

清华大学科技哲学文丛



科学实践哲学的新视野

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蒋劲松 吴彤 王巍 主编

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清华大学科技哲学丛书



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(清华大学哲学系教授、博士生导师)

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序

科学技术的迅速发展,深刻地改变并塑造着人类的生存条件和生活方式。在学术研究领域,这里主要指的是哲学社会科学领域,相应的形成了复数的关于科学技术的思考和研究(STUDIES),即是体现了从哲学社会科学多角度对于科学技术的思考和研究。中国的“大口袋”的自然辩证法研究传统(即中国的科学技术哲学),却与这种当代世界趋势是完全一致的。

如何促进学术研究和学科建设中的交叉、融合和创新,并在其中若干更狭义一些的方面夯实其规范性基础,成为我们的学科建设和学术发展中要处理好的一个基本问题。如果说,在清华大学出版社支持下,从2001年开始推出的《清华科技与社会丛书》体现了关于科学技术的多视角研究,那么,在内蒙古人民出版社的支持下,新推出的《清华大

学科技哲学文丛》侧重聚焦于关于科学技术的哲学研究。

从2001年4月开始举办的“清华大学科学哲学与技术哲学沙龙”，也体现了这种愿望。“沙龙”的启动，是与筹划《清华大学科技哲学文丛》同步的。说是“沙龙”，实际上采取了介于真正漫谈式的沙龙与比较正式的“讲座”之间的形式，原则上每月一次，至今已经举办了50多期。学术研究，贵在坚持，贵在思考，贵在积累，贵在创新。本着这种信念，我们希望通过持续的长期努力，通过学术积累和思考，深化学术研究，孕育和促进一些新的学术生长点。

清华大学科技哲学文丛编委会

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THE HEURISTIC STRUCTURE OF SCIENTIFIC PRACTICES:

A non – reductionistic account of practices
as Heuristic Structures

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1. Introduction. From different disciplinary perspectives, models of culture as a cognitive phenomenon are redrawing the boundaries of the social and the natural sciences, as well as the disciplinary boundaries of philosophy of science and epistemology. The growing importance of the concept of practice in the philosophy of science and epistemology is part of this redrawing of boundaries. The concept of practice, however, has been shrouded in rather obscure formulations. Further progress towards a philosophy of scientific practices requires getting clear about several issues underlying the concept. One important concern is about the best way of explaining how “implicit” or “tacit” knowledge articulated in skills and practices is related to the sort of

knowledge that is explicit in scientific theories. This is of course related to the issue of how we understand cognition as a social phenomenon, and to the more general issue of how we model cognition. In this paper I will show how shifting from traditional theories of cognition, based on metaphors of the mind as a computer (and in particular the idea of cognition as, exclusively, manipulation of internal representations), to theories which recognize a more complex and flexible boundary of "internal" and "external" representations, suggest and promotes ways in which the concept of practice can be elucidated and put to work as an important concept in philosophy of science. I will start by giving a brief account of traditional concepts of practice and the problems they face. I will say just enough to show how the difficulties in getting clear on the concept of practice is related with assumptions about the sort of explanation that is needed. Then I give a brief account of the classical view of cognition, and suggest how contemporary models of cognition which abandon the traditional rigid distinction between the internal structure of cognition and the external environment, suggest interesting possibilities which converge with concepts of practice increasingly used in the history of science and the empirical sciences, concepts which rely on a more flexible account about the site of cognition (and thus about the type of representations playing a role in cognition). I will then outline an account of practices which can be seen as supporting and being supported by those accounts of cognition which take seriously the role of external representations. Such account can provide a general framework in which the cognitive and the social aspects of practices can be seen as contributing to the

growth of knowledge.

2. The traditional concepts of practice and their problems. A well known characterization of practices comes from Wittgenstein. For him “practices are the inherited background against which I distinguish between truth and false”. As this quotation suggests, the notion of practice is often found contrasted with that of theory. A practice is something one engages in, consciously or not. The term also refers to the distinctive features of an activity, or to a repeated activity within a relatively well defined context, like the practice of law in a certain country and time. Often the notion of practice is used as a way of referring to the constraining or determination of knowledge by the tools used to reach such knowledge. In some cases it is even suggested, particularly in writings in the history of science, that practices are activities requiring specific tools and subject to certain standards. These notions are not the same. In his book The Social Theory of Practices (Turner 1994) Stephen Turner has introduced a distinction between two major groups of concepts of practice. On the one hand there are those that are based on the model of hidden premises of deductive theories, what he calls “shared presuppositions”, and on the other those that refer to embodied knowledge, such as skills, ingrained cultural or moral dispositions, or linguistic competences (Turner 1994, p. 3). Turner criticizes both groups of concepts of practices because, according to him, there is no way in which we can ground the claimed explanatory role of the concept. Since according to him, we do not have direct access to practices, either because the practices are some sort of

cognitive presupposition, or else because practices would be some sort of shared mental structure (which would support the explanation of observed similar behavior), grounding such explanations would require a network of causes described by a theory which would make intelligible the claim. In other words, elucidating the notion of practice would require presenting a theory about mental hidden causes which would explain the phenomena we identify as practices. Such theory is not available. Turner thinks that this lack of direct access leads to another problem, the problem of explaining how practices are transmitted from individual to individual. Practices have to be transmitted, but it is not clear how we can make sense of their transmission. Bordieu, for example, talks of mechanisms of "reproduction of practices", but what are more precisely such mechanisms?^① Turner thinks that this can only be seen as a metaphor. In order to have a clear idea of how practices get reproduced or transmitted one would need to match them up with the mechanisms familiar to the epistemological tradition – seeing, sensing, the hearing of utterances of linguistic objects such as sentences and the like. After elaborating those problems Turner concludes that the only way one can understand the concept of practice is as individual habits, a notion that can be explained in terms of the usual mechanisms accepted by an individualistic epistemology. After presenting the traditional view of cognition and some alternatives, I will suggest how to answer Turner's worries. The answer will require abandoning the narrow assumptions, associated with the traditional view, about the type of cognition underlying an account of practices. It will involve in particular that we recognize the role that heuristics can play as representations

(which cannot be understood as mere internal representations) in cognition.

3. The traditional view of cognition and its problems. According to the classical view of cognition the mind is a symbol - manipulating computer which mediates between perceptions (resulting from those traditional mechanisms Turner refers to as those of traditional epistemology) and plans of action. There are several considerations favoring this view of the mind. The processing of information that perceptual systems accomplish seem to fit this view of cognition if, for example, these systems are assumed to work by generating hypotheses about external causes of internal representations which would be the sort of theory. A lot of effort of classical cognitive science has gone into implementations of this idea, which relies on the functional decomposition of the processing task, which in turn reduces to the problem of modeling such systems by finding algorithms that yield the desired output. Nowadays this model of cognition does not seem as convincing as it once did, because of many reasons, but one important reason for sure is related to the fact that there are now alternative models available. Connectionist networks, for example, do not model cognition as a rule - governed manipulation of internal representations, but rather as the result of multi - layered networks which can be trained for solving different tasks. The chief difference between connectionist models and classical ones is that there is no symbolic representation within the network. Representation is rather distributed across the network. Networks have properties that are fascinating from the perspective of a

model of cognition because they turn out to be able to learn in ways similar to the way human beings learn. There is no doubt that connectionist networks are an impressive achievement, as we have already mentioned they are able to mimic important aspects of human thought. But nowadays connectionism is not the only alternative to the classical approach. Dynamical systems theory is another type of project in cognitive science which does not rely on internal representations and centralized processing, it assumes that an agent can be seen as coupled dynamically to an environment in such a way that the need of internal representations and goal directed behavior disappears. Furthermore, there are projects in artificial intelligence which are developing interesting alternatives particularly relevant to our discussion.

Some people working in robotics claim that the only way to achieve artificial intelligence is through building robots that are viable in environments not specified in advance, or constructed in such a way as to suit the perceptual limitations of the robot. Rodney Brooks (1999), for example, started a project from the premise that too much is given away once the programmer presupposes that the system will receive only data of a given type from a given environment^②. I will focus on this alternative to the traditional account of cognition because it will be easier to make my point. I do not exclude the possibility of arriving to similar conclusions on the basis of connectionist or dynamical accounts. However, I do believe that the sort of models developed by Brooks are particularly relevant since they rely on the notion of activity, a notion that fits very well with an account of practices as something beyond traditional epistemology.

The key difference between the sort of models proposed by Brooks and traditional programs in AI is that instead of looking for a decomposition of a complex problem by functions, he decomposes it in activities. Activities are for Brooks patterns of interactions with the world, such as “exploring interesting – looking areas” or “when passing through a door southbound, turn left”. Actions are the result of behavior produced by the direct transformation of input, they are not called as a subroutine by some central program. Thus, there are no global decisions based on centrally held internal representations of the world. As Brooks puts it, the world is the best model^③. What he proposes is a bottom – up approach to the study of intelligence, as opposed to the top down approach which “tackles intelligence through the notions of thought and reason, things we only know about through introspection” (Brooks p. 134, 1999). As it should be apparent by now, these approaches are useful for elucidating a notion of practice (under the assumption that they are better models of cognition than the traditional ones) to the extent that practices can be understood as articulations of activities. The activities, once they become viable in the (natural) environment get superimposed in what Brooks calls a subsumption architecture. The overall behavior is considered to be the result of various autonomous activities overriding each other. My point here is not to enter a discussion about the merits and problems of the different approaches, but to say that there are scientifically interesting projects which not only do not ground a model of cognition on the manipulation of symbolic representations, but also leave behind the idea that an explanation of cognition has to require a theory about internal representa-

tions and the way such representations link inputs and outputs. This is the sort of theory Turner seems to assume it is required to make sense of the notion of practice.

Models which assume the manipulation of internal representations as indispensable for cognition can be called of the “black – box type”. Such models assume that it is possible to draw a clear – cut boundary (which plays a crucial role in the explanation) between internal manipulation of representations and external causal processes. Such boundary makes it conceptually impossible to consider whatever causal role the “outside” plays in an explanation of behavior, unless it is mediated by internal representations which get constructed with data coming from perception. Notice, this is the assumption that leads Turner to the conclusion that the only way of making precise the notion of practice is by reducing it to that of habit. Thus, taking seriously alternative approaches to cognition is important for an elucidation of a concept of practice because it suggests ways in which black – box models of cognition can be abandoned, and “external” representational resources can be incorporated into an explanation of the concept of practice. Before going further in our suggestion it is important to address an important objection to all theories which abandon the notion of internal representation as the crux of cognition. The objection arises from the assumption that a theory of cognition has to identify and justify the basic ontology of cognition, the “natural kinds” on which the computational models rest. Internal representations can be identified in terms of functions which in turn can be explained as the result of evolution by natural selection. Thus, it seems that the traditional approach has the sup-