

Harry Collins

Martin Kusch



The Shape of Actions
What Humans and Machines Can Do

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Harry Collins and Martin Kusch

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To
Charlie Chaplin
and
Nick Faldo

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Preface

At the University of Oulu in Finland in 1991 the authors fell into argument over dinner. That interchange developed into a full-blown partnership in a project that resulted in this book. Most of the theory is a joint product of the two authors working things out in front of a blackboard during intense discussions occurring in large part in Bath and Edinburgh. Neither author could have written the main sections of the book on his own.

We are particularly grateful to Gerard de Vries and Wiebe Bijker for allowing us to use in chapter 5 some of the ideas *taken from H. M. Collins, G. de Vries, and W. Bijker, "Ways of Going On: Skill, Action, and Behavioural Repertoires," Science, Technology and Human Values, 22, 3 (1997), 267–284.* That chapter also draws on Collins's "The Structure of Knowledge," *Social Research, 60 (Spring 1993), 95–116,* while chapter 7 draws on his "Rat Tale: Sociology's Contribution to the Problem of Human and Machine Cognition in Context," in P. J. Felto-ovich, K. M. Ford, and R. R. Hoffman, eds., *Human and Machine Expertise in Context (Cambridge, Mass.: AAAI/MIT Press, 1997), 293–311.* Parts of the conclusion rest on Collins's "Embedded or Embodied: Hubert Dreyfus's *What Computers Still Can't Do,*" *Artificial Intelligence, 80, 1 (1996), 99–117.*

It is not unusual for a book to include previously published work, but in this case it is not a matter of our collecting existing papers; rather it is the other way round—the book project gave rise to the papers. Given the project's interdisciplinary nature, and its attempt to treat the topic in a way that is quite out of step with almost every other approach, including those of the authors' parent disciplines, we thought it appropriate

that some of the principal ideas should be tested by the peer review process of leading journals before inclusion in the book. That is why we are particularly pleased to be able to report the above sources and to note that two of the other chapters have passed scrutiny in a form very similar to that in which they appear here. Chapter 3 has been tested in the philosophical marketplace, and the bulk of it has appeared as H. M. Collins and M. Kusch, "Two Kinds of Actions: A Phenomenological Study," *Philosophy and Phenomenological Research*, 55, 4 (1995), 799–819. Chapter 9 has been examined and extensively improved through its exposure to historians of technology and is an almost unaltered version of H. M. Collins and M. Kusch, "Automating Airpumps: An Empirical and Conceptual Analysis," *Technology and Culture*, 36, 4 (1995), 802–829.

We are grateful to the editors of all the above-mentioned sources for permission to reproduce either the ideas or the words that they originally saw fit to allow to be published. In every case we have gained immensely from the advice and criticism of referees and editors.

We must also thank the many colleagues and students who forced us to think through and develop what we were saying. The students at the University of California at San Diego, to whom Collins taught some of these ideas in the spring of 1993, were generous in their understanding and sharp but constructive criticism. We have already thanked our Dutch colleagues, de Vries and Bijker, and should not pass by without mentioning some other friends at the University of Limburg and their students—notably Annemiek Nelis, who forced us to work out various bits of the theory during her brief time as an exchange student at Bath. Colleagues at Bath who were generous with their time include Graham Cox and David Gooding, while the Bath Science Studies Centre students did much to keep the project going; they include Georgina Rooke, Warren Evans, and Robert Evans. Tom Gieryn of the University of Indiana commented on the book at the American Sociological Association meeting in Washington, D.C., in August 1995 in an especially constructive and useful way, helping us to see more clearly our theory's relationship to Max Weber's notion of behavior. Jon Clark, of the University of Southampton, gave generously of his time in reading and commenting on the manuscript. In addition, Kusch in particular wishes to thank Bernie Katz

(Toronto) for discussions about Donald Davidson; Bryan Boddy, Dennis Klimchuk, and Niko Scharer for joining him in a philosophy of action reading group in Toronto in the spring of 1992; and Riitta Korhonen (Helsinki), Heini-Eliisa Hakosalo (Oulu), Simon Schaffer (Cambridge), David Bloor, John Holmwood, Matthias Klaes, Donald MacKenzie, Stanley Raffel, and Carole Tansley (all Edinburgh) for objections, suggestions, and examples. We have also benefited from the feedback at the many conferences and seminars that offered the opportunity to rehearse our themes. Naturally, all remaining mistakes and infelicities are our responsibility.

All in all, our critics have commented with varying degrees of sympathy, but they have always done it forcefully; it seems that whatever we are doing, we are not just following the trend. We accept this, and we hope that we have done a good enough job explaining our position in this book that the trend will turn.

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Cardiff University
Cambridge University
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Humans and Machines

What can humans do? What can machines do? How do humans delegate actions to machines? How do humans cooperate, and what kind of social organizations are there? How do humans exploit other human cultures?

These questions can be answered with a new theory: the theory of the shape of actions, or action morphicity. The theory goes like this: Humans can do two kinds of actions and—like machines—they can merely behave. When humans do *polimorphic actions*, they draw on their understanding of their society; when they do *mimeomorphic actions*, they intentionally act like machines—entities that do not need to understand society; when humans unintentionally blink or jerk their knees, they are like machines in every respect except appearance and moral worth.¹ Machines cannot do polimorphic actions because they do not have an understanding of society on which they can draw; but, though machines do not have intentions, they can be made to mimic mimeomorphic actions. It is obvious that if humans can act in ways that mimic machines, then, to that extent, machines can mimic human actions.

Why do we talk about the “shape” of actions—or action “morphicity”? It is because the theory of morphicity, unlike any other theory of action we know, is concerned with what actions look like from the point of view of an observer. From the outside, two mimeomorphic actions will,

1. The basic distinction between two kinds of action was put forward in Collins (1990) using a different terminology. In this book the terms “polimorphic action” and “mimeomorphic action” replace Collins’s earlier usage “regular action” and “behavior-specific action” (or “machinelike action”). The old terminology was not sufficiently “intuitive”; the terms did not carry enough information and the verbal formulations did not contrast clearly enough to be memorized and easily applied.

in principle, look the same; and we say that they have the same shape. Polimorphic actions usually look different on repeated occurrences. We also use diagrams to show the relationship between the “shapes” of different types of actions and to elaborate our theory.

There are entities that can do polimorphic actions and entities that cannot. We call all entities that cannot do polimorphic actions “machines.” This gives the term a broad extension. The machines we discuss include bridges, fridges, boots, bikes, bureaucracies, rockets, canoes, car washes, computers, machine tools, paint sprayers, plaster casts, animals, armies, air pumps, and McDonalds. We do not discuss insects, trees, rocks, and rivers, but we might have done so and, if we had, we would have called them machines as well.

We also use “machine” in its more conventional sense to refer to the elements of the above list that typically include gears or silicon chips. There is nothing confusing about this; in our theory, the relations that hold between humans and machines-as-conventionally-understood are the same as those that hold between humans and machines-as-defined-under-our-broad-extension.

For the sake of brevity, we call all entities that can do polimorphic actions “humans.” It is not clear whether nonhumans, such as chimpanzees and dolphins, can do polimorphic actions. If it turned out that dolphins and chimpanzees could do polimorphic actions, we would call them humans rather than machines. But the question does not arise in this text. Babies and, perhaps, autistic persons cannot do polimorphic actions, but we refer to them as humans because of their biological and moral continuity with other humans.

The key dichotomy between polimorphic and mimeomorphic actions is superficially similar to other dichotomies discussed in philosophy and the human sciences, but it divides the world in a different place, and it divides actions in a different way. The differences will become apparent in the text and will be discussed in the conclusion.

Boundaries

What has counted as the boundary between humans and machines, humans and animals, and science and nonscience, has varied from time

to time and place to place. Challenging, exploring, and demonstrating the permeability of these boundaries (a task to which the current authors have each made a small contribution) have given rise to some of the most exciting, not to say liberating, changes in our understanding of how the world is constituted. From one perspective, our current project continues this work: We show that the boundary between humans and machines is permeable at least insofar as humans often find reason for acting in machinelike fashion. We explore the possibility of shifts in the position of the boundary between humans and machines: If humans changed the ways they acted, they could make the very boundary between themselves and machines disappear.

But the essence of the theory of the shape of actions is to establish new boundaries rather than analyze or question old ones. We believe we have discovered a principled difference between those entities in the world that can do polymorphic actions and those that cannot. We could not understand how the boundary between humans and machines might shift if we had not first discovered the difference between polymorphic and mimeomorphic actions.² We are realists where our new dichotomies are concerned, and this allows us to be relativists about other things. We are realists when it comes to human beings and their actions, and thus we can be relativists about the way these actions make the world. Humans could have a world in which the boundary between machines and themselves became invisible, but to do this they would everywhere have to change the way they act. Were this to happen, the difference between polymorphic and mimeomorphic actions would remain; it is just that the terms would apply to different sets of actions in the world.

Plan of the Book

Our emphasis moves from theory to application. The early chapters are a theoretical defense and elaboration of the major dichotomy of actions, illustrated with examples drawn from common experience. The later chapters show the way the divisions can be applied, using more substan-

2. We use the word “discover” quite self-consciously to mark our commitment to social realism. For a more complete discussion, see Collins and Yearley (1992).

tive examples. In the first part a taxonomy of actions serves to brace the major dichotomy against attack from borderline cases; apparently fuzzy cases are shown to fall into subclasses on one side of the dichotomy or the other. The taxonomy also provides terms that are important in applications of the theory.

The new theory we develop, as we will show in the conclusion, splits the world in a different place to every preceding and superficially similar theory. Most of these preceding theories have a long and distinguished history and are very well established, yet we are going to argue that they miss the really important point. To realize such a grand ambition and defend it against all imaginable criticisms and counterexamples is not a trivial matter; inevitably, then, the first few chapters are densely argued. Those who would like to see where the whole thing is going before they commit themselves could jump ahead to chapters 6, 7, or 8, and have a look at the conclusion. (Chapter 9 is, again, rather specialized.)

In chapter 2 we explain what we mean by a theory of action, and we set out the methodological assumptions and presumptions that underlie the approach, which is a combination of sociology and philosophy.³ The difference between polymorphic and mimeomorphic actions sheds an interesting light on the idea of a social science and on the different varieties of order that are found in society.

Chapter 3 divides polymorphic action into three types and mimeomorphic action into four types, giving examples of each and accounting for apparent counterexamples to the main dichotomy and for fuzzy cases.

Using the seven types of action, chapter 4 works out the significance of the theory of the shape (morphicity) of actions for interactions between

3. Kusch has used the term “sociophilosophy” to describe such an approach. He is engaged in a reconstruction of philosophical epistemology based on “epistemological collectivism”—the view that the primary subject of knowledge is the group, not the individual (Kusch 1996, 1997, 1998).

“Philosophical sociology” is another description of what we do here—the study of formative action types, or the way types of human action make up societies. The two projects are two sides of the same coin. We see it as following the tradition of the later Wittgenstein (1953) and of Winch (1958). Both of these authors see conceptual structures as the counterpart of patterns of activity within forms of life or, as we might say, social collectivities. Given this way of looking at things, investigating the way that people do things is to investigate the way they think about the world, and vice versa.

people and people, and between people and machines. To make sense of what people do, one must share their society or form of life. Therefore machines ought to be the strangest of strangers. The most difficult problem our theory must deal with is not the gaucheness of some machines but the *savoir faire* of others.

Chapter 5 refers to the seven types of action to reveal what is involved in humans' learning new skills and actions. Some standard cases, such as bicycle riding, are shown to have been incorrectly analyzed in the past.

Chapter 6 employs the theory and its categories to analyze the action of writing. We move from high-level actions, such as writing a love letter, to low-level actions, such as inscribing individual symbols of the alphabet on the page.

Chapter 7 begins with a study of machines for writing and moves on to develop a typology of machines based on what machines do, and to another interwoven typology turning on how machines work. The difference between types of machines can be seen only by using the subcategories of the theory.

Chapter 8 applies the major dichotomy to organizations. We argue that the process of bureaucratization and deskilling has typically been cast at too high a level; this is why it has repeatedly failed to anticipate the problem of replacing humans with machines. The notion of mimeomorphic action is crucial to understanding such organizations as restaurants and armies.

Chapter 9 is an application of the major dichotomy to the technological development of the air pump. We show that the shape of actions provides the key to understanding the processes of mechanization and automation.

In the conclusion we pull together what we see as the consequences, both big and small, of what we have proposed.

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