Chapter 2

The Organism's Story

Organisms are purposive ("teleological") beings. Nothing could be more obvious. The fact of the matter is so indisputable that even those who don't believe it really do believe it. Philosopher of biology Robert Arp speaks for biology as a whole when he writes,

> Thinkers cannot seem to get around [evolutionary biologist Robert] Trivers' claim that "even the humblest creature, say, a virus, appears organized to *do* something; it acts as if it is trying to achieve some purpose", or [political philosopher Larry] Arnhart's observation that … "Reproduction, growth, feeding, healing, courtship, parental care for the young — these and many other activities of organisms are goal-directed".[1]

And yet, despite his acknowledgment that we "cannot get around" this truth, Arp again speaks for almost the entire discipline of biology when he tries, with some delicacy, to get around it: "with respect to organisms, it is useful to think *as if* these entities have traits and processes that function in goal-directed ways".[2] This *as if* is a long-running cliché in biology, designed to warn us that the organism's purposive behavior is somehow deceptive — not quite what it seems. The goal-directedness is, in the conventional terminology, merely *apparent* or *illusory*. Certainly it must not be seen as having any relation at all to human purposive activity — an odd insistence given how eager so many biologists are to make sure we never forget that the human being is "just another animal".

Others have commented on this strange, blindsighted reluctance to acknowledge fully the purposiveness that is there for all to see. The philosopher of science, Karl Popper, said that "The fear of using teleological terms reminds me of the Victorian fear of speaking about sex".[3] Popper may have had in mind a famous remark by his friend and twentieth-century British evolutionary theorist, J. B. S. Haldane, who once quipped that "Teleology is like a mistress to a biologist; he cannot live without her but he's unwilling to be seen with her in public".[4]

We find this same unwilling yet unshakable conviction of purposiveness at the foundations of evolutionary theory. The theory, we are often told, explains the organism's apparent purposes — it "naturalizes" them (explains them away), as those who claim to speak for nature like to say. But at the same time the theory is itself said to be grounded solidly in the fact that organisms, unlike rocks, thunderstorms, and solar systems, *struggle to survive and reproduce*. If they did not spend their entire lives striving toward an end, or *telos*, in this way, natural selection of the fittest organisms (those best qualified to survive and reproduce) could not occur. So it is not at all clear how selection is supposed to explain the origin of such end-directed behavior.

A double and conflicted stance toward end-directedness — believing and not believing, acknowledging and explaining away — constitutes, you could almost say, the warp and woof of biology itself. Look for "purpose" in the index of any biological textbook, and you will almost certainly be disappointed. That term, along with others such as "meaning" and "value", is effectively banned. There is something like a taboo against it.

Yet, in striking self-contradiction, those textbooks are themselves structured according to the purposive activities and meaningful tasks of organisms. Biologists are always working to narrate goal-directed achievements. How is DNA replicated? How do cells divide? How does metabolism supply energy for living activity? How are circadian rhythms established and maintained? How do animals arrive at the evolutionary strategies or games or arms races through which they try to eat and avoid being eaten?

Such questions are endless, and their defining role is reflected on every page of every textbook on development, physiology, behavior, or evolution. A research question is *biological*, as opposed to physical or chemical, only when it is posed in one way or another by the organism's purposive, future-oriented activity. The puzzle is that, having been aroused by such purposive questions, biologists look for answers rooted in the assumption that organisms have no purposes. The reigning conviction is that explanations of physical and chemical *means* effectively remove any need to deal scientifically with the *ends* that alone could have prompted our search for means in the first place.

My larger argument in this book will be that the biologist's conscious commitment to purely physical and chemical descriptions — which is to say, her conscious refusal of much that she actually knows — has devastating effects upon many fields of biological understanding, and particularly evolutionary theory. It hardly needs emphasizing that *if* organisms really are purposive beings — if the fact of purposive activity is not an illusion — then a biological science so repulsed by the idea of purpose that its practitioners must avert their eyes at the very mention of it … well, it appears that these practitioners must feel threatened at a place they consider foundational. And with some justification, for to admit what they actually know about organisms would be to turn upside down and inside out much of the science to which they have committed their lives.

"Purpose" — an idea that needs careful qualification in different biological contexts — gives us but one of several intimately related avenues of approach to what is distinctive about the life of organisms. In the remainder of this chapter I will briefly sketch a few of these avenues.

Organisms are agents capable of expressing their own meanings

Organisms are agents; they *do* things. The difference between a motionless rock, on one hand, and a motionless cat on the other is that the cat is not merely motionless; it is *resting*, or perhaps preparing to pounce. When it ceases *doing* things, it is no longer alive. Whereas a rock may *be moved* according to universal laws, the cat is *self-moved;* the needs and interests according to which it moves are not the universal laws of its surroundings. In our routine experience we take self-motivated activity to be definitive of living things. If an object moves unexpectedly — without an evident external cause — we immediately begin testing the assumption that it is living.

When an animal responds to a physical stimulus, its response is not in any strict way physically enforced, or directly caused, by the stimulus. Rather, the animal “reads” the meaning of the situation in light of its own concerns, including its needs and interests, and then alters that meaning by responding to it. If the animal *is* physically moved by a stimulus, as when a rolling stone bumps into a leg, we don’t consider the movement to be the organism’s own act. It is not a *response*, but merely a physically caused *result*.

As a useful picture of this, we need only consider how the negligible force producing an image on the retina — say, the image of a charging lion — can set the entire mass of a quarter-ton wildebeest into thundering motion. The impelling force comes from within, so that the movement seems to originate within the animal itself in a way that we do not see in inanimate objects.

Figure 2.1. A wildebeest, otherwise known as a gnu.[5]

The wildebeest is not forcibly moved by a physical impact, but rather *perceives* something. Further, its perception is at the same time an *interpretation* of its surroundings from its own point of view and in light of its own world of meaning. The “lawfulness” at issue here, such as it is, is far from being universal. It differs radically from one living being to another, so that the retinal image of a charging lion means a very different thing to the wildebeest from what it means to another lion or to a vulture circling overhead. And it produces an altogether different response in these cases.

Figure 2.2. A charging lioness in the Serengeti.[6]

All this may seem trivially obvious — and so it is. We make sense of biological activity in terms of meanings radically different from the meanings we bring to inanimate events. The truth comes out in a thousand ways, and above all in the choice of language. The words employed for description of animate activity differ dramatically from those applied to inanimate activity.

Think, for example, of a living dog, then of its decomposing corpse. At the moment of death, all the living processes normally studied by the biologist rapidly disintegrate. The corpse remains subject to the same laws of inanimate nature as the live dog. But now, with the cessation of life, we see those laws strictly in their own terms, without reference to life. The dramatic change in our descriptive language as we move between the

living and the dead speaks more loudly than any philosophical convictions we may have about life and death.

No biologist who had been studying the *behavior* of the living dog will concern herself with the corpse's "behavior". Nor will she refer to certain physical changes in the corpse as *reflexes*, just as she will never mention the corpse's *responses* to *stimuli*, or the *functions* of its organs, or the processes of *development* being undergone by the decomposing tissues.

Virtually the same collection of molecules exists in the canine cells during the moments immediately before and after death. But after the fateful transition no one will any longer think of genes as being *regulated*, nor will anyone refer to *normal* or *proper* chromosome functioning. No molecules will be said to *guide* other molecules to specific *targets*, and no molecules will be carrying *signals*, which is just as well because there will be no structures *recognizing* signals. *Code*, *information*, and *communication*, in their biological sense, will have disappeared from the scientist's vocabulary.

The corpse will not produce *errors* in chromosome replication or in any other processes, and neither will it *attempt* error *correction* or the *repair* of damaged parts. More generally, the ideas of *injury* and *healing* will be absent. No structures will *inherit* features from parent structures in the way that daughter cells inherit traits or tendencies from their parent cells, and no one will cite the *plasticity* or *context-dependence* of the corpse's *adaptation* to its environment.

The language highlighted here is clearly a language of more-than-physical meaning. When investigators do their best to ignore these additional layers of meaning — for example, when they present their findings *as if* they were merely elucidating physical and chemical interactions — then they are contradicting just about all their own biological descriptions.

It is not that conventional approaches are inadequate in their own, limited terms. *In such terms* we can be sure that everything being described makes perfect sense, and that the physical picture reveals no mysterious gaps. It's just that, within the arbitrarily imposed limits of physical and chemical description, we will see no living activity. "Physically lawful" describes only those aspects of the animal's body that continue uninterrupted, according to exactly the same laws, when it dies. If we restricted our understanding to *this* characterization, death would not even be a recognizable event.

Of course, in a split-personality, blindsighted sort of way every biologist does recognize death, because she recognizes the distinctive sorts of meaning, including the perceptions, purposes, intentions, and responses, that the once-living dog is no longer expressing. It's just that she typically refuses to let the expressive aspects of the creature's life become uncomfortably explicit, or to influence fundamental theory. Or, when they do affect theory, it must be the organism's physical activity, not its interior life as a perceptive and intentional actor, that enters into scientific consideration. Like the behaviorists of old, we are forbidden to accept the inner, immaterial, and immediately given *reality* of perceptions and intentions, as opposed to various associated physical manifestations.

The end is more constant than the means of attaining it

William McDougall, who lived from 1871 to 1938, was a highly respected (if also rather controversial) British psychologist who, after teaching at Oxford, spent the latter part of his career in the United States. He authored widely used textbooks of psychology and, for several years, occupied William James' chair at Harvard. Then he moved to Duke University where, with J. B. Rhine, he founded the Parapsychology Laboratory. Our present interest, however, is in a 1929 work, where McDougall usefully summarized certain typical features of purposive activity (McDougall 1929, pp. 50-51). He was writing about human behavior, but we can recognize something like these features in all purposive behavior, conscious or otherwise:

> • Goal-directed activity tends to be *persistent* and may be repeatedly renewed even after being effectively blocked for a time. If you tie up your hungry dog at some distance from its food bowl, it may cease straining at the leash. But as soon as you grant it freedom, it will again head for the bowl.
>
> • Goal-directed activity is very often *adaptable* to one degree or another. If one strategy fails, the organism may vary it or switch to a different strategy. As many dog owners have discovered after forgetting to give Fido his food, their beloved pet may contrive to enjoy the freshly roasted chicken on the kitchen counter.
>
> • And, as soon as the goal is reached, that particular goal-directed activity *ceases*. Having had its fill, your dog may want to play or else to sleep. But it will not continue its quest for food.

We do not find the same combination of features in the inanimate world. Yet anyone who interacts with animals takes them for granted. Moreover, analogous features are evident even in physiological activity, all the way down to the molecular biology of the cell. In its development "the embryo seems to be resolved to acquire a certain form and structure, and to be capable of overcoming very great obstacles placed in its path". When encountering such an obstacle to its development, the organism "adjusts itself to the changed conditions, and, in virtue of some obscure directive power, sets itself once more upon the road to its goal; which under the altered conditions it achieves only by means of steps that are different, sometimes extremely different, from the normal" (McDougall 1911, pp. 242-43).

When a cell is preparing to divide, it passes through what are known as internal "checkpoints", where the cell responds to the presence or absence of conditions necessary for a successful division. If something is awry, the cell may nevertheless *persist* in the aim of dividing by taking any corrective (*adaptive*) action that happens to be within its power. It then proceeds with its division, and *ceases* the entire, highly coordinated and complex activity once the process is complete. Or, when division is "judged" inadvisable — say, because chromosomes

have been irreversibly damaged — the cell may "decide" to self-destruct and offer its resources up for the good of the rest of the organism of which it is a part.

No one will bristle upon hearing that "this cell is preparing to divide". But we would certainly bristle if we heard that "Mars is preparing to make another journey around the sun", or "the nebula has ceased its effort after forming the solar system". A planet moves according to universal laws acting in an unchanging manner. There is no point in its journey when an act is *initiated* or *concluded*, but only the playing out of the immediately preceding forces. There is in this sense nothing new to explain. Biological explanation, by contrast, always involves something new, an element of initiative, a response to circumstances not fully necessitated by the preceding play of physical and chemical processes.

Here's another illustration, drawn from the great English physiologist, Sir Charles Scott Sherrington, writing in 1922. He is talking about what happens when, in some animals, a motor nerve is severed and the portion running from the point of severance to the muscle dies. The living end of the nerve immediately embarks upon a meaningful and unfathomably complex journey:

> The fibre, so to say, tries to grow out to reach to its old far-distant muscle. There are difficulties in its way. A multitude of non-nervous repair cells growing in the wound spin scar tissue across the new fibre's path. Between these alien cells the new nerve-fibre threads a tortuous way, avoiding and never joining any of them. This obstruction it may take many days to traverse. Then it reaches a region where the sheath-cells of the old dead nerve-fibres lie altered beyond ordinary recognition. But the growing fibre recognises them. Tunnelling through endless chains of them, it arrives finally, after weeks or months, at the wasted muscle-fibres which seem to have been its goal, for it connects with them at once. It pierces their covering membranes and re-forms with their substance junctions of characteristic pattern resembling the original that had died weeks or months before. Then its growth ceases, abruptly, as it began, and the wasted muscle recovers and the lost function is restored (Quoted in Russell 1945, p.111).

Here we see again goal-directed persistence over a long period, adaptability in the face of obstacles, and cessation of this particular activity when its end is achieved.

Notice also Sherrington's careful caveat ("so to say") whereby he qualifies the easily anthropomorphized phrase, "*tries* to grow". The care and the qualification are fully justified. But the fact is that such phrasing is pervasive and seemingly unavoidable whenever the researcher would offer informative biological descriptions. This suggests that we owe it to the discipline of biology to explore the nature of our own usage. It pays to know what we are *really* saying, rather than leaving it in a vague and ambiguous cloud of suggestion. Throughout this book we will touch on some of the problems we run into when employing the easily misused language of purposiveness, goals, and intentions.

E. S. Russell, a British marine biologist whose writings during the first half of the twentieth century can sometimes seem more up-to-date regarding the decisive issues of twenty-first century biology than the literature of our own day, summarized the gist of the foregoing discussion with wonderful succinctness: "The end-state is more constant than the method of reaching it" (Russell 1945, p. 110). This suggests that the end-state, understood as somehow implicit in the entire drama leading up to it, plays something like a causal role. It reminds one of

the way a complex, well-considered conclusion is implicit in the profound, multivalent play of thought leading up to it, rather than being the mere passive outcome of a deterministic march of "naked" machine logic. (For a fuller treatment of this, see the section on leaf sequences in Chapter 12 ("Is a Qualitative Biology Possible?").

Surely any such causal dimensions involving end-states would have large implications for a science focused on unraveling physical and chemical means while ignoring the ends that express the meaning of the activity.

Every organism is narrating a meaningful life story

The fact of purposive activity; the obvious play of an active agency; the coordination of diverse means toward the realization of interwoven and relatively stable ends; the undeniable evidence that animals perceive a world, interpreting and responding to perceptions according to their own concerns; and the coherence of all this activity in a governing unity that is the unity of a particular way of life — this tells us that every animal is narrating a meaningful life story. This is not something that a rock, say, loosened by ice and tumbling down the steep slope of a mountain ravine, does in anything like the same manner. The pattern of physical events in the organism is raised by its peculiar sort of coherence toward something like a biography whose "logic" unfolds on an entirely different level from the logic of inanimate physical causation. When we tell a story, the narrative threads convey the meanings of a life — for example, motives, needs, ways of experiencing the world, and intentions — and these are never a matter of mere physical cause and consequence.

So when I speak of the organism's wise and knowing agency, or its purposive striving, I refer, among other things, to *its capacity to weave, out of the resources of its own life, the kind of biological narrative we routinely observe, with its orchestration of physical events in the service of the organism's own meanings*.

We normally feel every birth as a new beginning, full of hope and expectation — a beginning of a sort we do not experience in the genesis of a raindrop or dust devil. Even the first shoot of a bean or squash seed, pushing upward through the soil surface, is the prelude to a narrative promising many vicissitudes — engagements with insects and diseases, complex communal relations with other plants, and confrontations with nurturing or threatening forces of nature. And a death is always the end of one particular story.

E. S. Russell, commenting on descriptions such as that of the chaffinch in Box 2.1, noted the narrative connectedness of the events: "Behaviour is often part of a long-range cycle of events, in which one action prepares for and leads on to the next until the end term is reached. Each stage in the chain or cycle is unintelligible to us except in its relation to what has gone before, and, more particularly, to what is yet to come. Such cycles have a temporal unity …" (Russell 1938, pp. 7-8). Present significances are interwoven with and inseparable from the tapestry of past events and their meanings. And future developments, along with whatever new and unpredictable elements they bring, are a continued, improvisational elaboration of the same tapestry of meaning.

In other words, the "end" being approached in an organism's story is not some particular, discrete accomplishment, distinct from the means of getting there, but rather the wholeness and perfection of the entire narrative movement from "here" to "there". Assessing this end is much the same as if we were assessing the meaning of a novel: knowing the ending in isolation would have little significance compared to knowing the larger story of which,

Box 2.1

The Nesting Cycle of the Chaffinch

From a 1927 description by the British naturalist and ornithologist, Edward Max Nicholson:[7]

"The male must leave the flock, if he has belonged to one, and establish himself in a territory which may at the time be incapable of sustaining him alone, but must later in the season supply a satisfactory food-supply for himself, his mate and family, and for as many birds of other species as overlap his sphere of influence. He must then sing loudly and incessantly for several months, since, however soon he secures a mate, trespassers must be warned off the territory, or, if they ignore his warning, driven out.

"His mate must help with the defence of the territory when she is needed; pairing must be accomplished; a suitable site must be found for the nest; materials must be collected and put together securely enough to hold five bulky young birds; eggs must be laid in the nest and continuously brooded for a fortnight till they hatch, often in very adverse weather; the young are at first so delicate that they have to be brooded and encouraged to sleep a great part of the time, yet they must have their own weight of food in a day, and in proportion as the need of brooding them decreases, their appetites grow, until in the end the parents are feeding four or five helpless birds equal to themselves in size and appetite but incapable of digesting nearly such a wide diet.

"Enemies must be watched for and the nest defended and kept clean. When the young scatter, often before they can fly properly, they need even greater vigilance, but within a few days of the fledging of the first brood a second nest will (in many cases) be ready and the process in full swing over again. All this

so we often feel, it is a necessary and proper part.

has to be done in face of great practical difficulties by two creatures, with little strength and not much intelligence, both of whom may have been hatched only the season before."

We are organisms, but not all organisms are human

Note well, then, that when speaking of the organism's story, we need make no reference to the consciously directed performances of human beings, even though our performances certainly exhibit a narrative character in the sense meant here. When I refer to living activity as "end-directed", I am not suggesting the formulation of a conscious goal that is "aimed at". I mean, rather, something like this:

> The organism's life is a continual *playing forward of meanings within meaningful contexts*. There is a certain directedness to any such play of meaning (as when birds build a nest), but it need not be the directedness of human plan fulfillment.

The directedness of a temporally unfolding play of meaning implies no narrow goal and no conscious planning. But every such play of meaning does have a certain directedness to it. Think of the greatest poems or novels, where nothing is calculated *in order to* reach the conclusion, but the movement is nevertheless from the beginning to the end, not the reverse. This movement simply expresses the progressive deepening of a meaningful and coherent unity — more like a dance than pursuit of a fixed and predefined goal. And the dance looks ever more improvisational as organisms ascend in the scale of complexity.

I offer no specific hypotheses to explain the existence of intentional agency and story narration. I only note that the *fact* of the narrative is immediately demonstrable in every organism. There may be huge differences in the nature of the stories that can be told by different kinds of organism, but from the molecular level on up there are always elements of story that we do not find in inanimate things. The narrative of meaningful activity undertaken and accomplished is there to be seen, and is characterized as such, if only inadvertently, in every paragraph of biological description.

Moreover, our recognition of intelligent and intentional activity does not require us to understand its source. Looking at the pages of a book, we have no difficulty distinguishing written marks from deposits of lint and dust, even if we know nothing about the origin of the marks. We can declare a functioning machine to be engaged in a purposive operation, whether or not we have any clue about the engineers who built a mechanistic reflection of their own purposes into it. And if we find live, intelligent performances by organisms, we don't have to know how, or from where, the intelligence gets its foothold before we accept the testimony of our eyes and understanding.

Neither should we expect the stories to be predictable — no more than we expect the ending of a half-read novel to be predictable. We can, however, expect the ending to *make*

sense, and even to throw light on everything that went before. The story will *hold together* in a way that unstoried physical events do not.

The storytelling is the being of the organism

If the organism's life is an unfolding story, then we might well take the essence of that life to be the *activity of storytelling* itself — the sort of activity by which the distinctive character of this or that species is sketched and acted out. Organisms, as philosopher Hans Jonas has written, "are individuals whose being is their own doing … they are committed to keeping up this being by ever renewed acts of it." Their identity is "not the inert one of a permanent substratum, but the self-created one of continuous performance" (Jonas 1968, p. 233).

Or, again, we have the rather different formulation by Paul Weiss, a profound observer of cellular life:

> Life is a dynamic *process*. Logically, the elements of a process can be only elementary *processes*, and not elementary *particles* or any other static units (Weiss 1962, p. 3).

An organism is not, most essentially, its body. After all, its body at one time is never materially identical to its body at a different time. The body reflects, rather, a unique power of activity. It is first of all a result of this activity, while also developing into a further vehicle for it. Organisms, in other words, are *doings* rather than *beings*. Or, as the student of holistic thinking, Henri Bortoft, has put it, they are "doings that be", not "beings that do".[8]

So it is not that an organism's material being determines its doings (as is broadly assumed throughout the biological sciences); rather, its doings are what constitute it as a material being. This means that it is never wholly present to our observation in any outward or material sense. The organism's essential power to act cannot itself be a visible product of its activity.

The preeminence of activity in relation to physical substance and structure would, if taken seriously, give us an altogether new science of life. For example, it might have saved us from an entire century of badly misdirected thinking about DNA and genes. It might also have spared biologists the crude materialism that many physicists long ago gained the freedom to question.

But this is to get ahead of the story. For now, it is enough to mention two questions implicit in the foregoing, while deferring further comment:

Regarding our theory of evolution: If, in reality, every organism's existence is a live, moment-by-moment, improvisational storytelling — a creative and adaptive, irreversible narrative that is always progressing coherently and contextually from challenge to response and adaptation, from initiative to outcome, from nascence to renascence, from immaturity through maturity to regeneration — then an evolutionary theory rooted in notions of random variation and mindlessness is a theory hanging upon a great question mark. "The answer to the question of what status teleology ['end-directedness'] should have in biology" — so the influential

biologist and philosopher Francisco Varela came to see at the end of his life — determines “the character of our whole theory of animate nature” (Weber and Varela 2002).

And then there is the question whether the future of individual species, the future of particular ecological settings, the future of life’s diversity on earth, and the future of earth itself, all depend on our willingness and ability to attend to the life stories of the beings among whom we live — depend, finally, on our capacity for the awe and reverence that these stories so naturally evoke.

WHERE ARE WE NOW?

An organism's story gives form to its material existence (not the other way around)

We have seen that animals are irreducibly purposive in both their behavior and their physiology, and that the purposive ends they seek are more constant than the means for seeking them. We have also seen that, as living beings rather than merely physical objects, animals are motivated and moved by perceived meanings rather than by impelling physical forces.

Its interpretive activity — activity through which meanings are apprehended and expressed — is what enables an animal to weave the story of its life, as opposed to being moved by a set of physical causes and consequences. A story just *is* an evolving tapestry of interwoven meanings, through which an animal gains its narrative unity and coherence in time. Without such unity, there is no story, and without a story there is no animal.

There are many questions raised by the discussion in this chapter, including these:

- Given that we share common roots with all life, what is the relation between the purposes of organisms in general and our own human purposes?
- Does saying that an organism makes a story of its life imply a form of consciousness? And, if so, what are the different forms consciousness takes in living beings?
- How do our own human purposes relate to the purposiveness in our bodies and cells, through which many of our intentions are carried out?
- In what sense must we consider the world itself as "living", given that it has brought forth and nurtured all living things on earth? Can the world from which we arose somehow be poorer in features and potentials than the creatures it brings forth?

And much more. In many chapters of this book we will tangentially brush up against such questions. And at times — as in Chapters 24 and 25 — we will face some of them head on. You may also find a few helpful preliminary notes in Chapter 1. But I hope every reader will be left with many open questions, as befits any *living* science.

Notes

1. Arp 2007. See also Trivers 1985, p. 5. In this same connection, the following comment by Georg Toepfer of Humboldt University in Berlin is significant:

> Most biological objects do not even exist as definite entities apart from the teleological perspective. This is because biological systems are not given as definite amounts of matter

> or structures with a certain form. They instead persist as functionally integrated entities while their matter and form changes. The period of existence of an organism is not determined by the conservation of its matter or form, but by the preservation of the cycle of its activities (Toepfer 2012).

Then there is this from the American philosopher, Susanne Langer:

> The image of life as motivated activity reflects an aspect of animate nature that has baffled philosophers ever since physics rose to its supreme place among the sciences, because inanimate nature — by far the greatest concern of physics — has no such aspect: the telic phenomenon, the functional relation of needs and satisfactions, ends and their attainment, effort and success or failure. There are no failures among the stars. Rocks have no interests. The oceans roar for nothing. But earthworms eat that they may live, and draw themselves into the earth to escape robins, and seek other worms to mate and procreate. They need not know why they eat, contract, or mate. Their acts are telic without being purposive (Langer 1967, p. 220).

But, of course, "telic" just means "purposive". What I think she is getting at is that purposive or end-directed activity need not be *consciously* purposive — that is, need not be *planned* in the human sense.

2. Emphasis in original. Hereafter and in all succeeding chapters this can be assumed unless explicitly stated otherwise.

3. Quoted in Niemann 2014, p. 30.

4. Quoted in Mayr 1974. Reports of this remark by Haldane come with many variations. The eminent French biologist, François Jacob, wrote, without attribution: "For a long time, the biologist treated teleology as he would a woman he could not do without, but did not care to be seen with in public" (Jacob 1973, pp. 8-9).

5. Figure 2.1 credit: Wildebeest photo by Chris Eason (CC BY 2.0).

6. Figure 2.2 credit: Lion photo by Schuyler Shepherd (CC BY-SA 2.5).

7. Quoted in Russell 1938, pp. 7-8. I have added paragraph breaks. The book by Nicholson is entitled *How Birds Live: A Brief Account of Bird-Life in the Light of Modern Observation*, and was published in London by Williams and Norgate, Ltd., in 1927.

The engraving of a chaffinch pair and their nest is from a book published in 1866 and titled, *Homes Without Hands: Being a Description of the Habitations of Animals, Classed According to Their Principle of Construction*, by John George Wood and others. For more information, see The Internet Archive Book Images.

8. The idea is central to the work of Bortoft, who ascribes this particular (apparently unpublished) formulation to the British scientist and philosopher, J. G. Bennett. See Bortoft 1996, p. 270.

Sources

Arp, Robert (2007). “Evolution and Two Popular Proposals for the Definition of Function”, *Journal for General Philosophy of Science* vol. 38, pp. 19-30. doi:10.1007/s10838-006-9008-3

Bortoft, Henri (1996). *The Wholeness of Nature: Goethe’s Way toward a Science of Conscious Participation in Nature*. Hudson NY: Lindisfarne.

Jacob, François (1973). *The Logic of Life: A History of Heredity*, translated by Betty E. Spillmann. New York: Random House. Originally published in French in 1970.

Jonas, Hans (1968). “Biological Foundations of Individuality”, *International Philosophical Quarterly* vol. 8, no. 2, pp. 231-51.

Langer, Susanne K. (1967). *Mind: An Essay on Human Feeling* vol. 1. Baltimore MD: Johns Hopkins University Press.

Mayr, Ernst (1974). “Teleological and Teleonomic, a New Analysis”, in *Methodological and Historical Essays in the Natural and Social Sciences* (vol. 14 of Boston Studies in the Philosophy of Science), edited by Robert S. Cohen and Marx W. Wartofsky. Dordrecht, Holland: Springer Netherlands, pp. 91-117. doi:10.1007/978-94-010-2128-9_6

McDougall, William (1911). *Body and Mind: A History and a Defense of Animism*. New York: Macmillan.

McDougall, William (1929). *Modern Materialism and Emergent Evolution*. New York: D. Van Nostrand.

Niemann, Hans-Joachim (2014). *Karl Popper and the Two New Secrets of Life*. Tübingen, Germany: Mohr Siebeck.

Russell, E. S. (1938). *The Behaviour of Animals*, second edition. London: Edward Arnold.

Russell, E. S. (1945). *The Directiveness of Organic Activities*. Cambridge UK: Cambridge University Press.

Toepfer, Georg (2012). “Teleology and Its Constitutive Role for Biology as the Science of Organized Systems in Nature”, *Studies in History and Philosophy of Biological and Biomedical Sciences* vol. 43, pp. 113-19. doi:10.1016/j.shpsc.2011.05.010

Trivers, Robert (1985). *Social Evolution*. Menlo Park CA: Benjamin-Cummings.

Weber, Andreas and Francisco J. Varela (2002). “Life after Kant: Natural Purposes and the Autopoietic Foundations of Biological Individuality”, *Phenomenology and the Cognitive Sciences* vol. 1, pp. 97-125. Available at https://link.springer.com/article/10.1023/a:1020368120174

Weiss, Paul (1962). “From Cell to Molecule”, in *The Molecular Control of Cellular Activity*, edited by John M. Allen, pp. 1-72. The University of Michigan Institute of Science and Technology Series. New York: McGraw-Hill.