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AN ANTHROPOLOGIST LOOKS AT BIOLOGY*

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This article sets out the foundations for an adequate integration of anthropology within the wider field of biology. In the discourse of social anthropology, the concept of 'biology' is commonly matched to one side of an opposition between humanity and nature, setting up persons and organisms as mutually exclusive objects of study. In biology itself, however, the established neo-Darwinian synthesis virtually eliminates the organism as a real entity, and the extension of this paradigm to incorporate 'cultural inheritance' likewise eliminates the person. An alternative biology is proposed that takes the organism as its starting point, and that comprehends the social life of persons as an aspect of organic life in general. Thus an anthropology of persons is encompassed within a biology of organisms whose focus is on processes rather than events, replacing the 'population thinking' of Darwinian evolutionary biology with a logic of relationships.

Biology is the science of living organisms; anthropology is the science of living people. In this article I want to propose that anthropology—including what passes as 'social' or 'cultural' in orientation—falls entirely within the domain of biology. But do not jump to conclusions. I am not a belated convert to sociobiology. To the contrary, I argue that in sociobiology, an impoverished biology that has lost touch with the reality of organisms meets an equally impoverished social science that leaves no conceptual space for real people. It is most unfortunate that the terms of the dialogue between biology and anthropology should have been thus pre-empted. I intend to show that central problems in current anthropological theory, concerning the generation, maintenance and transformation of structures in the process of social life, have their exact parallels in biology, but that their solution demands an approach that takes us far beyond the prevailing neo-Darwinian orthodoxy. In place of the kind of 'population thinking' (Mayr 1982: 45-7) that is the hallmark of Darwinian biology it is necessary to substitute a kind of 'relationships thinking', which locates the organism or person as a creative agent within a total field of relations whose transformations describe a process of evolution. I am offering, then, the prospect of a new synthesis between biology and social or cultural anthropology, but no more than a prospect, since much theoretical work remains to be done. I am also issuing a challenge, for the incorporation of human social life into a unified theory of organic evolution will require nothing less than a paradigm-shift within biology itself. There are signs that such a shift is already taking place[1], yet it seems that in the oppositional context of its confrontation with the humanities, neo-Darwinism is destined to take a last stand. So much is at stake.

I shall proceed as follows. First, I shall show how 'biology' has been construed within the discourse of anthropology through its assimilation to one side of an ancient dichotomy between humanity and nature. I go on to describe how the notion of

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biology has fared within the discipline to which it has given its name, and whose scope is defined by the distinctive properties of living things. I argue that the triumph of neo-Darwinism heralded the final disappearance of the organism from modern biology, and in the third part of the article I shall propose an alternative biology that takes the organism as its point of departure. Turning from organic life in general to social life in particular, I show that neo-Darwinian sociobiology leaves us without a theory of the person. In recapturing persons for anthropology I follow the same approach as in my recapturing of organisms for biology. I conclude by bringing the anthropology of persons within the compass of a biology of organisms that is at once post-Darwinian and yet harks back to an earlier era when the modern separation between the sciences of mind and nature had yet to be established.

Biology as human nature

There is a tension at the heart of western thought, one that has been with us for many centuries, between the thesis of humanity's separation from the world of nature, and the counter-thesis that humankind exists alongside other life-forms on an uninterrupted continuum or chain of being. Each has been generated in response to the challenge of the other: thus claims to human uniqueness, of man's absolute ascendancy and domination over nature, are countered by assertions of the fellowship and interdependence of all living beings. The discipline of biology is constituted within this dialogue, bounded on the one side by the opposition between humanity and nature, and on the other side by the opposition between living and non-living things. The first of these oppositions, of course, underwrites the established division of academic labour between natural science and those disciplines collectively known as the 'humanities', the former classically concerned with the composition and structures of the physical world, the latter with the forms and manifestations of the human spirit. It is in terms of this opposition that most humanists think of biology: for them, it is precisely what the study of language and thought, of history and civilisation, is *not*. But the origins of biology in fact lie in the *counter*-current, in assertions of the continuity of life that dissolved the boundary between humanity and nature, or recast it as one of degree rather than kind, yet only by invoking a thoroughgoing distinction between living and non-living things. Early attempts to attribute this distinction to the presence or absence of some non-material, vital force naturally compromised biology's claim to scientific status.

By and large, humanists have continued to frame their conceptions of biology within a preconceived view of the unique nature of our species. Indeed, the term 'biology' has simply been substituted for the much more venerable concept of human nature, without appreciably altering its significance[2]. But as accounts of human nature vary, so do the corresponding notions of biology. I want to distinguish four such accounts, all of which are frequently to be found in the literature of social and cultural anthropology. The first is couched in terms of a cardinal distinction between the contrary conditions of humanity and animality. The second appeals to the eighteenth-century doctrine of the 'psychic unity of mankind'. The third focuses on the opposition between the individual and society, whilst the fourth forces a distinction, within the individual, between innate and acquired characteristics. All four accounts are linked by the common assumptions that humans are unique in the animal kingdom, that their uniqueness lies in a shared essence once known as 'spirit' but now commonly identified with the 'capacity for culture', and that this capacity has enabled its possessors to transcend the forces of the material world within which all other beings are enmeshed.

Now to assert that humans are unique is not, in itself, remotely objectionable. For one could say the same of any other animal kind. Elephants for example are unique; so are beavers. Yet we are inclined to think of elephants and beavers as 'mere animals', whereas to be human—we say—is to be *more* than just an animal or 'just another unique species' (Foley 1987: 274). We like to picture ourselves as animals *plus*. And the plus factor turns out of course to be that common essence, the 'capacity for culture', whose diverse manifestations furnish anthropology with its subject matter[3]. According to this view of humans as animals plus, we are all constitutionally divided creatures, split between the physical condition of animality and the moral condition of humanity. Moreover, if human uniqueness lies precisely in the part of us that falls outside the material world of nature, then to view human beings *in* nature, as parts of the material world, is to focus not so much on species-specific differences as on those features by which humans are indistinguishable from other animals. Hence we reach the paradoxical result that whereas elephant nature comprises characteristics of morphology and behaviour peculiar to elephants, and beaver nature characteristics peculiar to beavers, human nature—on this account—appears to comprise characteristics that are *not* peculiar to humans, but are rather common to elephants, beavers, and any other species you care to name. In short, the human being is represented not as a specific manifestation of animality, but as the manifestation of a specific human essence superimposed upon a generalised animal substrate.

I believe that the primary reference of the term 'biology', in much anthropological literature, is to some such notion of generic animality, set up by its opposition to a notion of culture as the essence of humanity. Culture, however, is revealed as diversity, whereas the *capacity* for culture is supposed to depend on certain general properties of mental functioning. This leads to a second and equally prevalent view of human nature, by which it is equated with putative psychic universals. Whatever humans have in common is accordingly attributed to biology, whereas their differences are attributed to culture. Thus biology becomes, in this view, a quest for the bottom line or 'lowest common denominator' of humanity (Eisenberg 1978: 171), something that could only be directly observed—rather than inferred through comparative study—among humans living at or near the absolute zero of cultural development. A good deal of the popular interest directed towards contemporary populations of hunters and gatherers can be put down to the (wholly mistaken) notion that they are living exemplars of a prototypical humanity, a childhood of man from which the rest of us have grown up.

I have so far outlined two closely connected senses of human nature, and of 'biology': as a generalised animal substrate and as a universal baseline for cultural development. Both carry connotations of uniformity which stand in stark contrast to the emphasis in modern biological science on inter- and intra-species variability. The third sense I wish to adduce is a by-product of the notion of society or culture as a superorganism, a collective entity that has a life of its own over and above the lives of its individual constituents. I have considered the history of this notion elsewhere, and cannot go into it now (see Ingold 1986: 223-41). Suffice to say that the effect of transferring everything pertaining to the mutual involvement of human subjects to an external, superorganic domain of 'society' is to leave the individual organism as a hermetically sealed bundle of innate dispositions, given in advance of any relations it may form with other individuals. As Durkheim wrote in a classic statement, individual human organisms are, 'by nature, closed to each other' (1960 [1914]: 337)[4]. Biology, according to this conception, is a science of living things that treats its objects as preconstituted, self-contained systems. Anthropologists frequently appeal to this view of biology in making the claim, as does Sahlins, that it leaves a void to be filled by a science of culture (1976: 16). What they fail to realise is that such an astringent biology could not begin to provide an adequate account of the life of *any* organisms, let alone human ones. For life itself depends upon the fact that organisms are not closed but open systems.

In contrast to the superorganicism of Durkheim and its social anthropological derivatives, mainstream cultural anthropology has tended to take the view that culture, although in substance ideal rather than material, has its ultimate locus inside individuals' heads rather than coming to them from an exterior source in society. Thus the human organism is construed as a culture-bearer, within which the opposition between nature and culture is assimilated to one between the hereditary and traditional components of individual endowment. The former are nowadays known as genes, the latter used to be called cultural traits. What happens then to the concept of biology? Human beings, we are told, 'are both biological *and* cultural organisms', and their behaviour is a product of 'cultural and biological influences' (Boyd & Richerson 1985: 281; Durham 1979: 42). Biology, here, has ceased to have any specific reference to the organism at all, and is identified, purely and simply, with its genes. A biological account is one that deals exclusively with genetic *as opposed to* cultural causes and effects. Applied to non-cultural organisms, such a biology could be no more, and no less, than a theory of genetic determinism. This construction of biology resonates strongly with a dominant trend in modern biological science. It is therefore scarcely surprising that within biology itself, anthropology is typically constructed as a theory of cultural determinism in which the trait merely substitutes for the gene as a unit of account. I return to this point below.

Darwinism and the modern synthesis

Arriving at their various conceptions of biology in terms of an overriding opposition between humanity and nature, social and cultural anthropologists have, as I have shown, matched the domain of biological inquiry to the residue of common animality, behavioural universals, innate dispositions or genetic endowment that is left when everything apparently 'sociocultural' is peeled away. Yet when Lamarck first invented the concept of biology, in 1802, his intention was entirely different. It was to signal a fundamental contrast between living and non-living things as objects of study, a contrast that hinged upon the postulation of a vital force, launched into the material substance of organisms but absent from inorganic matter, which impelled their temporal advance along the scale of nature. In other words, far from being defined 'from the top down', to the exclusion of humanity, biology was defined 'from the bottom up', *including* humanity as the highest order of the living state.

The coining of a term does not, of course, suffice to create a science. As Mayr has observed, there was in Lamarck's day no biological science, and the ambitious schemes that he and his contemporaries presented were but 'prospectuses for a to-be-created biology' (Mayr 1982: 108). There existed at that time an assortment of more or less separate enterprises, of which the most important were medicine (including anatomy and physiology) and natural history (including botany and zoology). The establishment of biology proper, Mayr argues, had to await the unification of these fields. As one of the most eloquent architects of the grand evolutionary synthesis of twentieth-century biology, Mayr is predictably inclined to locate the origins of biological science in the intellectual ferment that accompanied the publication, in 1859, of Darwin's work on *The origin of species*. The importance of this work, as regards the unification of biology, lay in its demonstration that the structures and processes studied by anatomists and physiologists were themselves the precipitates of an evolutionary history, one that Darwin so accurately characterised as 'descent with modification', guided by the universal mechanism of variation under natural selection.

It was not, however, just the remarkable power of Darwin's theory in integrating previously disparate fields of inquiry that made a science out of biology. The only previous alternative to Lamarckian vitalism had been a Cartesian conception of the organism as a mechanical automaton, which dissolved the distinction between life and non-life and thus deprived biology of the autonomy of its subject matter. The choice, then, had been between a science that—viewing life as the working of a mechanism—was not particularly biological, and a biology that—infused by vitalist metaphysics—was not particularly scientific. Darwinian theory offered a resolution to this dilemma in furnishing an account of the evolution of organic forms which largely dispensed with vitalistic notions, whilst retaining a basic distinction between living and non-living states. According to the theory, all living things have two essential and distinguishing properties. The first is that they are variable, such that no individual is ever exactly like another. The second is that they are capable of transmitting the components of variability through reproduction. Given populations of entities sharing these two properties, multiplying within a finite environment, natural selection will inevitably occur, resulting in a third, derivative property of living things—ostensibly the most striking—namely that each is endowed with design.

Darwin was unsure about the source of heritable variability in populations, though he thought that it could be induced by environmental change, never doubting that acquired characteristics could be inherited. The refutation of this view by Weismann, in the final decades of the last century, has had an influence almost as profound as Darwinian theory itself upon the constitution of modern biological science. Weismann introduced the notion that every living thing is divided into two parts, which he called the germ plasm and the somatoplasm. The germ plasm, the heritable part, contains all the instructions necessary to assemble the organism, the somatoplasm, which responds passively to its commands. Only the somatoplasm, however, has direct contact with the environment. Since germ plasm and somatoplasm are linked by a one-way relation of causal determination, environmentally induced modifications in the latter cannot be translated into changes in the former. The inheritance of characteristics acquired by an organism during its own life-history, through the impact of environmental experience, is therefore a logical impossibility. Developments in genetics and molecular biology during the present century appear to offer striking confirmation of Weismann's theory. The germ plasm, initially traced to the chromosomes in the cell nucleus, has been identified with a biochemical substance, DNA, whose specific nucleotide sequences unilaterally trigger the assembly of proteins which form the building blocks of successively higher-level structures up to, and including, the whole organism. In modern terminology, Weismann's 'germ plasm' has become the genotype, whilst his 'somatoplasm' has become the phenotype.

The dichotomy between genotype and phenotype, coupled with the categorical denial of any reverse influence of phenotype on genotype, has established a conceptual basis for the complete separation of ontogeny from phylogeny. To study the development of organisms (epigenesis) is regarded as quite different from studying their evolution. Developmental biologists, it is said, are concerned only with *proximate* causation, with unravelling the chain of commands that translates from preformed genetic programmes to manifest phenotypic effects. Evolutionary biologists, by contrast, claim to be concerned with *ultimate* causation, that is with the genesis of the programmes themselves. Something more than an academic division of labour is implied here, since it is supposed that *all* the features of living organisms may be referred back, in the final analysis, to the action of natural selection on their genetic constituents. These constituents, the genes, are believed to provide a complete specification of developmental possibilities. The ultimate explanation for the origination of novel forms must therefore lie in the historical circumstances of variation and selection, in so far as they affect the composition of the genotype, and not in the properties of the epigenetic system that intervenes between the genotype and its phenotypic expression. Epigenesis, as Monod has declared, 'is not a *creation*, it is a *revelation*' (1972: 87).

I do not now intend to dwell on the history of genetics, on how Mendel's laws, when first rediscovered, seemed to refute Darwin's gradualist view of evolutionary change, and on how the Darwinian and Mendelian perspectives were eventually conjoined through Fisher's construction of a mathematical theory of population genetics. It is sufficient to note that the 'modern synthesis' of evolutionary biology, whose advent was proclaimed by Julian Huxley in 1942, effectively incorporated Mendelian particulate heredity and Weismann's barrier between phenotype and genotype into a comprehensive account of organic adaptation under natural selection. With the establishment of this synthesis, nowadays usually known as neo-Darwinism, natural selection lost its status as a theory and has come to assume that of an axiomatic framework constitutive of biological science itself. A biological approach to natural phenomena is taken to *mean* an approach couched in terms of the neo-Darwinian explanatory paradigm. It is commonly asserted, by biologists of eminence and repute, that the truth of natural selection is now proven beyond any shadow of doubt, and that we can confidently expect the future of biology to consist of footnotes to *The origin of species*. Over the years these assertions have become increasingly strident and doctrinaire, as the thesis that Darwin modestly proposed to account for adaptive modification has been elevated into a total, all-embracing explanation for the phenomena of life[5]. Alternatives that cannot be accommodated within the neo-Darwinian paradigm are consigned, along with creationism and other nonsense, to the wastebin of what Dawkins (1986: 287) calls 'doomed rivals'.

The biology of organisms

With the arrogant assurance of the zealot, Dawkins affirms that 'Darwinian theory is in principle capable of explaining life. No other theory that has ever been suggested is in principle capable of explaining life' (1986: 288). I wish to argue, to the contrary, that the most striking feature of neo-Darwinism is that it offers an account of adaptive modification that is not, *in any sense*, an explanation of life[6]. Indeed, it presents us with the odd spectacle of a biology from which organisms, as real entities, have effectively disappeared (Goodwin 1984: 221). There can, of course, be no adaptive modification of organic forms without organic forms to be modified; thus an adequate evolutionary biology must be concerned, in the first place, to construct a theory of *how organisms are possible*. Such a theory would be no mere adjunct to Darwinism. For one thing, it must begin with the process and properties of epigenesis, thus inverting the neo-Darwinian prioritisation of ultimate over proximate causation. 'Surely the most effective way to make predictions about evolution is first to try to discover what sort of changes a given epigenetic system is capable of producing, and only then to ask which are likely to be selected' (Ho & Saunders 1982: 345). For another thing, it should be capable of generating the range of forms that organisms can take, both within a life-cycle in the course of epigenesis, and between the recognisably distinct classes that give living nature the appearance of a logical system and thereby underwrite the project of taxonomy. Evolution has then to be understood as an exploration, over time, of the transformative potentials of a total generative system (Webster & Goodwin 1982: 46). As Ho and Saunders correctly state, 'the phenomenon that has to be explained in evolution is that of the transmutation of *form*' (1979: 575). Neo-Darwinism, however, can only conceive of evolution in terms of changes in the distribution and frequency of *genes*.

My assertion that Darwinian biology lacks a theory of the organism might seem perverse, given my earlier observation that it rests on certain distinguishing properties of the living state. Let me recall what these properties are. First, every living thing is a unique historical entity, absolutely distinct from its predecessors and successors, and from the environment of other things with which it coexists. The uniqueness of the individual, Montalenti states, 'is the most important characteristic of life, the one which differentiates more substantially living from non-living things, physics from biology' (1974: 11). Secondly, what gives the individual its unique identity is a non-recurrent combination of particulate units of heredity (genes), which are transmitted with occasional copying errors from ancestors to progeny within a population. Thus the differences between individuals are *combinatorial* (Medawar 1957: 134). Thirdly, the genes together encode a programme whose output consists of manifest structures that have adaptive functions, such that living things appear to be endowed with design. Fourthly, these structures, constituting the phenotype, through which the individual interacts with its external environment, have no direct, reverse effects on the genotypic instructions for their assembly. Consequently the 'selective pressure' exerted by the environment takes the *indirect* form of a bias in favour of the reproduction of better adapted variants, increasing the representation of their genes in future generations.

Now consider what this list of properties leaves out. The most obvious omission is the simple fact that organisms *grow*. To be sure, Darwinism assumes an ontogenetic process by which the information contained in the genotype is 'written out' in the form of the adaptive characters of the phenotype. But it has nothing to say about this process. Indeed in supposing that the conjunction of genotype plus phenotype yields an exhaustive account of the individual living thing, no conceptual space is left for the complex physiological relations that intervene between the one and the other. Yet this field of relations, rather than its genotypic inputs and phenotypic outputs, corresponds precisely to what we call the organism. Moreover it is to the generative properties of this field that the term 'life' essentially refers. No mystical or vitalistic connotations are intended here. Life is not something separately infused into inert matter. It is rather a name for *what is going on* in the generative field within which organic forms are located and 'held in place'. Thus life is not 'in' organisms, but organisms are 'in' life.

Taking this view of the living organism as our starting point, what implications follow? There are three sets of implications that I should like to draw out. The first have to do with the relative priority of processes over events. The second concern the nature of an order that is founded on relationships. The third deal with the question of how we are to understand the interface between organisms and their environments.

In Darwinian theory, the appearance of every organism represents a singular event in a history of things, marked by a novel configuration of fixed hereditary traits. Individuals, from this point of view, *are* events (Ingold 1986: 105), and each exists only to be itself, to express a preformed project, albeit in ways conditional upon external circumstances. The life of the organism is lived out in an extended present, wrapped up in the instant of the event it represents. It is a matter of being rather than becoming, or to recall Monod's terms, it is revelatory rather than creative. Our alternative is to view the organism not as an individual entity but as the embodiment of a life-process (Ingold 1986: 153). 'Organic life', as Cassirer has written, 'exists only so far as it evolves in time. It is not a thing but a process—a never-resting stream of events... The organism is never located in a single instant. In its life the three modes of time—the past, present and future—form a whole which cannot be split into individual elements' (1944: 49-50). Bergson likewise maintained that the living being should not be regarded as an object, for it is rather 'a thing that endures. Its past, in its entirety, is prolonged into its present' (1911: 16). Movement, then, is of the essence, whereas the stability of form is derived. We do not start with the organism as a given entity and bring it to life by setting it in motion, as one would a clockwork machine. We start instead with life as a movement which progressively builds itself into emergent structures. In short, contrary to Darwinism but with due acknowledgement to D'Arcy Thompson (1917), growth is not merely revelatory, it is the generation of form.

To recognise that organisms grow is also to appreciate that they are not sequentially 'put together' from pre-existent parts, as one might construct a machine[7]. The Darwinian metaphor for epigenesis as an assembly, with the genes as instructions, is therefore quite misleading. In the machine, as Bohm explains, 'each part is formed.... independently of the others, and interacts with the other parts only through some kind of external contact' (1980: 173). But this cannot be said of the living organism, in which each part takes shape in continuous relation to all the other parts, such that the form of the part enfolds the entire system of relationships that have made it what it is. Bohm refers to this kind of relational order in which everything, ultimately, is enfolded into everything else, as the *implicate order*, by contrast to the *explicate order* in which everything is closed to every other, lying 'only in its own particular region of space (and time) and outside the regions belonging to other things' (1980: 177). Thus the order inherent in the organism is implicate. Goodwin refers to this same, self-organising property of the living state by means of the notion of the 'morphogenetic field', defined as 'a spatial domain in which every part has a state determined by the state of neighbouring parts so that the whole has a specific relational structure' (Goodwin 1984: 228-9). It is by virtue of the field properties of living organisms that they can both reproduce and repair themselves in case of disturbance or damage. Since each part enfolds the whole it is possible, through an inverse movement of unfolding, to reconstitute the whole from the part.

What goes for the relations between internal parts of the whole organism also goes for the relations between the organism and its environment. Organic forms come into being and are maintained *because* of a perpetual interchange with their environments, not in spite of it (Ho & Saunders 1982: 343). Life, as Goodwin remarks, is 'lived at the interface, where forms are generated' (1988: 107). What is given initially is a continuous generative field within which forms emerge as discernible, bounded entities. But since an 'environment' can only be recognised in relation to an organism whose environment it is—since, in other words, it is the figure that constitutes the ground—the process of formation of the organism is also the process of formation of its environment. As John Dewey recognised as long ago as 1898, the environment 'has gone on developing along with the organism', yet we are inclined to see it as 'something which had been there from the start [so that] the whole problem has been for the organism to accommodate itself to that set of given surroundings' (1976: 284; see Costall 1985: 39). It is precisely this latter view of the environment that is entailed in the Darwinian conception of evolution as a process of adaptation. 'To make the metaphor of adaptation work', Lewontin points out, 'environments or ecological niches must exist before the organisms that fill them' (1983: 280). Thus in neo-Darwinism the environment is independently specified as a set of constraints, the organism is independently specified as a set of genes, so that development is viewed as the combined *effect* of these external and internal *causes*. Reversing this order of reasoning, we argue that both organism and environment emerge from a continuous process of development. Moreover, the interface between them is not one of external contact between separate and mutually exclusive domains, for enfolded within the organism itself is the entire history of its environmental relations.

I hope I have made it clear why neo-Darwinism does not, and indeed cannot explain life. Let me briefly recapitulate three major reasons.

First, *life is a process, yet neo-Darwinism deals only in events.* It is true that these events, compounded over very many generations, give the appearance of gradual change, to which neo-Darwinism (though not, initially, Darwin himself) has given the name 'evolution'. But this evolution is *not* a life-process. Indeed Weismann's barrier, separating ontogeny from phylogeny, drives a wedge *between* evolution and life. Monod is quite explicit about this: 'For modern theory', he writes, '*evolution is not a property of living beings*, since it stems from the very *imperfections* of the conserving mechanism which indeed constitutes their unique privilege' (1972: 113). The import of this remark, made in the context of a critique of Bergsonian vitalism, is that what is 'passed on' from generation to generation of living beings is not a current of life but bundles of genes, and that it is because the composition of these bundles gradually changes that evolution occurs. Thus neo-Darwinism explains evolution by putting life in brackets.

Secondly, *the order of life is implicate, yet neo-Darwinism deals only in terms of the explicate order.* This is above all evident in its conception of the individual as an exclusive and self-contained entity whose specificity is given not by its position in a wider system of relations but by the combination of genetic traits into which it may, in principle, be decomposed. By severing, at every juncture, the inner connectedness of things, neo-Darwinism arrives at a definition of evolution that is strictly statistical—namely, change in gene frequencies over time in populations of individuals.

Thirdly, *life cuts across the boundary between organism and environment, yet for neo-Darwinism it is not the organism-environment relationship that evolves*. Rather the environment is posited as a set of exogenous factors that undergo their own changes, for quite independent reasons, to which organisms adapt through the mechanism of natural selection. In other words, evolution is a matter of organisms' changing to 'track' environmental conditions whose changes necessarily lie outside of evolution (Odling-Smee 1988: 75).

As an antidote to neo-Darwinism, I want to prescribe an approach to evolution that is firmly grounded in the properties of living organisms. To achieve this, we have to replace the prevailing statistical conception of the evolutionary process with a topological one. Accordingly, evolution is to be redefined as the temporal modulation of a total relational field. The role of endogenous and exogenous factors, of gene products and independent environmental stimuli, is then to 'select', out of the set of possible modulations of the field, those forms that actually appear. To give you an analogy, all the conic sections, from ellipse to hyperbola, can be generated from a basic quadratic equation by changing the parameter values. But the latter do not on their own dictate the form of the curve, since one must also know the equation. Likewise, genes do not on their own dictate the form of an organism, since one must also know the properties of the generative field (Goodwin 1984: 236). Genes enable us to account for some of the *differences* between individual organisms, they do not enable us to account for the unity that links them as transforms of one another. The great error of modern genetics is to assume that organisms are exhausted by their differences. For every quality in respect of which the individuals of a population are observed to vary, the geneticist posits a substantive trait, identified with the gene, and then imagines that the organism can be constituted by the sum of its genes—a trick which, as Weiss has noted, automatically vests genes with exclusive 'responsibility' for organisation and order (Weiss 1969: 35). But organisation, as I have shown, is a property of organisms, not of genes; the latter *qualify* the expression, but they do not *determine* it.

Neo-Darwinism and the evolution of culture

The next stage in my argument is to show that what applies to life in general applies, more specifically, to *social* life. Just as life is excluded from neo-Darwinian biology, so also, I submit, is social life excluded from neo-Darwinian sociobiology. Launched under the grandiose banner of a 'new synthesis', sociobiology was defined by E.O. Wilson (1980: 4) as 'the systematic study of the biological basis of all social behavior'. That assumes, of course, that all social behaviour *has* a biological basis. My concern is not to dispute this assumption, but to discover what it means. The vigorous popular debate about the applicability of sociobiological analyses to our own species has turned up every one of the different meanings of the biological that I outlined in the first part of this article. Thus for some, showing how human social behaviour has a biological basis means demonstrating the existence of a common substrate that equally underlies the social behaviour of other animals. For others it means demonstrating the existence of universals of human behaviour, revealing the original condition of mankind in the state of nature. For others again, it means the attribution of behaviour to the intrinsic dispositions of individuals rather than the extrinsic impositions of society. And finally, there are those who equate biology with the hereditary component of individual behaviour, as opposed to the component attributed to acquired cultural tradition. As we have seen, each of these senses of the biological rests on an account of human nature that long antedates the advent of biological science, and indeed the concept of biology itself.

Although in its encounter with the humanities, sociobiology has been drawn—by both advocates and opponents—into an essentially pre-biological discourse, its project was originally conceived and continues to be practised within the conceptual framework furnished by the 'modern synthesis' of neo-Darwinian evolutionary theory. Studying the biological basis of social behaviour means, for practitioners, investigating its evolution through variation under natural selection[8]. Such an investigation must therefore rest upon the same assumptions about the properties of living things that underwrite Darwinian biology, and that constitute the mechanism of natural selection itself. Thus it is supposed that behaviour, like morphology, is the output of a programme, and that the variant elements of this programme—appearing in the different individuals of a population in uniquely different combinations—are replicable across generations. It is supposed, too, that behaviour has consequences for replication, in other words that variations in behaviour may be correlated with the differential representation, in future generations, of their underlying programme elements. Accordingly, sociobiologists aim to show that particular behaviours, including ones that at first glance seem rather unpromising with regard to the survival and reproduction of the individuals concerned, in fact tend to increase the representation, within the population, of the elements that give rise to them. To demonstrate that a behaviour has this effect is sufficient to account for its evolution by natural selection.

I have so far avoided attaching a specific label to the constituent elements of the behavioural programme. In early formulations of sociobiology they were simply assumed to be genes—E.O. Wilson himself argued that a biologised sociology would have to be built upon 'evolutionary explanations in the true genetic sense' (1980: 4). One recent reviewer refers to the gene as 'the official unit of sociobiology' (P.J. Wilson 1987: 181); nevertheless many advocates of a biological approach to human social behaviour have strenuously denied the charge of genetic determinism, a charge that has been described as one of the most 'wickedly pervasive' untruths about the nature of sociobiological explanation (Dunbar 1987*a*: 179)[9]. The denial, however, can take two forms. One is to point out that at least for humans, genes do not prescribe *specific* behaviours but underwrite the extraordinary phenotypic plasticity of the species that is evident in the great diversity of life-strategies, whilst at the same time furnishing a generalised set of preferences that bias individuals towards the adoption of strategies that enhance their reproductive fitness. The other is to argue that although the evolution of behaviour by natural selection requires the existence of replicable programme elements, or what Hull (1981: 33) calls *replicators*, it does not, in fact, require that these replicators should be genes. For the word 'natural' in natural selection qualifies the *process* of selection, not the *units* on which it operates, and takes its meaning from its opposition to the artificial selection of variants in the process of intentional design.

As replicators, genes are distinguished by their locus, in the chromosomes, and by their particular mode of transmission, in the process of meiosis. But it is possible to envisage at least one other kind of replicator whose locus is the brain, and whose mode of inter-generational transmission is one or another form of social learning—ranging from the imitation of unintentionally modelled behaviour to formal and deliberate tuition. Various names have been proposed for this replicator, such as 'meme' (Dawkins

1976: 206) and 'culturgen' (Lumsden & Wilson 1981: 7). Nothing new is being suggested here, for these terms are merely neologisms for that time-worn unit of classic diffusionist ethnology, the culture-trait. Thus the sum total of memes or culturgens current in a population at a given time is said to comprise its 'culture', the ideal analogue of the gene-pool. The recognition that both genetic and cultural systems may evolve concurrently, through a Darwinian process of 'blind-variation-and-selective-retention' (Campbell 1975: 1105), has given rise to a number of theories of so-called 'gene-culture co-evolution', which attempt to model what happens when both kinds of replicator—genetic and cultural—are using the same host organisms as vehicles for their own propagation[10]. The crucial difference between these theories and more conventionally sociobiological ones is that they treat cultural systems as *analogues* of genetic systems rather than as aspects of their phenotypic expression. Culture, in other words, is placed on the side of the replicators, not on the side of their manifest effects.

In one of the more sophisticated versions of coevolutionary theory, Boyd and Richerson (1985) show that behaviour that is optimal for genetic replication may be sub-optimal for the replication of cultural traits, and *vice versa*, so that the predicted behavioural outcome of a coevolutionary process in which genetic and cultural traits compete to control the individuals they inhabit will be a compromise in between the two optima. I do not intend to elaborate on this theory, but I do want to make two points about it. First, although the incorporation of what is called 'cultural inheritance' into a general evolutionary scheme requires certain amendments to orthodox neo-Darwinian models, Boyd and Richerson remain firmly committed to the Darwinian paradigm, claiming to offer nothing less than 'a Darwinian theory of the evolution of cultural organisms' (1985: 2). And so long as adherence to the paradigm is taken to be the distinguishing feature of a biological approach, it follows that theirs is no less 'biological' for taking culture into account. In these terms, cultural evolution, by natural selection, *is* biological evolution (Cloak 1977: 52). Secondly, individuals are still seen as *products* which are assembled, if not entirely from genetic instructions, then from genetic *plus* cultural instructions. In principle, all you need to know in order to predict the phenotype of a cultural organism is the genotype, the analogous 'culture-type' consisting of learning-transmitted information, and the state of the environment. The phenotype is the *effect* of genetic, cultural and environmental *causes.*

It will surely be agreed that a dual inheritance model, of the kind proposed by Boyd and Richerson, neutralises the objection commonly levelled against sociobiology by human scientists, that it fails to take into account the substantial component of behavioural encoding that, in humans, is transmitted non-genetically. But does that take us any further towards an understanding of social life? If culture consists of learning-transmitted information, located in the brains of individuals and capable of influencing their behaviour, then as Boyd and Richerson recognise, 'the relationship between culture and behaviour is similar to the relationship between genotype and phenotype in non-cultural organisms' (1985: 36). There is no lack of precedents for this view in the literature of cultural anthropology—as long ago as 1949, Kluckhohn was insisting on the distinction between culture as a pattern of covert rules, acquired by individuals through the filter of history, and behaviour as manifest practices (1949: 32). The distinction is, of course, formally analogous to Saussure's (1959) classic dichotomy between language and speaking, and to its many derivatives in anthropological structuralism. But does the couple culture-behaviour fill the void that is left in an account of the human being by the couple genotype-phenotype? Regarding the latter, I have argued that it excludes the entire field of relations that intervenes between genetic inputs and phenotypic outputs, that this field corresponds to what we call the organism, and that organic life can only be understood in terms of its self-organising properties. I now wish to argue, along precisely the same lines, that the coupling of culture and behaviour leaves no space for the complex psychological relations and processes that intervene between the one and the other, that this field of relations corresponds to what we call consciousness, and that it is only in terms of the self-organising properties of consciousness that we can reach an understanding of the structures and transformations of social life.

The anthropology of persons

I define the seat of consciousness, the locus of intentional agency, as the *person*. In speaking of persons I am not concerned, as was Mauss (1979), with variation in the cultural construction of the moral subject. It is the *reality* of the person that I am after, not its representation. Nor, however, do I follow Radcliffe-Brown in equating personhood with a state of social being separate from, and transcending, the state of organic existence. Radcliffe-Brown, it will be recalled, argued that the human being living in society is 'two things', an individual and a person. The human individual is 'a biological organism, a collection of a vast number of molecules organized in a complex structure, within which, as long as it persists, there occur physiological and psychological actions and reactions, processes and changes' (Radcliffe-Brown 1952: 193-4). This conception of the organism, as the organised embodiment of a life-process, is virtually our own. But Radcliffe-Brown was wrong in linking it to a conception of the individual as a self-contained, bounded isolate, given independently and in advance of its external relations[11]. I have already shown that every organism is an open system, generated within a relational field that cuts across the interface with its environment. For the developing human organism, that field *includes* the nexus of relations with other humans. It is this nexus of social relations that constitutes him or her as a person. Thus the process of becoming a person is integral to the process of becoming an organism; more specifically it is that part of the process that has to do with the development of consciousness. The human being, then, is not two things but one; not an individual *and* a person, but, quite simply, an organism. As the person is an aspect of the organism, so social life is an aspect of organic life in general. In that sense it may indeed be said to have a biological basis.

By social life I mean the processes that are going on in the relational field within which persons come into being and endure. There cannot be social life without persons, but, equally, there can be no persons without social life. In using the term 'person' to refer to the conscious subject of social relations, I have so far assumed all persons to be human. This is a questionable assumption, however, as I do not think there is a clear point, any more in phylogeny than in ontogeny, marking the first appearance of conscious awareness. I cannot now enter into the debate concerning the question of awareness in non-human animals, though I have done so on other occasions (Ingold 1988). Suffice to say that when I use the term 'person' here, it should be interpreted as applicable, but not in any sense *exclusive*, to humanity. My main point is that the acquisition of personhood does not, as orthodox social anthropology has it, entail the superimposition of a specifically human essence upon an undifferentiated organic substrate. To the contrary, I argue that personhood takes shape gradually within the developing human organism[12]. It is thus fundamentally mistaken to regard development as a process of socialisation, as the imprinting of an exterior structure of social relations onto the 'raw material' of organically preformed individuals. For every human infant comes into the world already situated within a field of social relations, and becoming a person is a matter of gathering those relations into the structures of consciousness. Through this enfoldment of social relations in consciousness, the person emerges as an autonomous agent with his or her own identity, ready to forge new relations out of which, in turn, new persons will come into being. Thus the true direction of development, as Vygotsky constantly emphasised, is 'not from the individual to the socialized, but from the social to the individual' (1962: 20).

If social life presumes the existence of persons, then clearly any account of social evolution must start out from a theory of how persons are possible. In other words, we require a theory of *sociality*. By sociality I refer to the generative properties of the relational field within which persons are situated. I want to make it absolutely clear that sociality is not a trait built into the human biogram or its cultural equivalent (*contra* Maxwell 1984: 135). It is not a pre-programmed property of discrete individuals; nor, however, does it reside in the force of the collectivity *as opposed* to individual natures. We should resist the temptation to assume that sociality necessarily makes reference to the dynamics of *groups*, whether these be conceived as mere aggregates of individuals or as higher-level entities with emergent properties of their own (Gordon 1987: 217-19). Rather, as I have argued elsewhere, 'sociality is the definitive quality of *relationships*' (Ingold 1989: 498-9), founded in the mutual entailment of consciousness and intersubjectivity. When we use words such as power, trust, hierarchy, community, reciprocity and exchange, it is to features of sociality, in this sense, that we refer. And in the study of social evolution, we are primarily concerned with the processes whereby these features arise and are transformed. In short, social evolution should be regarded as an exploration, over time, of the generative potentials of sociality.

So long as we remain confined to the conceptual straitjacket of genes, culture and behaviour, such an approach to social evolution is inconceivable. Transmutations of social form could only be understood as the outcome of changes in the frequency of particular genetic and cultural variants within populations of individuals. That is to say, we would be bound to view social evolution as a phylogenetic process. Darwinism, as we have seen, insists on the strict segregation of phylogeny from ontogeny, the latter having to do not with the evolution of sociality but with its realisation under specific environmental conditions. In our view, however, social evolution consists precisely in transformations of the total relational field within which the development of every human subject proceeds. Hence it is simply not possible to separate the study of development from the study of evolution. For just as the genesis of organic form lies in the self-organising potentials of the generative field that intervenes between genotype and phenotype, so also the genesis of social form lies in transformative potentials of the field, constitutive of persons as intentional agents, that intervenes between genes or culture and manifest social behaviour. This is an argument for assigning to persons an active role in the origination of social order, rather than relegating them to the status of passive vehicles for the replication of a design written into the materials of heredity or tradition[13].

It remains for me to set out the implications of the view of personhood and sociality that I have just presented. Developing my argument in parallel to what I had to say earlier about the nature of living organisms, I shall first consider what it means to regard the person as the embodiment of a process; secondly I shall show how the relational order of social life is an implicate one, and finally I shall examine the development of the interface between persons and their environments.

Recall that for neo-Darwinism, every individual comes into being as a unique combination of hereditary traits making up a programme that it lives to execute. When, in the execution of this programme, the individual communicates or co-operates with conspecifics, the biologist speaks of social interaction. Social life is accordingly seen to consist in the aggregate of interactions among individuals in frequent mutual contact. Taken together, these individuals are said to make up a society[14]. In our view, to the contrary, social life is not a pattern of interactions but an unfolding of relationships. The distinction between interactions and relationships is critical. It has been most carefully drawn by Hinde, who argues that a 'relationship involves a series of interactions over time between two individuals known to each other' (1987: 24). Thus every interaction in a relationship builds upon a previous history of involvement between the individuals concerned, and will in turn have a bearing on how they react to one another in the future. A relationship, then, is neither an event nor a simple concatenation of events, but in Hinde's words, 'a process in continuous creation through time' (1987: 38). To dissolve a relationship into its constituent interactions is to drain it of the very current of sociality that binds them as moments of a process, and that is of its essence. The creative unfolding of a relationship, however, is also a becoming of the persons joined by it. As the embodiments of relationships, persons exist and persist only so long as they are actively held within the movement of social life. Hence we do not posit individuals in advance as ready-made, functioning entities, and generate social life by imagining them to associate and to interact under the impulsion of their separate natures. We rather *start* with social life, as a progressive 'building up' of relationships into the structures of consciousness. This 'building up', as we have seen, is equivalent to the generation of persons.

Taking this view of the primacy of process, the connexion between relationships and consciousness can best be characterised by the metaphor of enfolding and unfolding: 'Consciousness enfolds social relations and unfolds *in* social relations' (Ingold 1986: 207). In other words, sociality should be understood as the inherent, generative dynamic of a relational field. Recall my earlier allusion to the concept of the morphogenetic field, defined as a domain in which each part of the living organism is given by its relations with neighbouring parts. To translate this concept into the terms of our current discussion, morphogenesis may be replaced by the genesis of social form, and parts by persons. Then each person, developing in continuous contact with other persons in the social field, is constituted by his or her relations with those others. In organic life, every part enfolds its relations with every other part; likewise in social life, every person enfolds his or her relations with every other person. A phrase that Strathern uses to describe a Melanesian conception captures perfectly what I have in mind: persons, she writes, 'contain a generalized sociality within' (1988: 13)[15]. The same analogy holds in the comparison of organic reproduction with the reproduction of social form. Just as in the organism the whole can be reconstituted by an inverse unfolding from the part, so in social life the relational structures enfolded in the consciousness of the person may be reconstituted through their unfolding in purposive, social action. However, this conception of sociality, as the dynamic potential of an implicate order, is entirely foreign to the neo-Darwinian view in which sociality—commonly rendered as 'group-living' (for example, by Alexander 1974: 326)—is merely a resultant of the associative proclivities of discrete individuals, each independently 'wired up' for co-operative or altruistic behaviour, and interacting through an external contact that leaves their basic natures unaffected. Society, for the sociobiologist, is an explicate order.

How, then, should we regard the environment of the human subject? In the old days of the nature/nurture debate, nature was identified with a set of internal, hereditary influences on behaviour, nurture with a set of external, environmental influences. Depending on which side of the debate you took, either the one or the other set of influences was supposed to prevail. Modern biologists dismiss the debate, claiming that behaviour is the combined product of *both* innate *and* environmental factors, though in proportions that are variable and empirically difficult to determine. But although the debate has been declared obsolete, the terms in which it was conducted obstinately persist. Genes (or cultural traits) and environment are still posited as independently given, endogenous and exogenous determinants of behaviour. Yet every item of behaviour is part of an interaction, and every interaction, as we have seen, is embedded in the evolution of a relationship. The formation of the person, in this evolution, is necessarily the formation of an environment for that person, whose existence as a bounded subject or 'self' presupposes the 'otherness' that constitutes the environment. Thus the environment can be no more regarded as the sum of exogenous preconditions than can the person be regarded as the sum of endogenous traits. Behaviour is not a simple effect of exogenous and endogenous causes. Rather, it discloses a moment in a continuous process of development within a relational field, whose *outcome* is the mutual complementarity of personhood and environment.

Let me summarise my argument by presenting three reasons why a sociobiology couched in neo-Darwinian terms cannot explain social life, even if amplified by the recognition of culture as an analogous inheritance system working in parallel with the genetic system. First, social life is a process, consisting in the creative unfolding of relationships and the becoming of persons. Yet neo-Darwinism deals only in events of behavioural interaction among pre-constituted individuals. Secondly, the order of social life is implicate, yet for neo-Darwinism, society is only conceivable as an explicate order. Thirdly, social life involves the evolution of a relational field that subsumes the interface between the human subject and his or her environment. Yet for neo-Darwinism, social life is seen as a resultant of internal (genetic or cultural) and external (environmental) factors.

To remedy the deficiencies of the neo-Darwinian paradigm, I recommend that we view social life not in statistical terms, as the outcome of a large number of interactions among discrete individuals, but in topological terms as the unfolding of a total generative field (Ingold 1986: 244-5). I have used the term 'sociality' to refer to the dynamic properties of this field. Returning to an earlier analogy, these properties stand to genetically and culturally transmitted information as an equation stands to its parameter values. Genetic or cultural variation may be expected to induce evolutionary modulations of the social field, but this is not to say that social forms are in any sense genetically or culturally determined. Culture enables us to account for most of the differences between social forms, but they are linked under transformation by the properties of sociality. Traditional cultural anthropology, however, has fallen into precisely the same error as modern genetics, in supposing that forms are exhausted by their differences. Just like the 'gene', the 'trait' is a trick concept that converts aspects or qualities of human conduct into substantive parts or components. Thus it is supposed that human individuals, endowed by inheritance with bundles of genes, and by tradition with bundles of cultural traits, have all they need to assemble organised social life. Nothing could be further from the truth. The genesis of social order lies in those domains of consciousness and intersubjectivity that are simply bracketed off by the partition of the human being into genes, culture and behaviour.

Towards a logic of relationships

If I could sum up the principal burden of my argument, it would be as follows: an adequate integration of anthropology within the wider field of biology requires that the study of persons be subsumed under the study of organisms. However, the dominant neo-Darwinian paradigm in evolutionary biology has no place for the organism; likewise traditional cultural anthropology has no place for the person. Indeed there is more than a passing similarity between these two paradigms, for in both the individual appears as no more than a vehicle for the replication of traits, whether genetic or cultural, whose patterning is the contingent outcome of historical processes of variation and selection. This similarity has been conducive to the construction of various synthetic models of gene-culture coevolution, which require some modification of, but no radical departure from, neo-Darwinian principles. On the other hand, social anthropology has explicitly defined the person as its object of study, but only by setting itself up in *opposition* to a biology of organisms, thereby driving a wedge into the human being, splitting it irrevocably into two mutually exclusive parts—the one individual, the other social. The result has been to perpetuate a separation between humanity and nature that has had fateful consequences in the history of western civilisation. The most urgent task for contemporary anthropology is to overcome this separation, and to re-embed the human subject within the continuum of organic life.

The approach I have sketched out here is one that attempts to do just that. I have shown how a theory of persons can be encompassed within a more general theory of organisms, without compromising the role of human agency or denying the essential creativity of social life. This creativity, magnified a thousandfold by the work of the consciousness, is but a specific aspect of the universal capacity of organisms to act, in a certain sense, as the originators of their own development. It has been said that, in history, ' man makes himself ', creating from within the very world in which he is a participant. But man (or woman) is an organism, and organisms generally make themselves, creating as they do a history of life. To arrive at this conception of the organism, however, we need a new biology, or should I say an old one?—for its holistic aspirations are redolent of a pre-Darwinian worldview. It must be a biology that asserts the primacy of processes over events, of relationships over entities, and of development over structure. Organism and person do not then confront one another as specific configurations of matter and mind, 'two sorts of independent substances', as Whitehead put it, 'each qualified by their appropriate passions' (1938: 178). Both are rather embodiments of the total movement of becoming that Whitehead so memorably described as a 'creative advance into novelty' (1929: 314).

Let me conclude by recalling Samuel Butler's celebrated aphorism that the chicken is only an egg's way of making another egg. To this, sociobiology claims to have added a new twist. 'The organism', E.O. Wilson declares, 'is only DNA's way of making more DNA' (1980: 3). By the same token a human being, as a culture-bearing organism, might be regarded as a trait's way of making more traits. Just such a view has been suggested in all seriousness by Cloak, in what could at best be described as the sneeze theory of culture. In the same way that the successful cold virus is one that propagates itself by causing the sufferer to sneeze, selection will favour traits (Cloak calls them 'instructions') that cause their carriers to behave in a manner that will ensure that they are copied into the heads of as many other people as possible (Cloak 1975: 172). For Wilson, organisms are literally 'manufactured' by their genes, for Cloak people are literally the 'slaves' of their cultural instructions. These visions of gene-machines and culture-infected zombies are the nightmares of a scientific imagination tormented by its profound sense of alienation from the real world. We stand in desperate need of a science that, to recollect the theme of Edmund Leach's 1967 Reith Lectures, would '*only connect...*'; that would recognise that 'it is not the bits and pieces that matter but the evolving system as a whole' (Leach 1967: 78). Only with such a science—anthropology, biology, call it what you will—can we begin to grasp the implications of our participation in the world and the full measure of our responsibility for what goes on in it. But to realise a science of this kind we must reject the logic of bits and pieces, of abstracted entities, and instal in its stead a *logic of relationships*. Organisms and persons are not the effects of molecular and neuronal causes, of genes and traits, but instances of the unfolding of a total relational field. They are formed from relationships, which in their activities they create anew. Samuel Butler was right after all, for there is more to an egg than a bundle of genes. When all is said and done, are not organisms and persons but relationships' ways of making further relationships?

NOTES

As always, many of my ideas have crystallised in the course of discussions with undergraduate students at the University of Manchester, and I should like to thank them all, especially Lorna Matheson and Janella Sillitoe. Robin Dunbar and I shall always disagree, but I am indebted to him for his lucid and critical observations. Mary Douglas rightly warned me against confusing the ideas of Durkheim with their subsequent misrepresentation in social anthropology. I have benefited from the encouragement and criticism of Brian Goodwin, Mae-Wan Ho, Deborah Gordon, John Peel, Vernon Reynolds and Marilyn Strathern, none of whom, however, bears any responsibility for the final product. I am grateful to the Royal Anthropological Institute for inviting me to present the Curl Lecture, and to the School of Oriental and African Studies, University of London, for hosting it. The present version is only slightly altered from the original text of the lecture.

[1] See especially the recent collections edited by Ho and Saunders (1984), Pollard (1984) and Ho and Fox (1988). An important, earlier collection that points in a similar direction is edited by Koestler and Smythies (1969). Haraway (1976) reviews the work of some major forerunners.

[2] Notice how, in this substitution, the science has come to stand for its subject matter. We are quite accustomed to thinking of human beings as the sites of an interaction between 'biology' and 'culture'. We are also used to regarding anthropology as the science of culture. But most of us, I suspect, would baulk at the idea of seeing humans as the products of 'nature' and 'anthropology'!

[3] Biologists are as susceptible to this way of thinking about humans and animals as are anthropologists. Mayr, for example, declares that it would be 'simple-minded and dangerous to treat man simply as a biological creature, that is, as if he were nothing but an animal...Man is a unique species, in that a large amount of cultural "inheritance" has been added to biological inheritance' (1982: 81-2). Notice the equation, here, between biology and animality, and the notion of culture as a factor *added* to biology.

[4] In fairness to Durkheim, I should emphasise that this view of organic closure was a corollary rather than a premiss of his theory of society, which was set up in explicit opposition to the utilitarianism of contemporary social theorists, notably Herbert Spencer (cf. Durkheim 1982 [1895]).

[5] Darwin, of course, was not a Darwinist, let alone a neo-Darwinist, and it is perfectly possible to accord a role to variation under natural selection in the evolutionary modification of species without being committed to every tenet of the neo-Darwinian credo. The latter is characterised by the claim that natural selection is not only necessary but also *sufficient* to account for the evolution of life (Maynard Smith 1969).

[6] In fact, Dawkins immediately moves to qualify his assertion: 'I must specify what it means to "explain life". There are, of course, many properties of living things that we could list, and some of them might be explicable by rival theories... There is one particular property of living things, however, that I want to single out as explicable *only* by Darwinian selection. This property is ... adaptive complexity' (1986: 288). Notice the duplicity in this argument. We are given no reason why an explanation of adaptive complexity should be tantamount to an explanation of life. If living things have other properties, explicable by other theories, then the latter have no less a claim to be explanations of life than the Darwinian theory.

[7] As Haraway (1976: 196) has rightly observed, in drawing the distinction between machine and organism one should be sensitive to the changing meanings of mechanism. Where once the prototypical machine was the clock, it is now the computer. Drawing on the metaphors of programme, code and system, neo-Darwinian biology has been able to present a mechanistic account of many of the properties of living things which, in the past, had been taken to mark the *contrast* between organisms and machines, and whose explanation had entailed recourse to notions of vitalism. At the same time, contemporary physics is at last becoming emancipated from the shackles of its formerly mechanistic world view. The paradoxical result is that present advocates of a philosophy of organism tend to stress the *continuities* rather than the contrasts between inanimate and animate worlds, or between physics and biology. For them, in a sense, the entire cosmos is an organism (Goodwin 1988: 108). Meanwhile, it is the mechanists who hold fast to the distinctiveness of living things and to the disciplinary autonomy of biology.

[8] Thus in a recent review, Harpending *et al.* define human sociobiology as 'the study of human behavior based on a Darwinian paradigm', claiming moreover that the 'basis of human sociobiology, *as of all biology*, is population genetics and evolutionary theory' (Harpending *et al.* 1987: 127, 129, my emphases).

[9] Sociobiology-watchers might be forgiven for believing that there is some confusion within the ranks of the sociobiologists themselves about the status of the gene. The remarks that I cite here by P.J. Wilson and Dunbar appear in reviews of two recent books on human and primate sociobiology, in the same issue of *Man* wherein another reviewer—of a book by Dunbar himself—praises him for being 'a "sociobiologist" who is not really a "sociobiologist"' (Sussman 1987: 179)! Elsewhere, Dunbar has elaborated on his objections to genetic determinism: 'Sociobiology is concerned centrally with the *consequences* of behaviour in terms of gene propagation and it is a serious mistake to assume that this necessarily implies anything about the genetic control of ontogeny or ... of behaviour itself' (1987*b*: 167). I find this objection incoherent. To show that such-and-such a behaviour has consequences for reproductive fitness, and hence for genetic replication, is to make a purely descriptive statement. To convert the description into an explanation, for the evolution of the behaviour in question by natural selection, Darwinian logic requires us to suppose that the replicated elements ('genes') are among the causes of which the behaviour is an (albeit indirect) effect. In other words, behaviour must not only be of consequence *for* genetic replication, it must also be a consequence *of* replicated genes. If it is not, natural selection will not work.

[10] Apart from the work of Boyd and Richerson cited below, see for example Cavalli-Sforza and Feldman (1981), Durham (1979), Lumsden and Wilson (1981) and Pulliam (1983).

[11] Radcliffe-Brown consistently compared the processes of organic life and social life, the latter consisting of 'an immense multitude of actions and interactions of human beings' (1952: 4, 178-9). But just as his view of organic closure led him to separate the life of the individual human organism from its social life with other humans, so also the life of the person was assumed to be wholly confined within the bounds of society, likewise conceived as a self-contained, closed system.

[12] One consequence of the classical separation of person and organism is that the development of the latter is seen to be situated within a domain of 'biological' relations which is excluded from the wider domain of 'social' relations wherein the human being, once formed organically, acquires his or her status as a person. This rationale underlies attempts to isolate 'the family' as a human biological universal, constituted by relations similar in kind to those found amongst non-human animals. The line that west-

ern thought draws between 'family' and 'society' thus has its ideological roots in the opposition between nature and humanity.

[13] There is a formal parallel between the neo-Darwinian segregation of ontogeny from phylogeny and the Saussurian segregation of synchrony from diachrony (Saussure 1959: 80-1). Both rule out any consideration of the relation between agency and structure in historical or evolutionary processes (see Giddens 1979: 7-8).

[14] For examples of biological definitions of society along these lines, see Dobzhansky (1962: 58), Altmann (1965: 519) and E.O. Wilson (1980: 7). These are reviewed by Ingold (1986: 241-3, 275).

[15] It is important to emphasise that the view proposed here is quite contrary to that expressed in the familiar formula of Durkheimian sociology, 'the whole does not equal the sum of its parts' (see Durkheim 1982 [1895]: 128). Since every part enfolds within itself the relational structure of the whole, they are not divisions of a kind that could be *added together* to yield a totality of a higher order.

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Un anthropologue considère la biologie

Résumé

Cet article présente les fondements pour une intégration adéquate de l'anthropologie au sein du domaine plus vaste de la biologie. Dans le discours de l'anthropologie sociale, le concept de 'biologie' est ordinairement associé à un côté d'une opposition entre humanité et nature, établissant des personnes et des organismes comme des objets d'étude mutuellement exclusifs. Dans la biologie même, néanmoins, la synthèse établie néo-Darwinienne élimine virtuellement l'organisme comme une entité réelle, et l'extension de ce pragmatisme à incorporer 'l'héritage culturel' élimine pareillement la personne. Une biologie alternative est proposée qui prend l'organisme comme point de départ, et qui comprend la vie sociale des personnes comme un aspect de la vie organique en général. Ainsi une anthropologie des personnes est contenue au sein d'une biologie des organismes dont l'intérêt est sur les processus plutôt que sur les événements, remplaçant la 'pensée en termes de population' de la biologie Darwinienne évolutionniste par une logique des rapports.