usage in social and cultural anthropology, in which modernity has generally been linked to some notion of Western urban-industrial society. The Cro-Magnons were modern in an *anatomical*, not in a socio-cultural sense. They were 'like us' biologically, but not culturally.

What separates the anatomically modern humans of thirty thousand years ago (and earlier) from their contemporary descendants, according to orthodox theory, is a process not of evolution but of history – or as some would have it, of cultural rather than biological evolution. This is not to suggest that with the advent of the 'moderns', the evolution of our species literally stopped. There have been continuing changes, but these have been relatively minor, and pale into insignificance beside the truly colossal transformations in ways of life that have occurred – apparently at an escalating rate – throughout the course of human history. Whether, or in what sense, these transformations can be considered progressive has been hotly debated: nevertheless it seems to be generally agreed that the history of culture has been marked by a cumulative increase in the scale and complexity of its technological component. Not only, however, was the historical process of complexification in the technological sphere of culture made possible by a biological endowment that was already established by the Upper Palaeolithic; it also left that endowment unaffected. The motor car is a modern invention, but the man behind the wheel remains a creature biologically equipped for life in the Stone Age!

Thus so far as their basic biology is concerned, cyclists are no different from walkers, and the walkers of today are no different from their predecessors of the Upper Palaeolithic. It is generally accepted that bipedal locomotion is a universal human characteristic, whose evolution entailed a distinctive suite of anatomical adjustments (Lovejoy 1988). Cycling, by contrast, is an acquired skill which has appeared relatively lately in some, but not all human populations. Though its advent was conditional upon a long chain of prior circumstances of invention and diffusion (from the discovery of the wheel to the manufacture of steel tubing), as well as of environmental modification (the construction of roads and tracks), it entailed no reconfiguration of human anatomy. In its structure and proportions, after all, the bicycle was designed to 'fit' a human body that had already evolved for walking, and its essential mechanical function is to convert bipedal into rotary motion.

This brings us back to the conventional answer to the question with which I began. The reason why Cro-Magnon Man did not ride a bicycle has nothing whatever to do with biology. That is, the reason is historical rather than evolutionary. The same distinction, as we saw in the last chapter, is generally invoked to explain why the toolmakers of the Upper Palaeolithic worked with flaked stone rather than complex mechanical or electronic equipment. And if it is absurd to posit a direct line of continuity from the very earliest stone tools to modern machinery, then it is equally absurd to posit a similar progression from quadrupedal to bicyclic locomotion. For whereas the transition from walking on four feet to walking on two belongs to evolution, the transition – if you will – from two feet to two wheels belongs to history.

WALKING AND CYCLING

I trust it will be agreed that this is a fair representation of the orthodox view. I shall now go on to show why I think it is wrong. Let me begin by taking a fresh look at the contrast

between walking and cycling. It is commonly supposed that walking is something we are 'born with' whereas cycling is a product of enculturation; in other words the former is presumed to be innate, the latter acquired. Yet the fact is that new-born infants cannot walk. They have to *learn* to walk, and the help of older persons, already competent in the art, is invariably enlisted in the enterprise. In brief, walking is a skill that emerges for every individual in the course of a process of development, through the active involvement of an agent – the child – within an environment that includes skilled caregivers, along with a variety of supporting objects and a certain terrain (Ingold 1991: 370). How, then, can we continue to maintain that it comes, as it were, 'pre-packaged' in the human biogram? True, the vast majority of human infants do learn to walk, moreover they do so within a fairly narrowly defined period. Thus while the baby does not exactly land in the world on two feet, it comes with a built-in developmental schedule which ensures that it will eventually walk upright provided, however, that certain conditions are present in its environment.

This last proviso is absolutely critical. Infants deprived of contact with older caregivers will not learn to walk – indeed they would not even survive, which is why all surviving children *do* walk, unless crippled by accident or disease. One could imagine a future scenario in which human locomotive needs were met entirely by wheeled vehicles, or of life under conditions of weightlessness in outer space, where walking would disappear. Such scenarios are admittedly fantastic, but to imagine them serves to reinforce my point, which is that the capacity for bipedal locomotion can only be said to be innate by presupposing the presence of the necessary environmental conditions for its development. Strictly speaking, therefore, bipedalism cannot be attributed to the human organism unless the environmental context enters into the specification of what that organism is.

With this point in mind, let me turn from walking to cycling. Children can only become proficient in cycling, as in walking, through a process of learning in which adult assistance is generally required. Compared with walking, however, the conditions for the development of cycling are a good deal more stringent. Obviously, no-one can learn to cycle who does not have a bike to ride, and the environment must also include roads or tracks that are negotiable on two wheels. In contemporary industrial societies these conditions are so ubiquitously present that we tend to think it as natural that children beyond a certain age should be able to cycle as it is that they can walk. In other societies, by contrast, bicycles may be rare or absent altogether, or the terrain may be quite unsuited to their use. And so the skills of cycling are of far more limited distribution than those of walking.

This is a difference, however, of extent rather than principle. If walking is innate in the sense – and only in the sense – that *given certain conditions*, it is bound to emerge in the course of development, then the same applies to cycling. And if cycling is acquired in the sense that its emergence depends on a process of learning that is embedded in contexts of social interaction, then the same applies to walking. In other words, it is as wrong to suppose that cycling is 'given' exogenously (independently of the human organism) as it is to suppose that walking is 'given' endogenously (independently of the environment). Both walking and cycling are skills that emerge in the relational contexts of the child's involvement in its surroundings, and are therefore properties of the developmental system constituted by these relations.

Moreover these skills are literally *embodied*, in the sense that their development entails specific modifications in neurology, musculature, and even in basic features of anatomy. Though children generally learn to walk before they learn to ride, the modifications entailed

in cycling are not simply inscribed upon an anatomy that comes, as it were, 'ready-made' for walking. For the human body is not ready-made for anything, but undergoes continuous change throughout the life-cycle as it is pressed into the performance of diverse tasks. Indeed the recurrent stresses and strains of everyday life do not just affect the relative development of different muscles; they also leave their mark on the skeleton itself. Thus carrying loads on the head affects the bones of the upper spine; squatting puts a strain on the knee, resulting in a notched kneecap, and no doubt cycling, too, leaves tell-tale signs.¹ It is of course true that the bicycle is designed for a creature already accustomed to bipedal locomotion, so that cycling calls for no *major* overhaul of human anatomy. Cyclists can still walk, and it is doubtful whether even the most percipient observer could distinguish a cyclist from a non-cyclist, save by putting them to the test. However the facts that no novice has succeeded in sustaining balance and co-ordination on a first attempt, and that the knack of riding a bicycle, once learned, is never lost, indicate that the exercise of the requisite sensory and motor skills leaves an indelible anatomical impression, if only in the normally invisible architecture of the brain. Indeed, this conclusion is supported by recent neurological research which shows, as Kandel and Hawkins report, that 'our brains are constantly changing anatomically', even as we learn (1992: 60).

In the light of these considerations, it is perhaps not so absurd, after all, to situate the emergence, respectively, of walking and cycling within the same overall process of evolution – an evolution, that is, of the developmental systems which underwrite these capacities. For once we introduce the environmental context of development into our specification of what an organism is, it must follow that a human-being-in-environment-A cannot be the same kind of organism as a human-being-in-environment-B. Thus Cro-Magnon Man was indeed a rather different kind of creature from the cycling or car-driving urban dweller of today. He was not 'like us' – not even biologically. He may have resembled us *genetically*, but that is another matter. How it was that biology came to be identified with genetics is a problem in the history of ideas to which I return below; suffice it to say at this juncture that such identification is already implicit in the notion that every individual receives his or her biological constitution, at the moment of conception, in the form of an *endowment*. Before examining this notion more closely, I should first like to review an area in which very similar issues arise to those raised in my comparison of walking and cycling, but which has been the site of far more serious controversy: namely, the evolution of language.

SPEECH AND WRITING

It is generally recognised that Cro-Magnon Man, as a paragon of anatomical modernity, had a fully-fledged capacity for language. He could speak just as well as you or I. But he could neither read nor write. I begin with the comparison between speech and literacy, since it bears the most obvious parallel with that between walking and cycling. Thus according to the orthodox view, the capacity for language is a human universal, something that we all receive as part of a common biological endowment that was in place by the Upper Palaeolithic, if not earlier (I am not here concerned with the arguments over dating). Literacy, by contrast, is a technology of language that arose independently in various parts of the world as a result of specific events of invention and diffusion, and which – even today – is by no means universally shared. The capacity for language, then, is a product of evolution; the capacity to read and write a product of history. The former

is said to be innate, the latter acquired. Cro-Magnon's failure to read and write, like his failure to ride a bicycle, had nothing to do with his biology. It was rather that, in the epoch during which he was living, the cultural developments that culminated in the invention of writing systems had yet to run their course.

I believe this view is wrong, for reasons that I have already spelled out. Human babies are not born talking, any more than they are born walking. Their capacity for language *develops*, through a series of fairly well-defined stages. The support of speaking caregivers, and the presence in the environment of a rich and highly structured array of significant features, are essential for normal language development. Since these conditions are almost invariably fulfilled, the overwhelming majority of children learn to speak without difficulty, and the exceptions are those whose development is impeded by some other handicap. The conditions that have to be fulfilled if a child is to learn successfully to read and write are, of course, far more restricted. Indeed, just what these conditions are is a matter of vigorous debate, especially in educational circles. Since literacy skills and practices are in fact exceedingly diverse, having no more in common than the representation of words in a graphic medium, the conditions necessary for their acquisition are, in all probability, equally variable (Street 1984). But this does not affect my main point, namely that literacy is not 'added on', through enculturation, to a human constitution that is biologically ready-made for speech. Rather, the abilities both to speak and to read and write emerge within a continuous process of bodily modification, involving a 'fine-tuning' of vocal-auditory and manual-visual skills together with corresponding anatomical changes in the brain, and taking place within the contexts of the learner's engagement with other persons and diverse objects in his or her environment. Both capacities, in short, are the properties of developmental systems.

Without prejudging the vexed issue of whether the so-called 'archaic' humans, typified by Neanderthal Man, could speak, there is considerable agreement among contemporary palaeoanthropologists that this capacity – at least in its fully-fledged form – was not shared by earlier, pre-human hominids such as *Homo erectus* and *Homo habilis*. The question we need to ask, however, is this: in what way, if at all, did the failure of these early hominids to speak differ from the failure of Upper Palaeolithic hunter-gatherers to read and write? To recall a distinction I introduced in the last chapter (pp. 364–5), in the context of a comparison of the technical capabilities of chimpanzees and human hunter-gatherers, how can we justify the attribution of the former to innate incapacity, when the latter is attributed to unfulfilled historical conditions? If Cro-Magnon Man, had he been brought up in the twentieth century, could have mastered the skills of literacy, why should not *Homo erectus*, had he been brought up in the Upper Palaeolithic, have mastered language?

A somewhat comparable question arises in the context of research into the linguistic capacities of great apes, especially chimpanzees. Reared under 'natural' conditions – that is, without significant contact with humans – chimpanzees do not learn to speak. Yet recent research shows fairly convincingly that chimpanzees reared in a human environment with speaking caregivers are capable of the spontaneous acquisition of linguistic syntax and semantics of a complexity equivalent to that used by small children (Savage-Rumbaugh and Rumbaugh 1993). Does this prove that contrary to expectations, chimpanzees – and by analogy, early hominids – do or did have a capacity for language, albeit of a limited sort? Are we to believe that thanks to the legacy of their common ancestry with humans, such a capacity is pre-installed, as an hereditary endowment, in the mind of every individual chimpanzee, merely awaiting propitious environmental circumstances for it to be 'brought out'?

I think not, for the question itself rests on a false premise, namely that the capacity for language is something whose presence or absence may be attributed to individuals of a species, irrespective of the environmental contexts of their development. Indeed it makes no sense to ask whether chimpanzees or hominids 'have' or 'had' language, as though it were programmed into them from the start. The biological definition of species depends upon the possibility of a context-independent specification: thus a chimpanzee is a chimpanzee, *Pan troglodytes*, whether reared among other chimpanzees or among humans, whether in the forest or in the laboratory. Yet the chimpanzee-in-an-environment-of-other-chimpanzees is not at all the same kind of animal as the chimpanzee-in-an-environment-of-humans: the latter may be credited with a rudimentary capacity for language which the former lacks. This capacity, as Dominique Lestel has pointed out, is the outcome of a process of development situated in the peculiar context of the hybrid human-animal community set up for the purposes of ape-language research (Lestel 1998: 13). And while this context may seem rather exceptional, it is nevertheless true of any process of development that it must involve an organism in relationships that cross-cut the boundaries of conventional taxonomic groupings. It follows that if a capacity – like language – can be shown to arise as an emergent property of the developmental system comprised by these relationships, then it cannot be attributed to a species. (Conversely, to attribute language to species is automatically to have resort to an innatist view that involves some kind of neural 'hard-wiring' that comes miraculously ready-made.)

The notion of the 'capacity for language' is itself deeply problematic. The orthodox account, which attributes this capacity to 'anatomically modern humans', requires that it be clearly distinguished, as a human universal, from the capacity to speak *this* language rather than *that*. Competence in one's particular mother-tongue is supposed to be a product of enculturation rather than given as part of one's biological endowment as a member of the human species. But human children are not 'born with' an innate programme (a language acquisition device) for assimilating an acquired one (in the form of the rules of syntax for a particular language). For whatever devices may be deployed in the process of language acquisition have themselves to undergo formation within a developmental context which is the very same as that within which the child learns the language of his or her community. There are not, in other words, two distinct and successive processes – the first 'wiring up' the brain for language, the second providing specific syntactic and semantic content – for it is in learning to speak in the manner of the people in his or her surroundings, and with their active assistance and support, that the neurological connections underwriting the child's linguistic competence are forged. Consequently, speakers of different languages, exposed at critical stages of development to different patterns of acoustic stimulation in different environments, will also differ in those aspects of their neural organisation that are involved in the production and interpretation of vocal utterances.²

In short, it is only by artificially separating out the more general from the more particular aspects of the total developmental system within which the skills of speaking emerge that 'language' can be identified as a universal capacity as against the speaking of one language rather than another. And in this respect, speaking is much like walking. There are, indeed, as many different ways of walking as there are ways of speaking. But as Esther Thelen and her colleagues have shown, in a series of studies of infant motor development, there is no 'essence' of walking that can be isolated from the real-time performance of the action itself (Thelen 1995: 83). Thus to refer to 'bipedal locomotion' or to 'language' as a universal attribute, distinct from the manifold skills of walking or speaking as these

are actually deployed in the everyday life of human communities, is to reify what is, at best, a convenient analytic abstraction. Moreover speaking, like walking, is an achievement of the whole human organism, it is not merely the behavioural output of a cognitive mechanism installed within the organism, and for which it serves as a vehicle. Thus both walking and speaking are, in Mauss's phrase, 'techniques of the body' (1979 [1934]: 97–123). We carry these techniques with us in the ways that our bodies have been formed in and through the developmental process.

The corollary of this conclusion, however, is quite radical. It is to overturn, once and for all, the deep-seated presumption that those differences in language, body posture and so on that we are inclined to call *cultural* are superimposed upon a pre-constituted substrate of human biological universals. We can no longer remain content with the facile notion that all human beings start out (biologically) much the same and end up (culturally) very different. Consider, for example, this formulation from Geertz: 'One of the most significant facts about us may finally be that we all begin with the natural equipment to live a thousand kinds of life but end in the end having lived only one' (1973: 45). My point, *contra* Geertz, is that human beings are not naturally pre-equipped for any kind of life; rather, such equipment as they have comes into existence as they live their lives, through a process of development. And this process is none other than that by which they acquire the skills appropriate to the particular kind of life they lead. What each of us begins with, then, is a developmental system. It follows that cultural differences – since they emerge within the process of development of the human organism in its environment – *are themselves biological*. Before examining the implications of this result, I must take a step back, to show how it was that biology and culture came to be separated in the first place. With this, I return to a reconsideration of the notion of 'biological endowment'.

THE GENOME AND THE GENOTYPE

As I have already indicated, anatomically modern humans are supposed to be biologically endowed not only with bipedalism but also with a host of other attributes from language to advanced cognitive and manipulative abilities, all of which are often lumped together under the general rubric of the capacity for culture. Let me remind you of Lieberman's comment, which I cited in the last chapter, that despite all the monuments to human technological advance which litter the landscape, present-day people have 'essentially the same biological endowment' as their predecessors of 30,000 years ago. That endowment, then, must be bequeathed to individuals in every successive generation, independently of the diverse environmental contexts in which they grow up as walkers or cyclists, as stone toolmakers or machine tool operators, as hunter-gatherers or city dwellers, and so on. In other words, it amounts to a context-independent specification of the human organism, given to each and every member of the species at the point of conception.

In modern biology, the technical term for such a context-independent specification is *genotype*. By contrast, to characterise the organism in the form in which it actually appears – in terms of its outward morphology and behaviour as revealed within any particular environmental context – is to specify its *phenotype*. A fundamental premise of evolutionary theory, in its current neo-Darwinian guise, is that only the characteristics of the genotype, and not those of the phenotype, are carried across generations. On this principle rests the conventional division between ontogeny and phylogeny, or between development and evolution. Whereas development refers to the process whereby, in the life-history of the individual, the initial genotype is 'realised' in the concrete form of an environmentally

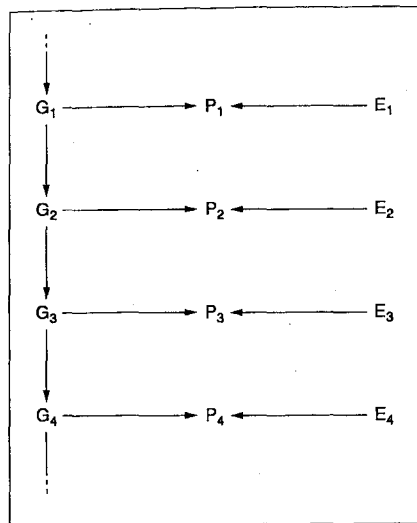


Figure 21.1 Schematic representation of the orthodox distinction between evolution and development. $G_1 - G_4$ are successive genotypes linked in an ancestor-descendant sequence. $P_1 - P_4$ are the respective phenotypes generated under environmental conditions $E_1 - E_4$. The vertical arrows depict an intergenerational phylogenetic pathway, the horizontal arrows depict ontogenetic processes confined within each generation.

specific phenotype, evolution refers to the gradual change, over a large number of successive generations, in the genotype itself (Figure 21.1). More exactly, it is the frequency of the constituent elements of the genotype, in populations of individuals, that is supposed to undergo evolutionary change, through a process of variation under natural selection.

To make this theory work, some vehicle is required that would serve to carry elements of the formal specification of the organism – namely genetic traits – from one site of development to another, heralding the initiation of a new life-cycle. With the discovery of DNA, it was thought that such a vehicle, long predicted, had at last been found. The DNA molecule comprises a very long string of nucleotide bases (some three billion in humans, contained within the twenty-three chromosomes of every cell in the body), each of which is one of only four possible kinds. This molecule has two critical properties. First, it binds with a complementary string which, rather like a photographic negative, provides a template in a chemical copying process that results in the synthesis of further strands of DNA with precisely the same sequence of bases as in the original. Secondly, segments of the molecule, of the order of ten thousand bases in length, guide the synthesis of specific proteins – the composition of each protein being determined by the linear sequence of bases in the corresponding segment. These proteins, in turn, are the fundamental constituents of the living organism. Thus the total complement of DNA in the cell, otherwise known as the genome, is supposed to encode in its base sequence a complete specification of the organism to which the cell belongs.

To explain this encoding, geneticists often resort to the language of information theory (Medawar 1967: 56–7). The genome, they say, carries a message which, roughly translated, means ‘build an organism of such-and-such a kind’ – that is, according to the formal specifications of the genotype. Now in fact, the theory of information, as it was developed in the 1940s by Norbert Wiener, John von Neumann and Claude Shannon, took up the notion of information in a specialised sense which had little to do with how the term was generally understood – namely to refer to the semantic content of messages passing between senders and recipients. Information for these theorists had no semantic value whatever; it did not *mean* anything. In their terms, a random string of letters could have the same informational content as a Shakespeare sonnet (Kay 1998: 507). This point, however, was entirely lost on the molecular biologists who, having realised that the DNA molecule could be regarded as a form of digital information in the technical, information-theoretic sense, immediately jumped to the conclusion that it therefore qualified as a *code* with a specific semantic content. The point was not lost on the information theorists themselves, however, who repeatedly warned against the conflation of the technical sense

of information with its generic counterpart, and looked on in dismay as the scriptural metaphors of message, language, text and so forth became entrenched in a biology that had become seemingly intoxicated with the idea of DNA as a ‘book of life’.³

The upshot of this conflation was that the information theoretic model, as it came to be reincarnated in the context of biological science, was all about messages and their transmission. It is a requirement of the model, thus conceived, that the message to be transmitted be first broken down into its minimal constituents of meaning, each of which is then represented, in coded form, in an appropriate physical medium. In verbal communication, for example, concepts are said to be represented by distinctive combinations of sounds (in the case of speech) or graphic traces (in the case of writing). In this physical guise they are picked up by a receiver who, through a reverse process of decoding, recovers the original meanings and puts them together to reconstitute the message. In the case of genetic transmission, the minimal constituents of meaning were supposed to correspond to characters or traits, each represented by a DNA segment with a distinctive base sequence. Just as the linguistic sign is understood to unite a particular concept with a particular sound pattern, so the gene came to be conceived as the union of a particular trait with its corresponding segment of the DNA molecule (Figure 21.2).

I shall defer until later the question of whether this model of information transmission provides an adequate account of what goes on even in ordinary verbal discourse. Suffice it to say at this point that the model is premised upon an ontological separation of mind and world. Indeed this separation is intrinsic to the very notion of information in its original sense – to the idea that form is *brought in* to real-world contexts of interaction. The message or instruction to be conveyed is thus supposed to pre-exist in the mind of the sender, and to be translated into a physical medium by means of a set of encoding rules that are themselves entirely independent of the contexts in which it is sent and received. How a message, once received, will be interpreted may of course depend upon the situation, but the message itself must be unambiguously specified. Likewise, if we are to suppose that the genome is a carrier of coded information from one context of development to another, then the ‘message’ – that is, the genotypic specification – must pre-exist its representation in the DNA, and be linked to it by context-independent encoding rules. In other words, it must be possible to ‘read off’ each element of the genotype – each trait – from its corresponding DNA segment, regardless of local conditions of development. However, just as a received message may be interpreted differently in different circumstances, so also the genotype will be ‘realised’ in different ways depending upon the environmental context, leading to observed variations in phenotypic form (Figure 21.3).

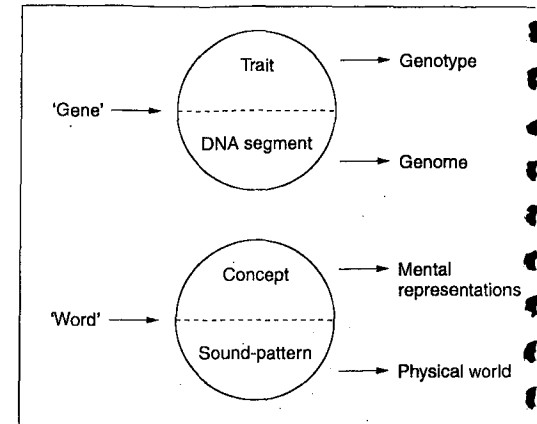


Figure 21.2 A schematic representation of the analogy between genes and words as signs.

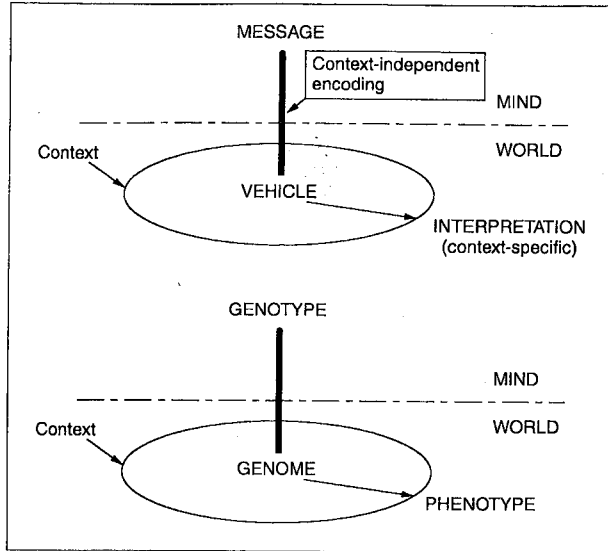


Figure 21.3 The relation between message, vehicle and interpretation (above), and its analogue in the biological domain (below).

corporation into the living machinery of the cell that molecules of DNA have the effects they do. They do not, unaided, make copies of themselves or construct proteins, let alone build entire organisms (see Lewontin 1992: 33, for an exceptionally lucid exposition of this point). Thus the DNA is not an agent but a reactant, and the particular reactions it sets in train depend upon the total organismic context in which it is situated. Only by presuming such a context can we ever say what any particular gene is 'for' (Ingold 1991: 368). To put it another way, it is the cellular machinery that 'reads' the DNA, and that reading is part and parcel of the very development of the organism in its environment. Hence there is no 'decoding' of the genome that is not itself a process of development; no attributes of form that do not themselves originate within that process; no specification of the organism that is independent of the developmental context.

So to return to my earlier question, 'where is the genotype?', there can be only one possible answer: 'in the mind of the biologist'. The genotype, I would argue, is the outcome of biologists' attempts to write a programme or algorithm for the development of the organism, in the form of a coherent system of epigenetic rules. These rules are derived by abstraction from the organism's observed characteristics, in a manner analogous to the way in which a linguist would derive the rules of syntax by abstraction from a sample of recorded utterances – an analogy that receives explicit acknowledgement in the notion of the 'biogram'. Moreover the same trick is then applied: as Bourdieu (1977: 96) puts it, by transferring onto the object of study the exteriority of the observer's relation to it, that object appears as the mere vehicle for an interiorised system of rational principles, a kind of 'intelligence' installed at the heart of the organism and directing its activity from within. Just as the linguist regards speaking as the application of syntactic structures located

The problem inherent in this kind of account may be posed in terms of a simple question: where is the genotype? Where, in other words, is the formal specification that – imported to the model – is said to be imported with the genome into the inaugural context of a new life-cycle, as a 'biological endowment'? We may grant that the newly conceived organism comes into being with its complement of DNA; taken on its own, however, the DNA 'specifies' nothing. It is, after all, just a molecule, and a remarkably inert one at that. But in reality, DNA never exists on its own, except when artificially isolated in the laboratory. It exists within cells, which are the parts of organisms, themselves situated within wider environments. And it is only by virtue of their in-

inside speakers' heads, so the biologist regards the development and behaviour of the organism as having its generative source in an innate biogram. In both cases aspects of form, abstracted from the contexts in which they arise, are converted into the elements of a programme that is said to precede and govern the processes of their production. As an explanation for the genesis of form, the circularity of this argument needs no further elaboration.

Nothing better illustrates the transferral, onto the organism, of the principles of the observer's external relation to it, than the fate of the concept of biology itself. Referring initially to the procedures involved in the scientific study of organic forms, 'biology' has come to be seen as a framework of rational principles – literally a *bio-logos* – supposedly residing in the organisms themselves, and orchestrating their construction. For any particular organism, this bio-logos is, of course, its genotype. Herein, then, lies the explanation for the identification, noted above, of 'biology' with genetics. In the final analysis, this identification betrays a logocentrism that biology shares with the entire enterprise of Western natural science: the assumption that the manifest phenomena of the physical world are underwritten by the work of reason. But the reason that science sees at work there is its own, reflected in the mirror of nature.

FORM AND DEVELOPMENT

If organisms do not receive their form, with the genome, as a 'biological endowment', then how are we to explain the stability of form across generations? The answer lies in the observation that the life of any organism is inaugurated with far more than its complement of DNA. For one thing, as Lewontin points out, the DNA is contained within an egg which, even before fertilisation, is equipped through its own development with the essential prerequisites for launching future growth. 'We inherit not only genes made of DNA but an intricate structure of cellular machinery made up of proteins' (Lewontin 1992: 33). For another thing, that egg exists not in a vacuum but in an already structured environment. Life begins, then, with DNA, in an egg, in an environment. Or as Oyama succinctly puts it, 'what is quite literally passed on or made available in reproduction is a genome and a segment of the world' (1985: 43, my emphasis). Together, these constitute a developmental system, and it is in the dynamic functioning of this system – in the complex interactions among components both internal to the organism (including the genome) and beyond its boundaries – that form is generated and maintained (Ho 1991: 346–7).

It follows that no one component – such as the DNA – can be privileged as 'holding' the form, which the others 'bring out', since the form itself is an emergent property of the total system consisting in the relations between them. Change in any component of the system, whether in the genome or in some aspect of the intra- or extra-organismic environment, insofar as it alters the parameters of development, may bring about significant change in form; however the possibilities for change are not unlimited but are constrained within the range of forms that can be generated by the system's properties of dynamic organisation. Thus the explanation for the intergenerational stability of form is to be found not in the fidelity of DNA copying, but in the self-organising potentials of the entire field of relations within which development occurs (Goodwin 1988, see also Chapter Eighteen, pp. 345–6).

It is important to be precise about how this conclusion differs from what is generally accepted in evolutionary biology. The issue of whether organisms are determined by their

nature or their nurture, by innate endowment or environmental conditioning, has long been declared obsolete, having given way to an interactionist perspective according to which every organism, at any moment of its life-cycle, is the product of a complex and ongoing interplay between genetic and environmental factors. Naturally, it is argued, organisms take on different appearances in different environments. It is nevertheless assumed that these environmentally induced differences merely reveal the potential for variation of what is essentially the *same* organism, and that only those differences attributable to genetic modification attest to evolutionary change in the organism itself. And it is on precisely this assumption, with its implicit privileging of the genome as the true bearer of organic form, that the conventional distinctions between genotype and phenotype, and between evolution and development, have been allowed to rest.

For orthodox theory, these distinctions are quite critical. Evolution, as we have seen, is taken to refer to intergenerational changes in the genotype; development to the translation, within each generation, from genotype to phenotype (see Figure 21.1). This is not to say that these processes are thought to be unrelated. Thus it is recognised, on the one hand, that the circumstances of development – insofar as they have a bearing on genetic replication – may exert an influence on evolution, and on the other hand that it is the evolved genotype that establishes the schedule for development (Hinde 1991: 585). But the theory rules out any possibility that the life-history of the organism may itself form an intrinsic part of the evolutionary process. From an evolutionary perspective, it is not what organisms do but the reproductive consequences of their activity that are significant. Considerations of agency and intentionality have no place in evolutionary explanation: these are assigned to the proximate mechanisms involved in the realisation of strategies whose ultimate rationale is already established by natural selection. For this reason, it is customary to speak of organisms as the sites *where* evolution occurs, but not as agents of evolutionary change. Thus changes are said to take place *in*, but not to be brought about *by*, populations of organisms.

But if form, as I have argued here, is a property not of genes but of developmental systems, then to account for the evolution of form we need to understand how these systems are constituted and reconstituted over time. We have seen that what an organism initially receives from its predecessors includes, besides its complement of genetic material, the environment wherein this material is placed. This placement sets up specific relations that are enfolded in the developing form. Yet as it develops, the organism also contributes by way of its actions to the environmental conditions not just for its own further development but for the development of other organisms – of its own and of different kinds – to which it relates. It may do so either directly, insofar as it has an immediate presence in the other's environment, or indirectly, insofar as its actions sustain, modify or transform the environment of another's experience. For example, the human child may grow up surrounded by parents and siblings, in a house constructed long ago by predecessors whom she will never meet. Yet all these people, and doubtless many more besides, play or have played their part in establishing the conditions for that child's development. Conversely, as she grows older and her powers of agency expand, she in turn will contribute to the conditions of development for her own contemporaries and successors.

Speaking of human beings, it is usual to refer to this process, wherein the people of each generation furnish through their life-activities the contexts within which their successors grow to maturity, as *history*. My point, however, is that human history is but one part of a process that is going on throughout the organic world (see Ingold 1990: 224). In this process, organisms figure not as the passive products of a mechanism – variation

under natural selection – that stands outside of time and change, but as active and creative agents, producers as well as products of their own evolution (Ho 1991: 338). For every organism not only undergoes development within a wider field of relationships, but also contributes through its activity to the perpetuation and transformation of that field. Thus what it does, in its life, is not expended in the reproduction of its genes but is incorporated into the developmental potentials of its successors. There can, then, be no separation between ontogeny and phylogeny, development and evolution. Ontogenesis, far from being accessory to evolutionary change, is the very fount from which the evolutionary process unfolds.

To forestall any possible misunderstanding, let me be quite clear about what I am claiming. I do not deny the existence of the genome or its importance as a regulator of developmental processes. Nor do I deny that changes can and do occur in the composition of the genome, as a result of the mutation, recombination and differential replication of its constituent segments across generations. I *do* deny, however, that the genome contains a specification of the essential form of the organism, or of its capacities for action, and therefore that a record of genetic change is in any sense tantamount to an account of its evolution. Much genetic change occurs without any corollary on the level of form or behaviour; conversely, significant morphological or behavioural transformation may occur without any corresponding changes in the genome. We have seen that since organisms, in their activities, can modify the conditions of development for successor generations, developmental systems – and the capacities specified therein – can go on evolving without requiring any genetic change at all. Nowhere is this more evident than in the evolution of our own kind. In order to explain how change can occur in the absence of significant genetic modification, orthodox evolutionary theory has had to conceive of a 'second track', of culture history, superimposed upon the baseline of an evolved genotypic heritage. Once it is realised, however, that capacities are constituted within developmental systems, rather than carried with the genes as a biological endowment, we can begin to see how the dichotomies between biology and culture, and between evolution and history, can be dispensed with. This is a matter to which I now turn.

BIOLOGY AND CULTURE

Let me begin by returning to the comparison between walking and cycling. Bipedal locomotion, according to orthodox theory, is part of the human biological endowment – that is, it is included as a property of the 'anatomically modern' genotype. Now we have seen that the genotype is the product of biologists' attempts to attribute the capacities of the organism to an interior programme, consisting of a set of rules or algorithms capable of generating appropriate responses under any given environmental circumstances. Thus if the capacity to walk belongs with the genotype, then it must be possible to comprehend walking as the output of a programme of this kind, designed by natural selection and imported with the genome into diverse contexts of development. What, then, are we to make of the capacity to ride a bicycle? It is doubtful whether much could be learned about the origins and development of this capacity through an examination of changing gene frequencies in the cycling public! By common consent, it forms no part of the human genotype, and for that reason is not generally considered to have evolved in the biological sense. Yet clearly, cycling is a skill that, in some sense, is passed on from one generation to the next. It cannot therefore be ascribed to the phenotype, since phenotypic characters are not supposed to be transmitted across generations.

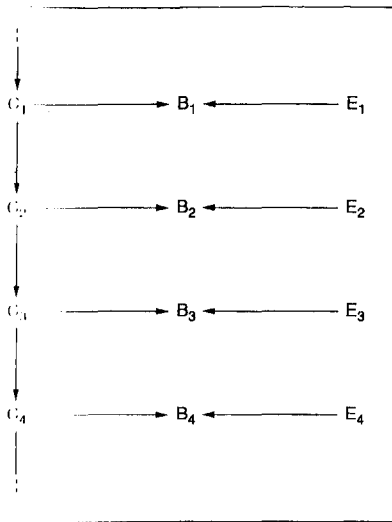


Figure 21.4 Individual and social learning. The vertical arrows depict the intergenerational transmission of cultural information through social learning in the ancestor-descendant sequence C₁ – C₄. The horizontal arrows depict the processes of individual learning through which, in each generation, the received cultural schemata are translated into overt behaviour (B₁ – B₄) under given environmental conditions (E₁ – E₄). Compare Figure 21.1.

Individual learning, here, refers to the way in which behaviour, just as much as morphology, is 'acquired' through the environmental steering of development culminating in the mature phenotype. In this each organism learns for itself, through experience, and the process of learning is coterminous with its own lifespan. Social learning, on the other hand, refers to the transmission, across generations, of a body of cultural knowledge in the form of a tradition. This tradition consists not in behaviour itself, but in a system of schemata – 'plans, recipes, rules, instructions' (Geertz 1973: 44) – for generating it. In the case of bicycle riding, for example, what an individual acquires from his or her seniors are the elements of a programme, analogous to the genetically encoded programme that supposedly underwrites the skills of walking, which is then 'realised' through practice and experience in an environment. Notice how this division between the social and the individual components of learning effectively divorces the sphere of the learner's involvement with others from the contexts of his or her practical engagement in the world. It assumes that what is passed on, in learning, is a context-independent specification for behaviour, and that such a specification is available for transmission, in coded form, outside the situations of its application. Accordingly, the inter-generational stability of cultural form is seen to lie in the fidelity with which this information is copied from mind to mind.

To accommodate the kind of non-genetic transmission that is apparently at work here, it has often been proposed that in human populations, a second mode of inheritance operates in parallel with the genetic one. 'Human beings', as Durham puts it, 'are possessed of *two* major information systems, one genetic, one cultural' (1991: 9). The capacity to ride a bicycle, then, is included in a cultural analogue of the genotype – a 'culture-type' (Richerson and Boyd 1978: 128) – whose constituent elements or traits are likewise encoded in a symbolic medium. This model of enculturation rests on precisely the same assumptions that I have already spelled out in connection with genetic transmission. It presupposes that the cultural 'message' that the individual receives from its conspecifics pre-exists its symbolic representation, that the message can be 'read off' from the representation by means of context-independent decoding rules, and that this reading precedes the application of the received cultural knowledge in the settings of practice. Thus a clear distinction has to be drawn between the intergenerational transmission of cultural information and its expression in the career of each individual, exactly parallel to the distinction that orthodox theory in evolutionary biology draws between the transmission of the elements making up the genotype and the latter's realisation, within the life of every organism, in the guise of the phenotype. The former distinction has conventionally been made by means of a contrast between 'individual' and 'social' learning (Figure 21.4).

As an account of what goes on in learning to ride a bicycle, or for that matter in the acquisition of any other practical skill, this is highly artificial. For one thing, the art of cycling – as indeed that of walking – defies codification in terms of any formal system of rules and representations. Even if it were possible to devise a programme for bicycle riding, it is doubtful whether a creature endowed with such a programme, and equipped with a machine to ride, would ever be able to achieve the fluency of the skilled practitioner. For another thing, where adult assistance is required it is above all to provide demonstration and support – that is, to set up situations in which the novice is afforded the possibility of getting the feel of things for him- or herself. The same is true in language learning, aptly described as a process of 'guided reinvention' (Lock 1980), in which the contribution of adults in the infant's environment is to provide contextually specific interpretations of the infant's vocal utterances that lead it to the discovery of how words can be used to convey meaning. What each generation contributes to the next, then, are not rules and schemata for the production of appropriate behaviour, but rather the specific conditions of development under which successors, growing up in a social world, acquire their own embodied skills and dispositions.

Words and deeds, of course, are full of meaning, and in any situation of learning the novice will listen to what people say and watch what they do. Yet there is no 'reading' of words or deeds that is not part of the novice's own practical orientation to his or her environment. Spoken words, for example, taken in themselves, are no more *for* anything than are genes. They do not carry meaning *into* contexts of interaction, as the orthodox model of information transmission requires. Rather, again like genes, they gather their meanings from the contexts of activities and relationships in which they are in play (I return to this point in Chapter Twenty-three, p. 409). Thus culture, as a body of context-independent, traditionally transmitted knowledge, encoded in words or other symbolic media, can exist nowhere except in the mind of the anthropological observer. It is derived by abstraction from observed behaviour, in just the same way that the biologist derives the genotype by abstraction from the observed characteristics of the organism, and the linguist derives a grammar from the record of utterances. And by the same trick that we have already noted in the fields of linguistics and biology, this abstraction is imagined to be implanted within the minds of the actors themselves, as the generative source of their behaviour.

I have argued, to the contrary, that whether our concern be with walking or cycling, talking or writing, making tools or operating machines, what people do cannot be understood as the behavioural output of an inner programme but only as the intentional activity of the whole human organism in its environment. Thus to reiterate my earlier conclusion, we have no grounds for distinguishing between those capacities for action due to 'biology' and those due to 'culture'. True, there are things that human beings can do which are apparently impossible for any other creature, even if raised in a human environment. And it is reasonable to suppose that these potentials would not have emerged were it not for certain changes in the genome that could, in principle, be traced in ancestral populations. But the genome, on its own, does not specify a capacity of any kind. Thus we will search in vain for a capacity for culture, whose evolutionary emergence might have marked what is sometimes called the 'human revolution'. For there is no such thing, apart from the diverse capacities of human beings growing up in different surroundings. These differences of developmental experience, as I have shown, are incorporated anatomically so as to make of each of us an organism of a different kind.

EVOLUTION AND HISTORY

Where does all this leave the Cro-Magnons? Did their arrival on the scene really mark the appearance of people 'entirely like ourselves'? We are not, of course, by any means perfect; nevertheless – Howells remarks – 'it is not unfair to say that *Homo sapiens* seems to have finished up all the unfinished business of human progress in the Pleistocene' (1967: 242). Yet in another sense, human progress had scarcely begun. These two senses of progress correspond, as we have seen, to what are customarily distinguished as evolution and history. Now this is not a distinction that would generally be made for any other species. It is assumed, in other words, that there can be no cumulative or progressive changes in the behavioural capacities of non-human kinds that are not tied to evolutionary changes in their essential, species-specific forms. For this reason, no-one finds it necessary to speak, for example, of 'anatomically modern chimpanzees' or 'anatomically modern elephants'. What the concept of anatomical modernity does, in effect, is to recognise an alternative sense in which people can be 'modern', only to place it out of bounds, as of no concern to the student of human biological evolution. Yet this second sense of modernity, founded as it is upon a commitment to the supremacy of reason, is built into the very project of contemporary science and underwrites its claim to be able to deliver an authoritative account of the workings of nature. Here, then, lies the contradiction to which I referred at the outset. For the historical process, which purports to raise humanity onto a level of existence above the purely biophysical, is presupposed by science as providing the platform from which its practitioners – who are of course humans too – can launch their declarations to the effect that the human is just another species of nature (Foley 1987).

The roots of the contradiction considerably antedate the rise of evolutionary theory in its modern Darwinian form, and may be traced back to a basic dualism in eighteenth-century thinking between nature and reason. In his *Systema Naturae* of 1735, Linnaeus recognised the status of man as a species within the animal kingdom, under the designation *Homo*. Yet unlike all other animal species, it was not by his physical characteristics that he was to be known. Indeed, Linnaeus declared himself hard-pressed to find any definitive criterion whereby human beings could be distinguished anatomically from the apes. Rather, he chose to identify the human distinction by means of a word of advice: *Nosce te ipsum* ('know for yourself'). It is in his wisdom, Linnaeus thought, not in his bodily form, that man differs essentially from the apes. Through our unique possession of the intellectual faculty of reason, we are the only beings who can seek to know, through our own powers of observation and analysis, what kinds of beings we are. There are no scientists among the animals.

The great nineteenth-century theorists of social and cultural evolution – men like Edward Tylor and Lewis Henry Morgan – placed their scenarios of human progress within a similarly dualistic framework. While all animal species were ranked, according to their physical form, in a chain of being culminating in humankind, the latter was supposed to have been uniquely endowed by the Creator with an incorporeal consciousness which, through history, has undergone progressive advance under laws of development of its own, within the bounds of an unchanging body (Ingold 1986b: 58–60). Thus all human beings were deemed to be alike in their essential nature and developmental potentials, but populations were supposed to differ in the degree to which these potentials were realised in the passage from savagery to civilisation. With the publication, in 1871, of Darwin's *The descent of man*, the doctrine of common human potential – or, as it was then known, of

the 'psychic unity of mankind' – was brought into contention, challenged by the view that inter-population differences on the scale of civilisation could be attributed to anatomical variation, above all in the size and complexity of the brain. Thomas Huxley went so far as to declare that the superiority of the European over the allegedly small-brained savage was no different, in principle, from that of the savage over the even smaller-brained ape. There ensued a period of quite rampant racism from which anthropology did not begin to recover until the second decade of the twentieth century. It did so by reasserting the universality of human nature, and by insisting that whatever differences of biological endowment may exist between populations are of no consequence for history and cultural development.

Indeed so long as it is assumed that the biological constitution of human organisms is given as a genetic endowment, there can be no escape from racism save by disconnecting cultural from biological variation. Clearly there is no foundation in fact for the racialogical belief that cultural differences have a genetic basis. My point, however, is that in turning its back on racist dogma, subsequent theorising about human evolution has reconstituted the eighteenth-century view in all its essentials. Once again human beings figure in a dual capacity, on the one hand as a species of nature, on the other as creatures who – uniquely among animals – have achieved such emancipation from the world of nature as to make it the object of their consciousness. It is true that unlike Linnaeus, contemporary students of human evolution are able to point with some precision to a whole cluster of anatomical features by which human beings may be distinguished not only from extant, non-human primates but also from their pre-human, hominid forbears. These are the diagnostic features for the recognition of anatomical modernity. But humans of this recognisably 'modern' type did not evolve as scientists, let alone with a ready-made theory of evolution. Science and its theories are widely understood to be the products of a cultural or civilisational process quite separate from the process of biological evolution: a cumulative growth of knowledge that has left our basic natures unaffected.

We thus have two distinct continua, one evolutionary, leading from ancestral pongid and hominid forms to 'anatomically modern' *Homo sapiens sapiens*, the other historical, leading from our presumed hunter-gatherer past to modern science and civilisation (Ingold 1998: 89–93). And it is the intersection of these continua that sets up a point of origin, without parallel in the history of life, at which our ancestors stood on the threshold of culture and, for the first time, came face to face with meaning (Figure 21.5). This point is believed to mark the emergence of what is sometimes called 'true humanity' (see, for example, Botscharow 1990: 64), or the arrival, in Howells's words, of 'the new kind – our kind – of man' (1967: 242). This kind of man, equipped anatomically for life as a hunter-gatherer, was possessed of a mind that would eventually enable him to reason like a scientist. Cro-Magnon Man, it seems, had all the biological potential necessary to make him into a scientist: his brain was as big, and as complex, as Einstein's. But the time was not ripe, in his era, for this potential to be brought out. Stretched between the poles of nature and reason, epitomised respectively by the contrasting figures of the hunter-gatherer and the scientist, lies the entire history of human culture, a history that has unfolded within the parameters of an essentially stable bodily form. And that form, which all human beings are supposed to receive as a common biological endowment, irrespective of cultural or historical circumstance, is of course none other than the 'modern human' genotype.

Just as in the eighteenth-century doctrine of psychic unity, the human genotype – albeit installed by natural selection rather than divine intervention – is said to establish a universal baseline for cultural development. As an ideal representation of the essential form of

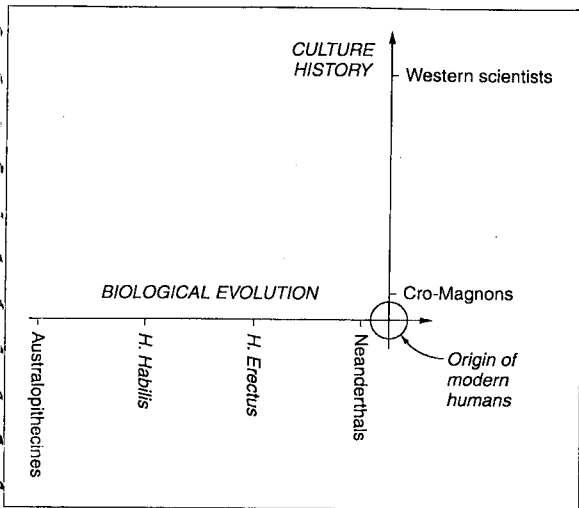


Figure 21.5 The origin of 'true humanity', conceived as lying at the intersection between the continuum of biological evolution leading from ancestral pongid and hominid forms to anatomically modern humans, and the continuum of culture history leading from Palaeolithic hunting and gathering to modern science and civilisation.

humanity, the 'modern human' is itself a creature of modern Western thought. He (or she) is conceived as the epitome of everything a human being possibly could be, a compendium of universal capacities abstracted from the manifold forms of life that have actually appeared in history, and retrojected onto the Palaeolithic past as a set of genetically inscribed, developmental potentials underwriting their realisation.⁴ Thus the course of history reappears as the progressive unfolding of the latent capacities of our ancestors, biologically fixed in evolution even before history began. There is a certain irony here. Biologists, who long ago co-opted the notion of evolution to describe the process that Darwin had originally called 'descent with modification', have been scathing in their criticism of social scientists who have continued to use the notion, with reference to human history, in

its original sense of progressive development. Yet just such a view of human history, as the developmental realisation of innate potentials, is implied by their own theory!

I have argued that the distinction between evolution and history, as set out in the orthodox view, cannot be sustained. Regarded as a process whereby people, in their activities, shape the contexts of development for their successors, history reappears as the continuation, by another name, of a process of evolution that is going on throughout the organic world. In the *Eighteenth Brumaire*, Marx wrote that 'men make their own history, but they do not make it just as they please, they do not make it under circumstances chosen by themselves, but under circumstances directly encountered, given and transmitted from the past' (Marx 1963 [1869]: 15). In just the same way do organisms in general make their own evolution. There is, then, no point of origin when history began; no moment of emergence of 'true humanity'. Thus we do not need one theory to explain how apes became human, and another to explain how (some) humans became scientists. For the business of human evolution was not finished with the arrival of the Cro-Magnons, but has carried on into the present – though we call it history now. I have attempted to show that the various forms and capacities that have emerged within this process are neither given in advance as a genetic endowment, nor transmitted as components of a separate body of cultural information, but are rather generated in and through the dynamic functioning of the developmental systems constituted by virtue of the involvement of human beings in their diverse environments.

For human as for any other organisms, such involvement is an inescapable condition of existence. I believe we need to recast the whole way we think about evolution, taking

this condition of involvement as our point of departure. Orthodox theory, which attributes evolutionary change to underlying modifications in the genotype, requires that human beings be completely specifiable, independently of the relational contexts of their development. But such a specification, as I have shown, exists only in the mind of the observer, and therefore introjects a division between mind and world, or between reason and nature, as an ontological *a priori*. There is, in truth, no species-specific, essential form of humanity, no way of saying what an 'anatomically modern human' is apart from the manifold ways in which humans actually *become* (Ingold 1991: 359). These variations of developmental circumstance, not of genetic inheritance, make us organisms of different kinds. Thus my conclusion, that the differences we call cultural are indeed biological, carries no racist connotations whatever. By refocusing on the human-being-in-its-environment, we can dispense with the need for a species-specific characterisation of humankind, and so also with the opposition between species and culture. People inhabit one world, not because their differences are underwritten by universals of human nature, but because they are caught up – along with other creatures – in a continuous field of relations, in the unfolding of which all difference is generated.