Back to Roy Wood Sellars: Why His Evolutionary Naturalism Is Still Worthwhile

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1. INTRODUCTION

At the moment, naturalism is fashionable as never before. Several of the most prominent living philosophers—e.g., Quine, Churchland, Ruse—call themselves naturalists. However, it is not always that clear what really is meant by naturalism, apart from a philosophy in which science plays a large role. This lack of clarity stems in part from the uncertainty about what is meant by "science"—physics, biology, or both of them. But partly it also stems from different interpretations of the impact of scientific models on philosophical reflections.

In this article I propose a return to the writings of the "evolutionary naturalist" Roy Wood Sellars (July 9, 1880, Seaforth, Ontario-September 5, 1973, Ann Arbor, Michigan). He was the father of Wilfrid Sellars, but I think that the philosophy of Sellars père is a better starting-point for "a reading programme" for modern naturalists than the philosophy of Sellars fils, in spite of the claim of the latter that "Critical Realism and Evolutionary Naturalism . . . and all that they imply, are part of my paternal inheritance."¹ Although it may be true that much of the philosophy of Wilfrid Sellars is rooted in the philosophy of his father, we miss the illuminating evolutionary considerations characteristic of his father's philosophy in most of his work, and we can see a tendency to expect too much from linguistic analyses alone (instead of the more typically naturalistic way of expecting solutions from new perspectives offered by new knowledge). Beyond that, Wilfred Sellars, with his attack on "the Myth of the Given" and his dichotomy between the manifest and the scientific

¹ "Physical Realism," in Philosophical Perspectives (Springfield, IL: Charles Thomas, 1967), 185.
image, although in fact he was only criticizing logical positivism and extending some arguments of his father, probably had the effect of suggesting the hopelessness of realism and naturalism. With his painstakingly detailed linguistic analyses of problems, he probably helped to initiate "the linguistic turn" in philosophy and thereby strengthened a movement that kept naturalism in check for at least one generation. Most of the time, however, his analyses are either completely compatible with his father's philosophy, or try to carry it further in specific domains and discussions. Given the fact that both father and son tried to take "both science and man seriously," the differences in their work can be explained partly by the completely different philosophical scene in which they were operating. It seems to me, however, that the elder Sellars was more fully alive to the importance of evolution than Wilfrid Sellars. The work of Sellars père is the best starting-point for anyone interested in finding a balanced and reasonable version of naturalism in which the epistemological questions raised by the counterintuitive nature of physics, or by the mysterious relations between mind and body and mind and nature, are partly solved by evolutionary considerations about the nature of knowledge and consciousness.

In my examination of Roy Wood Sellars's philosophy I will concentrate on three important interrelated problems that any "adequate naturalism" will have to solve and for whose solution he has some very useful suggestions. They are, first, the problem of realism in epistemology (sections 2 and 3); second, the problem of "levels of organization" in ontology, which sometimes turn up in modern debates in the discussion about "natural kinds," "depth realism" or about the autonomy of biology (section 4); and, third, the status of subjective experience in the philosophy of mind (section 5). For Roy Wood Sellars the solutions to these problems are closely interrelated. For him naturalism meant an "interpretative synthesis" in which scientific and philosophical insights are integrated into an "organized whole" (EN, 1). Naturalism was

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in his opinion essentially an opportunity to build a systematic philosophy on a solid foundation in which all problems are treated on the basis of the same general principles.

What makes Roy Wood Sellars so special is not only that his thinking is evolutionary, but that his underlying view of evolution is completely different from the views of contemporary fellow "evolutionary" philosophers like Bergson, Samuel Alexander and Lloyd Morgan. Although Sellars did not write much about evolutionary biology, and most of his writings come from a period well before the era of the revival of Darwinism, it is clear from his writings on materialism that there is nothing mystical about his notion of emergence and that there is not a remnant of vitalism in his views. In his later work he was able to integrate modern discoveries about genes into his conceptual framework without any difficulty (see, e.g., PPPP, 270). His conclusions from evolutionary theory often anticipate later evolutionary epistemology with its hypothetical realism. Modern discussions about the mind-body problem are also foreshadowed in his evolutionary approach to this subject.

In all these discussions Sellars's subtlety and clarity makes his work, even now, worth studying. Here is a philosopher who continually refers to the classical philosophers but who also knows his physics and biology; a philosopher who was prepared to enter into discussion with all of his contemporaries, not only pragmatists, new realists, logical positivists, and ordinary language philosophers, but also idealists, Thomists, dialectical materialists, humanists, existentialists. Besides that, in Sellars we meet a philosopher who was always prepared to go back to his most fundamental presuppositions while at the same time retaining an intuitive feel for the underlying presuppositions behind other philosophical stances. But let us start with the problem of realism.

2. KNOWLEDGE AS AN EVOLUTIONARY ACHIEVEMENT AND THE NECESSITY OF A REALISTIC FRAMEWORK

Today the discussion about realism in the philosophy of science is largely concerned with the opposition of scientific realism (which upholds the "real" reference of theoretical terms) and instrumentalism. In the days of Sellars the opposition was more that of realism and idealism. Yet these discussions show important continuities, since antirealist attitudes are still largely based on empiricistic and phenomenalistic arguments. The underlying question in both

debates is therefore still, “What is our justification in inferring an unobservable reality \( x \) from a set of observations?” or “What is our justification in inferring a thing-in-itself behind the phenomena?”

Therefore when Bas van Fraassen speaks about “saving the phenomena,” he no longer seems to be concerning himself with Humean sense-impressions; nevertheless, he relies heavily on the distinction between the certainty attached to what we humans can observe and the sphere of scientific speculation and explanation “beyond.” Van Fraassen is a student of Wilfrid Sellars, who, as we have seen, stressed the distinction between the “manifest image” and the “scientific image” and who related the latter to unobservables. But while Wilfrid Sellars speculated about the possible replacement of the manifest image (though he was not so radical as Paul Churchland, another student of his), van Fraassen interprets the scientific image as the realm of speculation and makes a fundamental distinction between (realistic) “belief in” and merely (instrumentalistic) “acceptance of” a theory postulating unobservables.7 When Arthur Fine pleads for a “minimalist” philosophy of science, he does so because he doesn’t believe in “adding” an “external world” to our scientific beliefs.8 And when the self-confessed naturalist Michael Ruse claims that “Darwinian epistemology” really combines better with Humean “metaphysical scepticism” than with Kantian “metaphysical realism,” the underlying paradigm is still the Humean stream of impressions and the “thing-in-itself” “beyond” those impressions. His claim is that between these two realms there exists only “a justificatory void.”9

It seems to me that in all these views, even Ruse’s, Darwinism is not taken seriously enough. If the Darwinian explanation of life and knowledge is taken seriously, a mind-independent reality which can be partially known has to exist, because we are immersed in a struggle for existence in this reality and our minds have evolved to orient us and direct our behavior. Of course, there is no ultimate proof of Darwinism nor of the hypothetical realism that it includes, but the point is that realism is simply part of the Darwinian paradigm and is not a metaphysical “extra,” as suggested by Ruse. There has to be a reality outside the organism if the concept of adaptation is to make any sense, and the capacity for knowledge and even for science enables certain organisms to adapt themselves to their cosmic environment. Cognition as adaptive representation is only one form of adaptation, but the simple fact that brains exist

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shows that somehow orientation on the basis of clues from the environment which are processed into a central decision-center works (EN, 72–73). And there has to be at least a minimal correspondence, or fitting, between ideas and world if it is to work. Because both adaptation and adaptive representation presuppose an outside world, it would be highly artificial to believe in or accept Darwinism and at the same time try to be a complete sceptic. Metaphysical realism is simply part of the Darwinian framework.

Of course, according to the Darwinian interpretation our brains have evolved to detect the everyday world around us (the mesocosmos). A Darwinian framework warns us not to trust our imagination if we want to go beyond that sphere, but it does not exclude the possibility that instruments and our inferential reasoning could enable us to stretch the sphere of the knowable far beyond the everyday world. The point here is that the borderline between classical "metaphysical" realism and modern "scientific" realism about scientific entities is not that sharp, given our evolved abilities to combine different sources of information into a representation that to some extent maps the world around us. Of course, the realism that is a part of Darwinism is only a hypothesis explaining, first, how a world without us could turn into the world around us and, second, how the world around us is reflected and registered in our brains in a way that enables us to behave adequately.

It is this "hypothetical realism" that is not only foreshadowed in the work of Sellars, but which is also described there in detail. Sellars does not so much give reasons for believing in realism generally, as he tries to show that cognitive claims simply are claims about supposedly real objects or properties, and that an evolutionary analysis of cognition simply has to assume realism from the very start. He is aware of the distinction between the sphere of "commonsense realism" and the sphere of scientific speculation, which his son Wilfrid stressed (and perhaps exaggerated) and on which van Fraassen seems to rely. But he sees no reason to favor the first (which he calls "naive realism") over the second, or vice versa, because he thinks we don't "intuit" reality directly in either of them (nothing is "given"). He also recognizes the uncertainty in-

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10 Of course, this is not a "proof" of realism, because in principle our brain could be adapted to a world that no longer exists. The brain as an organ of orientation could have evolved because the world until last Friday was causal, stereometric, and homogenic: since last Friday, however, all our causal and space/time-related expectations are simply atavistic illusions. The point is that we don't have much reason to believe such a hypothesis.


13 It is no coincidence that Sellars was one of the first to use the term 'scientific realism'; see his CR.
volved in all cognition, but sees no ground in it for an epistemological ideology inspired by caution only, such as Ruse's "metaphysical scepticism," which denies the possibility of real though uncertain progress in the development of ever better theories and interpretations.

Realism for Sellars is therefore simply a part of his paradigm or, to use the term he himself uses, his framework. For Sellars an approach in which metaphysical realism is something that has to be proven is already determined by a series of false assumptions. Large parts of his work are devoted to analyses of the historical roots of these assumptions which place the burden of proof on the realist, and to the way in which they can be replaced by a model that is more in harmony with both common sense and science. Let us first present his analysis and then try to imagine what kind of position they would lead him to in more recent debates.

Sellars traces the assumptions which have driven realism into a blind alley back to Descartes, Locke, and Hume. In his article in *Mind*, "Sensations as Guides to Perceiving," he locates the most fatal presupposition in what he calls Locke's causal theory of perception, according to which the awareness of sense-data as atomic facts causes us to "infer" objects. Starting from this presupposition our actual, perceptual beliefs are without any justification, and even our common-sense realism totters. Opposed to the "inferential realism" that tries to prove that there are objects "behind" the phenomena, Sellars places the "referential realism" of the new realists as well as the critical realists, both of whom see perception as from the very start objectively referring to objects. The difference between the new and the critical realists lies in the naive behaviorism and pan-objectivism of the new realists, which contrasts with the refined representationalism of the critical realists (to which he himself belonged: he even created the name; see NA, 362). Sellars's own contribution is a thorough analysis of knowledge as an "evolutionary achievement"—as an evolved solution to the problem of the necessity of orientation.

So the best cure for empiricism and phenomenalism is simply a more scientific model of perception in which "the stimulus aspect is just the beginning of true perception" (PER, 122) and in which true perception has to be understood as guiding the behavior of the organism. Sense-data are from the beginning only used as cues in a "perceptual judging" (PER, 65) and are therefore not "terminal." Sensory factors are used as guides and are therefore more occasions than causes of knowledge. Stimuli and response are mediated by "central aroused processes" which enable the organism to do something with the incoming stimuli, for example to learn from them (PER, 10). Stimuli alone have no importance or meaning whatsoever. What is important is the way in which we represent the world as a result of both stimuli and the structure of our nervous system.
The introduction of a representationalism that no longer splits the world into two is a major concern of Sellars's epistemology. In his article "'True' as Contextually Implying Correspondence" he tries to show that the rickety nature of the first versions of representationalism were the main cause of epistemology's historical detour. Locke created a problem by interpreting ideas as the primary objects of knowledge and then suggesting that ideas might "copy" a real world. Against this Sellars proposes that there is a difference between the content and the object of knowledge: knowledge is directed toward (real, external) objects but, since there is no way in which objects can be directly given, it uses perceptions as clues and continually constructs and reconstructs representations of the objects. In sum: "We look through the visual field at the things stimulating us and apply learned concepts to them under the guidance of the visual field" (PER, 20).

So ideas are taken as mediating between the knower and the known, and with that directness and mediation are no longer contradictory (PER, 113). We only have access to things via ideas and ideas are not essences of things, but "learned concepts." Sellars is critical of the "doctrine of essence" of some of his fellow critical realists, like Drake and Santayana. He clearly commits himself to nominalism. Of course, reality has "structure and connections" and exhibits "persistent patterns" (PPR, 163), but those are not directly given to the mind. Instead, the mind has to learn to discriminate them and to label them according to its own categories. The repetition of the act of adequately recognizing and labeling them is "quite analogous to the repetition of a skilled act" (PPR, 164). In even more complex acts symbols are used as characterizations of complex patterns.

We can interpret modern connectionism as support for this analysis of knowledge. According to the connectionist analysis a neural network which is learning some distinction is "fed" a large sample of characteristic patterns of stimuli which results in specific divisions of synaptic weights corresponding with those patterns. Those specific divisions of synaptic weights represent a

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14 This is a point that recurs in the philosophy of Wilfrid Sellars: "Whereas the naive realist wants to construe our knowledge of the physical world as direct and unmediated, and the representationalist construes it as mediated and indirect, Sellars is trying to fashion a middle course that sees our knowledge of the physical world as direct but mediated. Perceptual knowledge properly so called will be mediated by sensations but will not be directly about sensations" (C.F. Delaney, "Theory of Knowledge" in The Synoptic Vision, 5).

15 See especially PPR, vi, 155–83: "I am a conceptual nominalist who regards concepts as arising in individual minds and having the capacity of disclosure of the characteristics of objects, a capacity well founded on the basis of sense-data. And I am an ontological nominalist who rejects the universal-theory."

16 See P. Churchland, A Neurocomputational Perspective (Cambridge, MA: The MIT Press, 1989); henceforth referred to as ANP.
kind of "prototype" that enables the neural network to classify new patterns of stimuli in the right categories. Sellars’s “learned concepts” could correspond to those “prototypes in a trained network” in that they both, first, are based on real distinctive patterns coming from “outside” the neural system and, second, are “translated” into something within the mind. Sellars’s model is more “ecological and teleological,” however, than Churchland’s version of connectionism, because there is no dogma of infinite plasticity here and the mind is portrayed as actively deciphering its environment as a function of the need for orientation (we shall note other differences in section 5).

Central to Sellars’s analysis is the notion that all complex mental operations with representations and concepts refer to real objects. “I think through the distinguishable content of the idea to the denoted object” (PPR, 164). The concepts with which the mind thinks things are, of course, not identical with anything in the thing, but are able to disclose its characteristics (PPR, 166).

Of course, the background of this analysis is the idea that knowledge arose to adapt the mind of the individual organism to its environment (EN, 340). The organism of course has no direct access to the world, but is in need of at least a kind of internal map corresponding with the real world to which it must adapt (EN, 72–73). All of Sellars’s analyses of classical philosophical mistakes are thus inspired by his evolutionary approach to cognition, from which his representationalism follows directly. In this respect he is really a philosophically very sophisticated precursor of modern evolutionary epistemology and modern ecological as well as naturalistic-teleological analyses of knowledge.17

The two most important characteristics of knowledge are, then, (1) “translation in another medium” (physical characteristics of objects are translated into categories, ideas, etc.) and (2) what Sellars calls “aboutness” (PER, 22) and what under the influence of Brentano and Husserl is often called “intentionality.” Because Sellars emphasizes both these aspects of knowledge, his critical realism is both critical and realistic. His consequent evolutionary naturalism is expressed by the fact that he explains both characteristics as results of the specific set-up of our brain-mind.

(1) With regard to “translation in another medium”: Time and time again Sellars stresses the fundamental difference between cognitional identity and existential identity. In cognitional identity characteristics of objects are grasped in terms of predicates within the act of cognition (PER, 125). Cognitional identity is therefore not identity in the strict sense (and maybe Sellars shouldn’t have used the concept of identity at all) but rather reflection, projec-

tion, or correspondence: it is no coincidence that more often he speaks of translation, reproduction, or transferral to another medium. Some citations may give an impression of the way in which he searches for analogies:

The fundamental postulate of critical realism is... that patterned and correlated sense-data can mediate just the kind of knowledge of the physical world we actually possess according to science. The content of perception contains a *translation* of the gross structure of the external world, and theory pushes this translation further. But never do we intuit the very stuff of the physical world. It is the form of reality... not reality itself which is grasped by the human mind. (PER, 111)

The revelatory identity between content of knowledge and the object of knowledge concerns the characteristics of things. It is this that is reproducible in another medium. Things must have structure and connections. In knowledge, our universals are contents which partly symbolize, partly reproduce this structure and these connections. The content of knowledge is, as it were, a translation of the characteristics of the thing; and, as in all translations, there is reproduction and yet difference. Knowledge can never be anything but a pale reflection of the object. Knowledge should not claim to be *being*. (EN, 37)

The need of the organism is to achieve a presentational pattern corresponding to the physical environment to which it must adapt itself. The facts indicate that the organism selectively receives stimuli in their real order and transmutes them into sense-data of a corresponding order. The brain is sympathetic with reality, and, like a skilled lawyer, draws out its story and puts it into its own language. (EN, 72–73)

The obvious conclusion from all these citations is that our brain "has its own language" into which it maps its environment. This "language" is largely a product of the organism's evolved mindset. Eventually its representations or reconstructions have only to guide the organism in its environment; they only have to be *überlebensadäquat* (Vollmer). This means, however, that they have to be continually updated and corrected. How is this achieved?

(2) It is here that "aboutness" or intentionality becomes important. It is especially in his later work that Sellars discovers that the brain-mind is able to guide the organism as a result of the "from-and-to-circuit" or "circuit of return," in which the acting organism, via its sense-organs, corrects its representations of the world. There is a "give-and-take" (PER, 24) of our muscular interplay with the things around us, which has both "direction and objective import" because it has to guide our behavior. The "referential transcendence" of our representations is thus based on the particular structure of our knowledge-apparatus, the deliverances of which we naturally take as an interactive perspective on the world. We are able to isolate objects and zoom in on them, as it were. In doing so we use subjective sense-data via an act of perceptual judging in an objectively referring way (PER, 65). Our knowledge can

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18 See D. Bickerton, *Language and Species* (Chicago & London, 1990), for a description of the way in which each medium dictates the way events are being represented in it.
thus be subjective in content while having at the same time an objective framework of reference which causes it to be continually corrected and updated.

It was the mistake of Kantian idealism to forget this. Kant took the phenomenal world as our normal everyday world. The thing-in-itself could thus be seen as unknown. In cognition, however, we are continually directed to the world-in-itself via the phenomena. The phenomenon is the thing-in-itself as we are compelled to think it (PER, 83). The phenomenal world is therefore the world of representations and reconstructions we create as a result of our interaction with the real world, which is guided by our intentionality, the natural “focus” of our minds. Although, of course, knowledge is always uncertain, we can achieve knowledge of the real world through our phenomenal world and the way it changes as a result of our activities and the way in which we move from perspective to perspective. The phenomenal world is therefore our interactive perspective on the real world.19 “I can transcend my consciousness, not in the sense that I can get outside of it in any literal way, but in the sense that the knowledge I build up in it can by an act in consciousness be thought of as interpretative of an existent affirmed by the self as co-real” (EN, 45).

This, in combination with our knowledge of Sellars's comments on Kant (e.g., in EN), probably gives us also an indication about the kind of answer Sellars would have given to Husserl’s idealism. Probably he would have commented that it is not possible to have intentionality without realism. In opposition to Husserl's proposal to put all reality claims “between brackets” (the “epoche”) we could argue from the view-point of a Sellarsian critical realism that intentionality only makes sense in interaction with a real world, although of course we can never intuit such a world directly.

Knowledge, then, is both subjective in content and objective in reference—and as a result of the gap between those poles it is always characterized by uncertainty. “Knowledge is a saltatory claim, though to its making you may have any number of ambulatory experiences” (EN, 36). To know is to gamble, to some extent, but of course, there are strategies for minimizing risks, and science is one of them.

According to Sellars only an epistemology that has gone through a phase of idealism can depict these phenomena correctly.20 There is therefore a fundamental difference between critical realism and common sense realism. An important part of critical realism is the explanation of naive realism. In opposition to many versions of idealism and antirealism, Sellars never forgot

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19 A contemporary of Roy Wood Sellars who found a similar answer to Nietzsche’s relativistic perspectivism in a realistic perspectivism was José Ortega y Gasset. See his El tema de nuestro tiempo (Madrid: Espasa-Calpe, 1923), in which he proves that perspectivism is not only compatible with realism, but actually presupposes it.

20 See especially Chapter 2 of PPR, "Idealism as an Interlude."
that the explanation of the beliefs of philosophical antipodes is one of the
tasks of a philosophical theory. As a result of this, both (a) our naive ob­
jectification of the way in which we perceive things and (b) our naive ob­
jectification of concepts (naive logical realism; PPR, 166) have to be explained.

(a) Our “natural objectification of the object of perception” (EN, 25) is a
result of our “natural instincts and motor attitudes.” They cause the “natural
illusion”\(^2\) that the objects we perceive are literally presented. Although Sellars
doesn’t make this explicit, the cause of naive realism is therefore the relative
superfluity of a more sophisticated epistemology for an acting organism. The
acting organism needs a representation of the world which it is not able to
interpret lightheartedly as merely a stream of sensory chimeras.

Sellars seems to underestimate the role of genetic factors in this natural
objectification (although not as radically as Churchland). At least, he is not
very clear about what he means by “instincts” and “natural motor attitudes.”
He sees categories as “growths” (EN, 71)\(^2\) and sees the notion of a thing as
something that “develops in the setting of perceptual attitude, response and
result” (PER, 12). Modern evolutionary epistemology is in this respect clearer,
although it may sometimes overestimate the genetic influence or forget that
the genetic influence is already a product of an atavistic cognitive interac­
tion.\(^3\) When we need an interactive theory in embryology, there is every
reason to assume that we need it in epistemology as well.

(b) Part of our “natural ontological attitude” is our naive logical realism,
that is, our tendency “to project into the things the meanings in terms of which
we think of them.” Instead of “thinking of predicates as disclosing objects” the
naive logician is inclined to think of them “as being one with the characteristics
of the objects” (PPR, 166). Of course, this tendency is also exactly what we
would expect of a creature who doesn’t need epistemological sophistication in
the first place.

A possible cause of many problems in epistemology is simply the sheer
disbelief in the miracle of knowledge as an “evolutionary achievement” (PER,
118). The contrast between the complexity of the knowledge-apparatus and the
natural simplicity and spontaneity of the knowledge-act is difficult to grasp. On
the one hand idealists and others are inclined to see knowledge as something
“beyond biology”; on the other hand some naturalists (for example, Dewey) are


\(^{3}\) He adds “and yet, I think, they are inevitable growths.”

\(^{3}\) European evolutionary epistemology from Lorenz to Vollmer tends to regard the Kantian
"a priori" as a set of evolved interpretative frameworks. Hence, it proclaims that what is
ontogenetically a priori can be phylogenetically a posteriori. In reaction to the supposedly naive
realism involved, Michael Ruse rejects this form of evolutionary inductivism and stresses almost
exclusively a kind of evolutionary relativism (see his Taking Darwin Seriously).
inclined to underestimate the problems of adequate representation of an outside world, which leads them to downplay epistemological problems.

Sellars was always consistent in treating knowledge as a biological achievement for which there is simply no analogy. The revelatory identity of content of knowledge and the characteristics of the object of knowledge is the product of the necessity for the organism of finding clues to orient itself (PER, 115; EN, 72–73, 340). Knowledge is thus anything but a biological luxury, and only that explains its spontaneity and (apparent) adequacy. Therefore, when many epistemologues (for example, the new realists and the idealists) underestimate the complexity of the knowledge-act, they are like spectators who think that the ballet-dancers are simply born graceful. To understand knowledge, however, one needs to understand why organisms need a picture of their environment, why they use different kinds of vibration and radiation to construct such a picture, and why they conceive their picture of reality as Reality itself. Above that, one needs to understand the cumulative effects of time and chance over innumerable generations. Our knowledge-apparatus is simply an amazing product of evolution. One doesn’t need to travel far to experience one of the greatest of natural wonders.

It seems to me that Sellars understood this. According to him, knowledge only appears simple. “It is an evolutionary achievement involving a complex mechanism” (PER, 118).

3. SELLARS’S REALISM AND THE CONTEMPORARY DEBATE
In what sense do these analyses contribute, then, to the realist/instrumentalist discussion in the philosophy of science? I think they show us at least three things.

1. First, the distinction between observable and unobservable realities (between common sense and science) is a very gradual one. What we accept as observables are already brain-made interpretations. Our common-sense beliefs about the world are simply interpretations that fit in so well with our “motor attitudes” and that are used and confirmed by use so continually, that we are simply no longer able to have serious doubts about them. In principle, the borderline of cases in which we have such “stable interpretations” of our environment can be stretched out far beyond the sphere of ordinary life. This I take to be also the message of Hacking’s article on “Experimentation and Scientific Realism.” When a scientist routinely ma-
nipulates unobservable entities like electrons in an experimental setting, he is familiar with them in the way normal people are familiar with chairs and electric drills. Of course, it is always possible that what we have conceived as an electric drill will be discovered to be a new species of death-watch beetle, but at least there is a "consistent syndrome of related symptoms" that is somewhere out there.

Both in everyday life and in science there is therefore a gradual transition from stable to more unstable interpretations, the latter of which are the result of a shorter period and a more indirect way of interaction. Both in everyday life and in science interpretations are corrected continually in the "from-and-to circuit" discovered by Sellars in his later years. Often fundamental "Gestalt-switches" (in science we might rather speak of Kuhnian changes of paradigm) are the result of a more intimate familiarity with the objects on which we focus our attention.

But there is no clear line between the observable and the unobservable, because we do not see sense-data. Essentially we always see something we construct out of stimuli. Sellars tries to express this by stating that we see through the stimuli, while denying that it is possible that the object is literally presented. That means that our minds continually create a world out of our stimuli that seems to correspond roughly with the real world in that it at least seems to be a consistent fantasy in which we don't die too often in a car accident. In our everyday lives we are well enough acquainted with relatively small misinterpretations that we are able to live through our big dream without too much epistemological anxiety. But in science the things that we "see" through our stimuli are so amazing, and our Gestalt-switches succeed each other with such rapidity, that we can be seduced by antirealistic philosophers into a nostalgic preference for the realism of everyday life.

In spite of assertions to the contrary, however, a rather consistent "fantasy-world" seems to arise from the research of science. When we concentrate on the fate of individual hypotheses, of course, we see them come and go like the scientists who propose them. But on the whole our world-view has changed dramatically since the Renaissance and it is very difficult to deny that this change can be described as an "increase of knowledge." For example, at the moment it is probably still unclear exactly what the role of change and selection in evolution is, but compared with debates in the nineteenth century, when the very fact of evolution was denied, on the whole modern debates...
about evolution can be described as "fine-tuning." What a century ago was still pure speculation (for example, evolution among the hominids), we are now actually able to "see" through a series of fossils. At the moment, there are about a hundred-fifty studies about evolutionary processes in the wild (for example, about Darwin finches on the Galapagos), a fact which for Darwin and his contemporaries was only a dream. And, as I said before, I don't see how it is possible to combine Darwinism with antirealism.

By patient observation and experimentation scientists are thus often able to throw light on processes that would otherwise go unnoticed. Science can therefore be described as the undertaking of enlarging the scope of our experience in particular domains by a series of specially designed methods. But that leads us to conclude that science itself is the undertaking of enlarging the realm of the observable. Science means extending our natural sensory equipment in such a way that we can transcend the limits that are normally imposed upon it. Science is therefore in essence a cultural/technological expanding of the scope of common sense. This means, however, that any attempt to link up realism with the kind of everyday reality we cherish in the late twentieth century is premature. What today is unobservable, can be observable tomorrow. When we think of concepts like chromosomes, black holes, Archeopteryx, the cosmic particles we can "see" in a bubble chamber, Homo erectus, etc., we see the borders of the observable gradually broadening. No doubt there are still many unobservable entities waiting to be discovered tomorrow. Does that mean that they don't exist today?

2. Closely related to this fluid border between the unobservable and the observable is the problem of representation. Because it is true that nothing is literally observable, in the sense that everything we see is constructed out of sense-data, our total world is a product of the way we "conceptualize" it. This conceptualization does not need to be a matter of language, as Churchland shows in his connectionist interpretation of knowledge. As I have already indicated, I think that connectionist "prototypes" are about the same as what Sellars meant when he spoke of "concepts." Sellars concentrated, however, more on the ecological context in which the brain-mind converts physical characteristics of things into corresponding representations. As a result of this Sellars was able to call himself "a conceptual nominalist who regards concepts as arising in individual minds and having the capacity of disclosure of the characteristics of objects, a capacity well founded on the basis of sense-data" (PPR, vi).

This means that concepts in the sciences are also ways in which the brains of scientists, using all kinds of techniques to enlarge the scope of their interaction with the world and with particular phenomena in it, structure a real world. Of course, particular concepts or distinctions may appear only tempo-
rarily, to be replaced later by more adequate divisions and concepts. The essential point, however, is that we see the world through a veil of representations and that we are continually interacting with real phenomena to "disclose" their real characteristics. We are continually trying out different translations, as it were, and in this process of "matching" and "puzzle-solving" we gradually learn more about the world with which we are interacting. Sellars's "circuit of return" is truly an enlightening concept in this case.

But, as we also can learn from Sellars, we never intuit the real world without something in between us and it. Knowledge, in essence, is interaction with the world via representations/concepts/prototypes in such a manner that we can orient ourselves. It is never a literal "givenness" of essences, objects, or sense-data in the mind. (As we have seen, this point was elaborated especially by Sellars fils.) Both common-sense knowledge and scientific knowledge are therefore essentially reconstructive, representational, and interactive (another point made by Sellars fils, but taken in a somewhat different direction). Both can only be reconstructive, representational, and interactive, however, in relation with a real world and real objects. The idea that scientific concepts are different because they are only "instruments" is to deny this element of real interaction with the world in which scientific concepts are used to "disclose" characteristics of things. It is also to look in a very one-sided manner at a relatively small series of situations in which scientists decide to go on with a particular model without caring why it works. Of course, many working scientists, especially specialists who concentrate on a relatively small group of phenomena, can afford the luxury of looking at their models this way. But when we look at the scientific enterprise as a whole, the instrumentalistic attitude is seen rather as an exception that proves the rule—the rule being that science "discloses," "discovers," phenomena, causes, and relationships that were hidden before. The aim of science in general is the development of a series of representations/concepts/prototypes that give us access to the real world and that enable us to deal with it. Only when we look at science in this way are we able to see how it grew out of common sense.

3. The third and most important point that we can learn from Sellars is, then, that realism is not a metaphysical "extra" theory that has to be added each time that a model seems to work. Realism is not an explanation of the success of science, because this would imply that it is an extra addition. Realism is simply the intention and direction of science in general, and of most theories in particular. It is especially the intention of the Darwinian theory of evol-

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\[\text{Churchland clarifies this issue with the distinction between "local" and "global minima": neural networks sometimes can't get to the global conceptual optimum because each step from a local conceptual optimum produces a dramatic increase in mistakes. See ANP, 173.}\]
tion, because this explains how we originated in an environment in which we had to orient ourselves. When the antirealist keeps repeating that a successful scientific theory doesn't need to be "true," he can only point to a small collection of computational models in the exact sciences that are used provisionally. He forgets that there simply is no purely instrumental\(^9\) cause of World War II; that there is no ancestor of man that is purely "instrumentally" an ancestor; or that the trajectory of the moon is not simply an instrumentalistic notion to predict its position in the sky.

Of course, realism does not imply that all theories that we entertain at the moment are approximately true. Mistakes are as much a part of science as they are of everyday life. But mistakes can only be mistakes when they are not intended to be so. A purely instrumentalistic research program that refuses to commit itself to a particular model is only a sign of despair. Sooner or later its postulated entities will have to prove their existence or not. This is also the reason that Ruse's "metaphysical scepticism" is not a real option for science in the long run. Of course, a doubter in science may nurse such scepticism as a legitimization of his uncertainty at a particular moment. But sooner or later someone will arise who will ask himself the question why a particular model worked or not and will try to penetrate the causal mechanism involved.

The message of all this is that there is no difference between a knowledge-claim and a reality-claim. As Sellars has taught us, knowledge is a disclosure of characteristics of the real world. Science is the enterprise of enlarging the scope of our knowledge by enlarging the scope of our ordinary sensory equipment. There is therefore no way in which the results of science as a whole can be treated as a "just-so story" about the world. The discovery of Reality is the aim of science, and Sellars's epistemology can help us not to expect too much (literal presence) but also not too little (purely instrumentalistic use) from its endeavors.

4. THE FAILURE OF PHYSICALISM AND SELLARS'S REFORMED MATERIALISM

Another key problem of modern naturalism is the extent to which it should be purely physicalistic. Often naturalism is defined in such a way that it is taken to be identical to physicalism, which is the belief that ultimately only the laws of physics refer to real entities. Both Quine and Churchland, for example, are playing with the idea that only a couple of physical entities or variables are real "natural kinds" (see, for example, the latter's ANP, 295). In principle, however, naturalism could be combined with an epistemological pluralism in

which many different forms of knowledge and many different scientific disciplines "disclose" characteristics of things. Many sciences can be interpreted as studying properties of objects whose constituents we can't see. And outside the realm of science, we still have experience of the world and of our place in it, and this experience is a form of knowledge too.

The context in which Sellars discussed these problems was different from the current debates in the sense that it was still largely a theoretical debate in metaphysics about the status of materialism. In several discussions relating to vitalism, however, he argues for the autonomy of biology (see EN, 320ff., PPPP, 270ff.). Originally, Sellars concentrated on the question whether naturalism implied materialism or not. His answer was negative. In an article written in 1927 he enumerates five characteristics of traditional materialism—(1) physical realism, (2) mechanism, (3) epiphenomenalism, (4) denial of the significance of values and ideals, (5) stress on stuff rather than on organization—and he concludes that naturalism shares only the first characteristic with materialism and this one only if we don't equate physical realism with physicalism. He concludes that "the truth of materialism was in its naturalism more than in its oversimplified ontology." At the same time, however, he confesses that he wouldn't resist the label 'materialist' if materialism were to be defined in a new way.

It is exactly this that Sellars tried to do himself during the '30s and '40s when he often wrote about the need for a "reformed materialism." Epistemologically, this reformed materialism was based on a distinction between "external" nonparticipative knowledge—often referring to abstract, mathematical relations between objects—and the "participative knowledge" in which we see the natural processes in our minds "from the inside." (Roughly this distinction corresponds to the distinction between explanation, with reference to natural laws, and understanding, in which we use our own experience to understand the experiences of other creatures.)

The idea is that participative knowledge has been neglected by traditional materialism and has been unjustly reified by idealism and panpsychism. A reformed materialism is needed to do justice to the fact that material entities not only have "external" causal relations, but often are so organized that their structure has an "immanent" or "emergent" internal causal structure as well. We have exclusive access to such a process in our own thinking, in which we "are on the inside of the brain and its focal level of operation" (EN, 313).

It is here, again, that Sellars's evolutionary naturalism comes into play. In the book with this title (EN) he develops the ideas about emergence that he later will call "evolutionary materialism" (RAPW, 64). His message is that

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"organization is objectively significant and causally effective" and that "function and structure go together at every level" (EN, 334). Evolution is defined as "the active rise of new wholes with new properties" (EN, 334). "Evolution means that there are levels in nature, that the higher is an outgrowth of the lower, that A and B integrated are more than A and B separate" (EN, 329).

Although Sellars makes a very clear distinction between his evolutionary materialism and that of, for example, Samuel Alexander and Lloyd Morgan, it is a pity that in his earlier work he does not refer more clearly to natural selection as the force that continually preserves integrated units and weeds out less well integrated units. Only as a result of this force do new "wholes" arise again and again, and the formulation in which Sellars speaks about the "active rise" of new wholes is at least misleading. In his later work it becomes clear, however, that his whole approach is compatible with modern gene theory, according to which "genes act as codes or patterns which can be reproduced" and "which embody possibilities of organization" that can be advantageous or not (PPPP, 272, 274).

Already in his early writings Sellars rejected Bergson's *élan vital*. In 1909 he visited Bergson and defended in discussion with him a nonvitalistic, completely materialistic philosophy. The lack of a more precise account about the levels in nature might be reason for confusing Sellars's evolutionary naturalism with Lloyd Morgan's "emergent evolution." Such a confusion would be unfair, however, because Sellars means by his "wholes" nothing more than the compositions of parts, as, for example, is clear from his discussions about the origin of life (EN, PPPP).³¹

It is only as a result of recent discussions in evolutionary biology that we are now able to speak more clearly about levels in nature. On what level do we have reason to expect integrated units, for example? To answer this question we have to decide which entities natural selection works on: groups, individuals, families, or genes?³² Clearly, the discussion about the "levels of selection" which resulted in sociobiology is of special relevance here. Since the publication in

³¹ "After I had adopted the term 'emergence' as an effective label, I still wished to keep from it any mystical connotation. To me it meant simply the fact that novel organization *involved* novel properties. Such properties should not be considered to be stuck on externally and miraculously, but to be functions of the organization. It was, after all, just the conviction that structure and function are internally related" (PER, 203). Churchland recognizes two senses in which the expression "emergent properties" is used (ANP, 51): one which he identifies with "network properties" and one which he often encounters in philosophical contexts and rejects. At least Sellars cannot be accused of identifying emergent properties with anything other than network properties. But whether this implies that emergent properties are *reducible*, as Churchland claims, depends on one's notion of reduction.

of Wynne-Edwards's *Animal Dispersion in Relation to Social Behaviour*, it is no longer self-evident that individuals are the only possible examples of integrated units in nature. After the many reactions to the work of Wynne-Edwards\(^5\) it has also become clear, however, that individuals are relatively the most stable integrated units that are continually chiseled out and polished by natural selection. "Outlaw genes" that threaten the fitness of the individual will go extinct with the maladaptive individuals they help to create. Groups which demand a high degree of selflessness from their individual members seem to be mostly a product of special kinship relations (hymenoptera, termites) or of strong reciprocal relations, indicating that selection by complete group extinction probably is a weaker force in evolution than selection as a result of differential reproduction of individuals within groups. At the same time, it has become increasingly clear, however, that individuals are essentially transitory units that have to dissolve as a result of sex and death each generation, because they are the product of genes and genes are selected for their ability to promote their own immortality, not that of their temporary vehicles.\(^4\)

In Sellars's day the most a philosopher could achieve in this respect was still rather vague. We can better understand now why individuals are in fact the most common example of integrated units, but we recognize at the same time that in principle groups or other aggregations could also have "emergent" characteristics. Because we realize that it is natural selection that sifts and saves the "holistic properties" of organisms, and tests and refines them, we can overcome the gap between holism and reductionism. Those "holistic properties" are coded in DNA and can only be selected when coded in this inheritable form (PPPP, 272).

5. **The Double Knowledge Theory of the Brain-Mind**

Finally, a word about Sellars's philosophy of mind, which is really a product of his reformed materialism. As a materialist, he of course maintained what he called the "essential identity of the brain-mind" (NA, 376). As a reformed materialist, however, he recognized the fact of our double knowledge about it. On the one hand we can know the brain in the external way that we know most physical objects; on the other hand we possess participative knowledge of its workings. In Sellars's own words: "Consciousness is a qualitative isolate in which we participate in our functioning. Here alone are we on the inside of nature" (PER, 148). Consciousness is therefore also effective, a causal force. If it were simply a passive spectator-like ability or an epiphenomenon, it wouldn't have


evolved. In this context Sellars cites James's argument (which goes back to Darwin): "If pleasures and pains have no efficacy, one does not see ... why the most noxious acts, such as burning, might not give thrills of delight, and the most necessary ones, such as breathing, cause agony" (Principles of Psychology, 1: 43, cited in "An Important Antinomy" [1908], NA, 36). Apparently consciousness is the way in which nature has enabled us to make biologically "wise" decisions.

On the human level consciousness clearly represents a new form of causality, which Sellars calls "agential causality" or "rational causality," "that is, a causality guided by because" (NA, 372). Sellars also sees here the solution for the age-old debate about determinism and free will. Obviously, the notion of levels in nature also demands an idea about "higher" forms of causality which emerge as a result of new levels of complexity and integration. Human freedom needs therefore not to be understood as a kind of "counter-causal activity" (NA, 37), but as representing a high level of causality, in which an organism is able to devise models of different, more and less desirable futures. Such a creature can continually weigh different alternatives and can continually correct and optimalize its course in relation to a series of internal goals. Freedom is not opposed to causal determinism, but is opposed to a fatalism and belief in predestination that ignores our ability to control our own destiny to the extent that we "participate in our functioning."

Therefore, on the one hand, human behavior cannot be understood on purely mechanistic principles. As Sellars says: "The behavior of man cannot be described in terms of mechanics. It is absurd and unempirical to ignore the fact that his behavior involves the application of past experience to the situation which now confronts him. And this situation is inseparable from his interests and selections" (EN, 273). On the other hand, however, is it not completely impossible to predict the behavior of a fellow human being. "[I]f I knew exactly what the situation was which confronted an individual, what his valuations and desires were, what his courage was, etc., I could foretell his conduct. Assuredly the general line of it. Why? Because these are the actual data of his own decision. As soon as these become stable in deliberation, the choice is fixed" (EN, 275). Of course, the kind of knowledge that we use to predict our fellow human beings is completely different from physicalistic external knowledge. We are to some extent able to predict the behavior of fellow human beings, because we ourselves are biological decision-centers, evaluating the situations we encounter on the basis of past experiences and relating them to desirable goals. We ourselves are biological "selves" in which multiple desires are integrated and transformed into practicable plans.

Of course, without such a self, human behavior would lose the goal-
directed character that makes it so completely different from the Brownian movements of particles. Agential causality, according to Sellars, is based on the biological necessity of a unified response, which requires dominance, integration, and inhibition among the different inclinations (NA, 377). The “self” is simply the “focus” of this activity of unifying impulses and guiding behavior. It is constituted by “a background of achievement and growth that we call character, accepted rules, working knowledge, and so on” (NA, 379). ‘Free will’ is, accordingly, to be conceived as choice and decision, in which the self acts as a focus and locus of the biological need for viable action, in a context in which reflexes and habits are not enough” (NA, 381).

In what respect are these analyses interesting for modern versions of naturalism? Modern naturalists, for example Paul Churchland, have made much fuss about the status of what they call “folk psychology,” “a theory that enables us to predict and explain the behavior of humans that surround us” (ANP, xi). In this respect they seem to take Feyerabend’s side in the debate between Wilfrid Sellars and Feyerabend on the status of the “manifest image”: Wilfrid Sellars protested against Feyerabend’s idea that the manifest image constituted an, in principle, replaceable theory. Paul Churchland follows in Feyerabend’s footsteps and even thinks that he has found the theory that in the end will replace “folk psychology”: a sophisticated connectionist neuroscience.

An important implication of Roy Wood Sellars’s view about agential causality is that folk psychology probably cannot be completely replaced by a more scientific psychology, because the categories which we use to express and understand our behavior are also the categories which structure and determine our behavior. The level on which we experience our behavior is also the level on which it is caused, and probably the way in which we experience ourselves is not purely a product of culture, contrary to the suggestion of both Feyerabend and Churchland.36

If Sellars is right that our consciousness is a “natural isolate,” in which we are “on the inside of nature” and in which we “participate in our functioning” (PER, 148), then purely external, physicalistic knowledge about our brain-minds will not be sufficient to understand and predict our behavior. To understand a fellow human being, we will have to apply the same valuations and weigh the same desires as she has and we will have to see the situations in which she made her decision from her perspective. External knowledge has too limited a scope and cannot deal with the effectiveness of the complicated

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35 See “Scientific Realism or Irenic Instrumentalism,” in W. Sellars, Philosophical Perspectives, 338.
structures which determine behavior. To understand other human beings and intelligent animals, we therefore have to use our ability to simulate the way they will probably represent their situation on the private “dashboard” of their consciousness on the basis of our own consciousness. And probably our “dashboard” has evolved to represent the variables which are relevant for decisions that have consequences for survival.37

This means that our understanding of animals and humans differs from our understanding of a physical system. It is no coincidence that the laws of physics are mainly abstractions derived from very simple situations in laboratories, in which only two or three variables are allowed to change and all other variables are artificially kept constant. Of course, no one would want to claim that the laws of physics are infringed outside the laboratory, but whether they are sufficient to understand and predict more complicated systems is a question. Already in the laboratories of the chemist we can see how the structure of a material can determine its properties to such a degree that the laws of physics are no longer sufficient to understand them. Organic substances like DNA can function like complicated instructions and are thus able to “impose their own story” upon their surroundings.

 Those “stories” are not based on a transgression of the laws of physics; rather they simply assume them, like the artist who, according to Nietzsche, is able to dance in chains. To predict the behavior of such “pattern-driven” entities the laws of physics are simply insufficient; we need to disentangle the patterns or stories that really determine their behavior. In the same way human behavior might be directed by a series of causes which really have the character of “becauses” and the only way to predict human behavior could well be the internal simulation of these “becauses.” Probably we have evolved a natural talent for this hermeneutical task which is so important for a social animal.38

This would mean that “participative knowledge” is essentially not reducible and that our evolved ability to have such knowledge can probably not be very easily improved. “Folk psychology” can therefore have its own legitimacy and independency. “Reasons” or “becauses” would constitute real causal forces and it would therefore not make much sense to call only physical entities “natural kinds,” as Churchland does. At the same time this would mean, however, that we are forced to accept an epistemological pluralism in which concepts of different sciences can in principle all have objective reference. They simply refer to different levels of organization and integration in

which the “higher levels” are not independent of lower levels, but nevertheless represent their own causal or functional “logic” and “simplicity.”

It is very tempting (and hubristic) to give an answer in this spirit to the critical remarks made by Wilfrid Sellars on the philosophy of mind of his father. Wilfrid Sellars refers to passages in his father’s writings in which he denies that physical and neurophysiological (“external”) science can throw much light on the qualitative dimension of consciousness. Sellars fils proposes that, in principle, a “sufficiently subtle theory of neurophysiological structure” should be able to localize the physical basis of those qualitative characteristics (without concluding that the internal description can be completely eliminated). Probably he is right; probably his father was indeed somewhat too pessimistic about the future possibilities of neuroscience.

On the other hand, his father might have been right in his scepticism towards the completeness of neurophysiology. That is, it could still be true that even a complete knowledge of the specific neurophysiological set-up required for a particular frame of mind would only produce a third-person account of it. And the only way actually to know what a particular frame of mind is and how it produces the behavior that is typical of that frame of mind is to have direct access to a first-person account of it, which you can’t get from the “outside” (contra ANP, 75). If Sellars père is right the best way to predict the behavior of humans is by way of “empathetic understanding,” because the way in which a situation is judged from the perspective of a particular brain-state probably can never be reconstructed from a detailed knowledge of each of its synaptic weights but only from a more holistic overview of them and of their interaction with the environment—a view which is uniquely offered from the inside of the brain, on the “dashboard” of self-consciousness.

6. WHAT, THEN, IS NATURALISM?

Naturalism, as the position that sees philosophy as no longer “an a priori propaedeutic or groundwork for science, but as continuous with science,”

39 According to Michael Ruse, for example, biology “has its own simplicity” (“The Last Word on Teleology,” in Is Science Sexist? [Dordrecht, 1981]). The suggestion that is developed here in the spirit of Roy Wood Sellars is that a kind of “higher-order simplicity” could give us access via our own mental states to our own behavior.


41 For an interesting review which covers the transition from Roy Wood Sellars to modern philosophy of mind and shows how all modern positions can be seen as radicalizations of aspects of his original position, see C. F. Delaney, “Sellars and the Contemporary Mind-Body Problem,” New Scholasticism 45 (1971): 245-68. I have tried to draw the contours of a “dashboard theory of consciousness” based on Sellars and criticizing Churchland in “Innate Structures of Experience, Intentions and Symbols,” Algemeen Nederlands Tijdschrift voor Wijsbegeerte 84 (1992): 6, 128-37.

has long been embarrassed by conflicting sympathies. On the one hand, it has a high regard for science; and physics is still often regarded as the ultimate example of what a science should be: exact, solid, testable, falsifiable, or whatever. On the other hand, naturalism can be seen as a (to some extent "common sense") reaction against all those philosophies that have tended to isolate man from the rest of nature and neglected the more down-to-earth aspects of human life. It is this latter form of naturalism that has been reinforced by the Darwinian explanation of our own origins.

According to Sellars it is "the fundamental thesis of naturalism" that man is "a part of nature" (EN, 278). From this follows the fact that the natural sciences should also apply to man. However, it does not follow that physics has a monopoly on causal explanations—only that there is no special realm in which the laws of physics are transcended and that all causes (even "because" or reasons) are natural causes.

The attempt to identify naturalism with physicalism can ultimately be seen as the result of a nostalgia towards a foundational kind of philosophy in which all reality can be deduced from a simple set of primary truths. If we are a part of reality, however, it is the question whether we are able to take up an external vantage point from which we can oversee all reality. If we are a part of reality and knowledge is "only" our way of orientation, it is no longer necessary to assume that knowledge could even in principle ever be "complete," because knowledge is thoroughly perspectival and semeiotic.

In Sellars's words: knowledge should never claim to be being (EN, 37). It is essentially abbreviation, representation in another medium, in which it should simplify to enable decisions. Recently, connectionist models of mind have clarified the way in which large amounts of information can be stored in simplified "prototypes" which are the result of a gradual modification of synaptic weights until they are able to make particular distinctions (ANP). If this model is correct, it seems to me that there is no longer reason to assume that one class of prototypes has a superior value in structuring reality. In principle all prototypes that help us make sense of our world could be valid.

When we combine this epistemological pluralism with realism and with the idea of emergence, we are very close to the naturalism of Sellars, which to some extent is more radical than it seems at first sight. Realism, even "depth realism" (Collier), is a necessary assumption if the notion of man being part of nature is to make any sense. The idea that the burden of proof is on the realist

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43 Elsewhere, I have argued that Churchland's neurocomputational relativism is in conflict with this physicalism. I proposed an "epistemological pluralism" ("Innate Structures of Experience, Intentions and Symbols") and afterwards was reassured by reading Stump's article on naturalism and methodological pluralism ("Naturalized Philosophy of Science with a Plurality of Methods").
arises from a foundationalistic philosophy which assumes that we can start from scratch (or from sense-data). It would be fairer, however, simply to compare the explanatory power of a realist framework with that of an anti-realistic alternative, if such an alternative really exists, if it is not simply an exhibition of philosophical acrobatics. The instrumentalist always lags behind, because he still doesn’t have an answer to the question of why our theories are sometimes so successful.

Emergent properties must be assumed in order to understand why evolution works. Natural selection has to test something; and what it tests are emergent properties insofar as they can be encoded in genes. It is a pity that Sellars did not clearly formulate this link between selection and emergence (see, however, PPPP, 272), but he nevertheless clearly did see that evolution demands a completely materialistic notion of emergent properties.

At the same time Sellars was one of the few twentieth-century philosophers who realized that the clue to an adequate naturalism lies not so much in an orientation to physics as in an orientation to evolutionary biology. The roots of naturalism lie more in the Darwinian view that we are products of nature than in the Newtonian view that nature is governed by inflexible laws.44

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44Research for this article was supported by the Foundation for Philosophical Research (SWON), which is subsidized by the Netherlands Organization for Scientific Research (NWO). I also thank two anonymous referees for their useful comments on an earlier version of this paper.