PART I

Foundations

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Naturalism and Teleology

1.1 Basics

This book is largely about a single idea concerning the place of mind within nature. The idea is this:

Environmental Complexity Thesis:
The function of cognition is to enable the agent to deal with environmental complexity.

Naturalistic philosophy has already developed part of a theory of the place of mind within nature, a physicalist theory of what minds are made up of, and of how some of the strange properties of mentality can exist in the natural world. It may be possible to also develop another kind of theory of the place of mind in nature, a theory of what mind is *doing* here, perhaps a theory of what it is *for*. The environmental complexity thesis expresses one possible way to develop such a theory.

The topic of this book lies at the intersection of philosophy of mind, philosophy of biology, and epistemology. The aim is an account of the place of mind in nature, but many of the concepts used will be biological. And although I will not give a "theory of knowledge," this book is intended as a contribution to epistemology. In 1976 Alvin Goldman motivated an approach to epistemology, known as "reliabilism," by appealing to a sense of the word "know" illustrated by a phrase from Shakespeare's *Hamlet*: "I know a hawk from a handsaw." The present work is intended to shed light upon another sense of "know." This sense can also be illustrated with some well-known lines of verse:

> You've got to know when to hold 'em; know when to fold 'em.
> Know when to walk away; know when to run.
>
> "The Gambler," recorded by Kenny Rogers

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A philosophical term standardly associated with epistemology which addresses this relation between thought and action is "pragmatism." This book aims to develop a theory which is pragmatist in some senses, but which is also closely allied to contemporary naturalistic views, including reliabilism.

Some parts of this book will investigate the environmental complexity thesis directly. Other parts will try to shed light on it from a distance, by examining a more general family of ideas which the thesis belongs to.

The environmental complexity thesis asserts a link between certain capacities of organic systems and a specific property of these systems' environments. It tries to understand the internal in terms of relations to the external. In this book all explanations of internal properties of organic systems in terms of external properties will be called *externalist*. Externalism is one very basic approach that can be taken to understanding the organic world, and one way the environmental complexity thesis will be investigated in this book is by means of a general investigation of the logic and pattern of externalist explanation.

There is also a subcategory of externalist explanation, exemplified by the environmental complexity thesis, which we will pay particular attention to. These are explanations in which properties of complexity are the focus: the internal complexity of some organic system is explained in terms of the complexity of its environment. These will be called "c-externalist" explanations.

The aim is not to discuss the categories of externalist and c-externalist explanation in order to promote them. They need no promotion. Externalism is one of a small number of basic explanatory schemas, encountered constantly within different parts of science and also in philosophy. The logic of externalist explanation is the logic of adaptationist evolutionary thought, associationist psychology such as behaviorist learning theory, and many brands of empiricist epistemology. It is an explanatory project which also prompts a distinctive pattern of revolt, advocating the explanatory importance of the internal structure of organic systems. This internalist response is exemplified in biology by developmentally oriented views of evolution, Chomsky's "mentalism" in linguistics and psycholinguistics, and various types of philosophical rationalism. One aim of this book is to locate the place occupied by the environmental complexity thesis within a very large conceptual landscape.

In the case of the general categories of externalist and c-externalist explanation, my aim is understanding rather than promotion. The more specific view, the environmental complexity thesis about cognition, *will* be promoted though. Once it has been clarified and refined in the right way, this idea has promise as a central component of a theory of mind's place in nature.

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1.2   Spencer and Dewey

One way the environmental complexity thesis will be investigated is through an investigation of externalism in general. Another way the thesis will be investigated is historical. We will look in detail at two very different versions of the thesis, found in the work of Herbert Spencer and John Dewey.

Herbert Spencer is not often remembered now, and when he is rescued from oblivion it is usually to briefly damn him further. But he was an important intellectual figure during the Victorian period. He is interesting as an early and systematic exponent of a theory of mind based upon a naturalistic outlook and a set of evolutionary concepts involving adaptive adjustment to complex environments. Spencer published the first edition of his evolutionary *Principles of Psychology* in 1855, four years before Darwin's *Origin of Species*. In this work Spencer stressed the continuity between life and mind, which were understood as the "adjustment of internal relations to external relations." Spencer viewed mind as an advanced form of living organization developed by organisms in response to complex environments.

The reason Spencer will occupy an important place in this book is not because I think of him as a forgotten genius. I do not think this (although I do think he is a more interesting thinker than he is usually thought to have been). Spencer's work is important here for several reasons. First, his work was central to the initial meeting of two massive currents of thought. Though he was an evolutionist, Spencer's epistemology in general was continuous with the British empiricist tradition, stressing the role of experience and simple rules of association of ideas. Spencer stands exactly at the point where British empiricism met the theory of evolution.

His thought is also distinguished from earlier empiricist views with respect to several important features. First, Spencer was willing to theorize about the role played by the structure of agents' environments. Classical empiricists like Locke and Hume generally did not attempt to explain characteristics of thought in terms of specific characteristics of the external world. They start the story at the point where a sensory impression has appeared in the subject, and proceed from there. Spencer starts the story with the characteristics of the subject's environment that are perceived and dealt with.

Second, although Spencer was a broadly empiricist thinker he was not hostile at all to the idea that the mind has rich innate structure, as "rationalist" philosophers claim. Spencer was entirely prepared to concede this, as long as the innate structure has an adaptationist evolutionary explanation. Individual learning and adaptive evolution were, for Spencer, two specific modes of the

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same process. Recognizing adaptive innate structure was no concession to Spencer's real opposition, people who would explain life and mind in terms of internal drives and principles. Spencer recognized the deeper concord of explanatory pattern in empiricist and adaptationist explanations, and he fused these mechanisms to produce a single externalist theory of the sources of organic complexity.

Spencer's evolutionism led him also to focus on the role of cognition in coordinating behavioral responses to environmental conditions. Here Spencer's views bring him close to some contemporary naturalistic thinking about the mind. Since the advent of behaviorism and, more importantly, philosophical functionalism, materialist theories of mind have focused upon the role mental states play in mediating between sensory input and behavioral output (Putnam, 1960; Armstrong, 1968; Lewis, 1972; Fodor, 1981). Further, in the past decade or so a number of thinkers have argued that a specific appeal to evolution, and to a concept of function with an evolutionary backing, is the key to overcoming a range of problems materialists face, especially problems involving the semantic content of thought (Millikan, 1984; Papineau, 1987). So some of the distinctive ingredients of Spencer's view are also key features of modern naturalistic theories of mind.

Sometimes people associate an empiricist temperament, combined with a focus on behavior, with the term "pragmatist." This is an oversimplification. In fact, William James developed parts of his view of the mind in *reaction* to Spencer's more scientistic views. Spencer has a historical role in the development of pragmatism, but not because he was a pragmatist. It is better to regard Spencer as an evolutionary naturalist.

One person who was a pragmatist, however, is John Dewey. In fact it is common to regard Dewey's later thought as the high point of the pragmatist tradition so far. I agree with this assessment. Like his predecessors Peirce and James, Dewey understood beliefs as guides to action, as instruments. He saw inquiry as a goal-directed attempt to relieve the anxieties of doubt and obstructed action, and as a tool for overcoming practical problems. Unlike Peirce and James, however, Dewey explicitly described intelligent action as a response to problematic environmental *situations*. Dewey related the goal-directed operations of thought and action to problems deriving from the fact that agents inhabit environments which are, in themselves, precarious and uncertain in many respects. In other ways these environments are stable, contain useful constancies. Intelligent agents make use of the stable patterns in order to respond intelligently to problems posed by the world's instabilities. That is, Dewey's account of the function of thought focuses, like Spencer's, on

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the role played by cognition in responding to a complex or variable environment.

This focus on specific environmental patterns is a distinctive part of both Spencer's and Dewey's epistemological views. It is common to think that very *general* features of the external world are relevant to epistemology; it is common to say that if the everyday world is composed only of material particles with primary qualities, or is composed only of particular things rather than universals, or is a domain characterized by change, then this makes a difference to theories of knowledge. Global claims about our epistemic abilities are often buttressed with global claims about the composition of the world. This is different from finding specific and contingent facts about how the world's furniture happens to be arranged, and developing an epistemology around these.

Thus the idea that mind is for dealing with complex environments marks a point at which a certain evolutionary continuation of orthodox empiricism, exemplified by Spencer, makes contact with classical pragmatism, exemplified by Dewey. Spencer and Dewey do not understand the thesis in the same way, and in many respects their philosophies could hardly be more different. But their acceptance of this claim about the mind marks a point of contact between them, and distinguishes their views of the mind from other approaches, including other empiricist, naturalist and pragmatist approaches.

This brings us to the point where I can say why this book will single out Spencer's and Dewey's views for detailed treatment, rather than give a general account of the history of theories that link mind and environmental complexity. The environmental complexity thesis marks a point of contact between Dewey's pragmatist philosophy and a more overtly materialist, naturalistic approach which makes use of evolutionary concepts. In my view, naturalistic materialism and Dewey-style pragmatism are the two most important rival philosophical outlooks which exist at present, as far as core metaphysical and epistemological questions about the relations between mind, knowledge and reality are concerned. It is these two outlooks whose agreements and disagreements are the most important to understand.

This is not to say that Spencer's ideas will be used here to represent the views of modern evolutionary naturalism. A very large proportion of Spencer's specific views on the relations between mind and environmental complexity, and on evolutionary and psychological mechanisms, are false. Most contemporary naturalistic philosophers would also find his overall world view a completely unacceptable one. But a philosophical system does not have to be true to be worthy of study, and useful in the task of developing

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and presenting difficult ideas. Spencer's views do provide a good starting point in the investigation of the relations between mind and environmental complexity. They also furnish ideal examples of externalist patterns of explanation, and they are important in understanding certain aspects of Dewey's thought.

I said that Dewey's work is the high point of the pragmatist tradition, and that I aim to investigate the relation between naturalism and pragmatism. But Dewey often used the term "naturalistic" for his own epistemological view, and he was guarded with the term "pragmatist." Certainly Dewey was closer than other pragmatists to modern naturalistic views. However, there are definite differences between Dewey's views of mind and knowledge, and those of contemporary naturalists such as Dretske, Fodor, Millikan, Kitcher, Devitt and Goldman. It is this recent tradition, rather than "naturalism" in the abstract, that I am interested in. Contemporary naturalism stresses the continuity of philosophy with science (Kornblith, 1985; Kitcher, 1992). Philosophical questions are viewed as very abstract scientific questions, and are treated in these terms. But from a perspective such as Dewey's, modern naturalists are too conservative; they are too prepared to accept the categories and terms of debate which the philosophical tradition has bequeathed. They use science to attack the old problems of mind, representation and knowledge head-on, for the most part. For Dewey, these problems are set up by the tradition in such a way that there can be no solution, and many standard philosophical outlooks, including familiar forms of materialism, are designed to paper over the real problems, to make possible a systematic shirking of the concrete issues that philosophy should face. Thus Dewey's version of the environmental complexity thesis is intended as part of a more radical reorientation of philosophical theorizing about knowledge. One aim of this book is to use the environmental complexity thesis as an instrument for exploring where Dewey's pragmatism and recent naturalism converge and diverge, on questions about the relation between thought and the world.

So the central aims of this book are nonhistorical; they have to do with developing the resources of the environmental complexity thesis, understanding the logic and pattern of externalism, and investigating the relations between naturalism and pragmatism. But there will be a number of historical discussions. Historical examples will first be used to illustrate externalism and the characteristic patterns of debate between externalists and their opponents. Second, we will look at parts of the world views of Spencer and Dewey, and see the role played in these views by versions of the environmental complexity thesis. The historical discussions are not intended to give a complete history of ideas about the relation between mind and environmental complexity, and

they are not intended to cover every aspect of Spencer's and Dewey's views of the world. The aim is to look at the development of a specific line of thought about the function of mind in nature, and then to improve this idea.

1.3   Outline of the book

The remainder of this chapter, and all of Chapter 2, are concerned with laying out the general framework used in the rest of the book. This first chapter will examine some of the key terms used in my statement of the environmental complexity thesis. In particular, it will outline how "complexity," "function" and "cognition" will be understood. Two versions of the thesis, the teleonomic version and the instrumental version, will be distinguished. Then Chapter 2 will look in detail at the externalist approach to organic systems, as seen across a variety of fields in the sciences and philosophy, and at the ongoing oppositions between externalist and internalist patterns of explanation.

The third chapter will examine Spencer, and the fourth will look at Dewey. These chapters will discuss two very different versions of the environmental complexity thesis, and describe how this thesis has a place in two different overall views of mind and nature. As we go through these chapters we will extract specific aspects of Spencer's and Dewey's versions of the thesis for positive endorsement. Dewey's position contributes more to this project than Spencer's.

With the basic outlines of a version of the environmental complexity thesis laid out, Chapters 5 and 6 will look at two specific concepts which may be useful in understanding the relations between organisms and environments: the concepts of *construction* and of *correspondence*.

Both concepts are very philosophically controversial. If any term can raise small hairs on the back of contemporary necks, it is "construction." Concepts of construction and constructivism have become new battlefields on which age-old conflicts between realists and their foes are now fought. These are also stamps on the side of large crates of new perspectives and methodologies which proliferate through the humanities and social sciences. Many who call themselves constructivists oppose the very idea of a "given" and natural world, which languages, belief systems and social practices conform to or reflect. Instead reality is constructed by these languages, belief systems and patterns of practice.

Dewey, too, thought that construction was a critically important relation between inquirers and their environments; thought functions to aid in the reconstruction of conditions, and the transformation of situations. If we accept

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a Dewey-style version of the environmental complexity thesis, does that mean we also have to enthuse about the "construction" of environments? Yes, but only if construction is understood in the right way, and this is a way that does not have the ontological sting of contemporary constructivism.

If pragmatists and other malcontents emphasize construction, the more orthodox (including more orthodox naturalists) often hold out for *correspondence* as a relation between internal and external. A thought has the highest credentials if it corresponds to the world. Spencer was an enthusiast for relations of correspondence, and he gave this concept a central place in his theory of mind. Pragmatists universally distrust correspondence as a relation between internal and external, and Dewey was no exception. But both Dewey and Spencer lacked a moderate, modern understanding of what correspondence as a property of thought might be, informed by recent work in naturalistic philosophy of mind. Once we have such a concept of correspondence, should the environmental complexity thesis be understood as vindicating correspondence or replacing it? This is a difficult question, which I place at the end of Part I of the book. It also is a point at which the disagreement between modern naturalism and pragmatism is sharp. My tentative verdict is that correspondence can be retained by the naturalist. But there is also a possibility that it can only be retained at a cost. Once naturalized, correspondence may lose some of its apparent explanatory importance.

So the first part of this book is structured in pairs of chapters. There are two chapters which lay out the framework used, two chapters on Spencer and Dewey, and two chapters on specific concepts which might be important in understanding organism/environment relations, the concepts of construction and correspondence.

The second part of this book is focused on models. Some ideas which were discussed in Part I in an informal way will be recast in a simple mathematical form in these later chapters. Chapters 7 and 8 will outline the framework of a very general theory of adaptive response to environmental variability, a theory which includes intelligent, cognitive modes of response but includes flexibility in development and physiology as well. Chapter 7 makes use of recent biological models of "phenotypic plasticity," models intended to describe the circumstances under which a plastic or flexible organism has higher fitness in a variable environment than an inflexible one. Chapter 8 embeds these results within another mathematical framework, "signal detection theory." This chapter will look closely at *reliability* as a relationship between organism and environment. Reliability will be construed as something the

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organism can "invest" in, or not, depending on the relation between the costs and benefits of tracking the world.

One specific, simple form of question is central to these chapters. We will look at cases in which an organism is located in a complex environment, an environment which can be in a number of possible states. We will ask about the circumstances in which this environmental complexity should engender complexity within the organic system. When should heterogeneity in the environment bring about heterogeneity in the organism's response? When should the organism attend to the differences between environmental states, and when should it ignore these differences, and act as if the environment was always the same? When should environmental complexity bring it about that the organic system will *make a distinction*, will attend to a difference in the world?

The framework used in these chapters is decision-theoretic, in a broad sense. It makes use mainly of simple statistical concepts along with assumptions about actions and payoffs. This is one specific way to follow up and formalize some of the ideas discussed in earlier chapters. It is not the only way, however. These chapters should be understood as illustrating one possible direction of further investigation into the relations between internal and external complexity. It is not claimed that the decision-theoretic approach is the only way to proceed further on these questions.

In Chapter 9 we will switch from looking at complexity or flexibility as a property of individual organisms to looking at population-level analogs of these properties. We will look at ways in which environmental complexity can generate complex populations, rather than complex individuals. This will be done via an examination of some models developed in genetics and population biology during the 1950's and subsequent decades. This is, for the most part, not a discussion of the environmental complexity thesis per se, but a discussion of a more general explanatory pattern which the environmental complexity thesis exemplifies. Chapter 9 will also look at an ambitious and philosophically rich attempt to give a general model of individual-level and population-level responses to environmental complexity: Richard Levins' book *Evolution in Changing Environments*.

1.4   Thought and act

At this point we can begin the task of taking apart the environmental complexity thesis and examining its components. Three issues will be discussed in the remainder of this chapter.