

Science, Technology, Society: Prologue

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The expansion of higher education has produced graduates equipped with knowledge, skills and problem-solving abilities, who, having spread throughout society and society's institutions, are now to be found in all social spheres. Countless new areas of scientific activity have sprung up alongside traditional academic institutions with the result that here, too, knowledge is being produced (Robbins-Roth 1998). Types of knowledge have emerged that have been developed not in the traditional manner—i.e. within the confines of the university—but rather by people who work with symbols, concepts, data, models and theories from many different sources and then combine these to produce ever new configurations. As our definition of knowledge has broadened, non-scientific forms of knowledge have been upgraded. The widespread, and to a large extent unquestioning, acceptance of these only makes sense if one also takes account of just how fundamentally approaches to the social perspectives for action have likewise changed, not just in the social sciences, but in the cultural sciences, too. The misleading fiction that in realms (as yet) untouched by the rational power of academic knowledge irrationality must hold sway (Hack 2001, 26 f.) was not debunked until the everyday knowledge and capacity for action of normal actors were systematically revalued (by Schütz, Bourdieu and Giddens, for example) and until knowing—especially tacit knowing—was recognized as a precondition for finding one's way in a world fraught with significance and meaning. The retraction of this academic myth is discussed variously and explicitly as the '*Wiederentdeckung des praktischen Wissens*' [Rediscovery of practical knowledge] (Hörning 2001), as the 'Practice Turn in Contemporary Theory' (Schatzki et al. 2001) and as the '*Transformation der Kulturtheorien*' [Transformation of cultural theories] (Reckwitz 2006). The practice turn in contemporary science is in fact manifesting itself in two different ways: (1) in the advent of *post-academic* science as a real process, in the course of which academic science, having until now been the only institution with the prerogative to generate

socially binding knowledge, is being replaced with numerous competing networks, all of which promise knowledge that is both more relevant and more robust than the academic knowledge generated hitherto, and (2) in *inner-academic* reflection on this process, by which old, academic, science is being forced to justify its own existence and to engage in a multitude of activities, all of which have nevertheless remained firmly within the existing institutional framework and subject to traditional epistemic standards. The practice turn in this context simply means academic science in typical fashion reacting to, and reflecting on, the changes taking place out there in the world at large. This is especially true of the cultural sciences.

The patterns of interpretation of epistemic theories that are formulated *in the context of academic science* and that hinge on social reproduction as manifested in the trivial situations of everyday life can be outlined on the basis of those characteristics that set them apart from other approaches, be they of epistemic or of philosophical origin: (1) (academic) knowledge does not—or rather no longer—precede everyday action, but instead is more likely to evolve out of it. It is actually a constituent element of practice and one that follows a heterogeneous, fiercely independent and context-specific logic, which differs significantly from that cultivated in the academic milieu—for example in the conceptual world of cognitive *mentalism* or in semiotic *textualism* (Reckwitz 2006). This could be expressed metaphorically as follows: building a house, for example, requires more than a knowledge of statics as taught at university in abstract terms. Practical problems are solved not by interpreting an existing ‘text’, in other words by ‘reading’, but rather by doing, including by experimenting on precisely those projects that are to be realised in practice. (2) The agents of everyday action are the physical bodies of the persons involved and the artefacts they make use of. In other words: most social reproduction today manifests itself in hybrid forms, in particular such forms that involve humans and non-human things. Artefacts, moreover, not only have an important role to play, but are in fact a key component of social practice—which is something that the academic social sciences tend to overlook. After all, the claim made by Latour (1991) that ‘Technology is society made durable’ is only somewhat exaggerated. (3) The dichotomies so typical of

Western thought—mind and body, subject and object, nature and society, micro and macro—have to be jettisoned, for the focus now is on the more or less vague topos of the network underlying the practical problem to be solved. As a rule, this network will have both ‘intersubjective’ and ‘interobjective’ structural components which, because they follow an implicit logic, call for the application of practical, but nevertheless scientific knowledge depending on the situation and context of the problem to be solved—which might be something as straightforward and mundane as cleaning one’s teeth, or something as infinitely more complex—or so we are told—as handling the BSE crisis. The seemingly humdrum and utterly forgettable act of brushing one’s teeth in fact brings together an abundance of completely different forms of knowledge, ranging from an understanding of how to work the hot and cold taps in the bathroom and an informal grasp of how the teeth should be cleaned to the chemical knowledge of the toothpaste manufacturer, the knowledge implemented in the toothbrush (soft versus hard, the angle and position of the bristles) and the interpretative and orientational knowledge implicit in the individual’s acknowledgment of the necessity of cleaning one’s teeth to today’s (post)-modernist civilization etc. Those forms of knowledge that vouch for ‘the truth’ no longer derive their significance from their alleged universality (or at least not to the extent that they once did), but rather from their sensitivity to context, the extent to which they embody practically applicable, and socially robust, local knowledge. (4) Social practice is remarkable for two peculiarities that at first glance seem mutually exclusive, but in reality are not contradictory at all, but instead represent two sides of the same coin: while on the one hand, it manifests itself in the humdrum routines that ensure the continuity of social reproduction, on the other, it contains within it an element of the unpredictable and interpretative uncertainties which permit, indeed provoke, social dynamism and innovation. The humdrum routines are sooner or later translated into technology and as such become part of the cement that holds society together. Yet context-induced reinterpretations of existing practice are also emerging even as this is happening and because of the instability they themselves create, have the potential to upset social reproduction either in part or in its entirety. (5) The abstract fiction of the autonomous subject

on the one hand and equally abstract universal of 'society' (with its ineluctable behavioural presumptions) on the other has been displaced as the key object of interpretative analysis by historically specific practice complexes and networks. Latour, for example uses the term 'association' to capture these micro- and macro-sociological aspects. Loosely connected complexes of heterogeneous practices and networks are now a focus of sociological interest. And the practices performed within these complexes are remarkable both for their situational and temporal specificity and for the way in which they bring together loosely connected, and in some cases overlapping, forms of knowledge. Academic knowledge may still have an important role to play among them, but is nevertheless only one form of knowledge among many, and can no longer claim more authority, or more truth, than the others. Social reproduction is no longer concerned with extracting truth from reality, but rather with reaching a verdict on the reality of truths which first have to be construed—which are in fact the outcome of a production process. Only when considered against this backdrop does Latour's appeal to academic science make sense: 'Down with Kant! Down with the Critique! Let us go back to the world, still unknown and despised' (1988b, 173).

Post-academic science generates its 'socially robust' knowledge to a large extent 'in situ' and in relation to problems raised by social reproduction outside the confines of the ivory tower (Enzinger 2008; Falk et al. 2006; Schmidt 2003). Even if academic science is still expanding, measured in absolute terms, post-academic science is growing proportionately faster. What we are talking about here is not just a quantitative shift, but rather a change in the quality of the relationship between science and society, which is itself a process affecting not just institutional integration, but also the epistemic status of scientific knowledge. Which raises the question of how this process, which, as must now be apparent, has certainly not gone unnoticed in academic circles, is being registered, or even advanced and supported, by academic science. Two basic reactions can be made out:

The first of these is the drafting of *strategic recommendations*, above all by Lyotard, who formulated his search for ways out of the crisis of post-modernist knowledge with the aid of Wittgensteinian language-game theory. Crucial to originality and to the ability to produce something new,

he argued, was the ability 'to articulate together what was not together (before)'. Lyotard described this skill as the 'imagination' that enabled one 'either to make a new move or to change the rules of play', (1986, 152). He distinguished two kinds of 'progress' in academic science, 'one of which is equivalent to a new move (a new argument) according to the established rules, and the other to the invention of new rules and hence to a change in the game itself' (ibid. 128). I would interpret this passage to mean innovations in the language games of academic science in the first place, and the rejection of the imperatives underlying these in the second—which ultimately implies the advent of post-academic science.

The imperative of 'originality at all costs'—as long as it remains within the context of the language games of traditional academic science and is cultivated ad nauseam—has often enough led to the production of eloquent nonsense, as the Sokal Affair proved (Sokal & Bricmont 2001). The virtuosity applied to the invention of new moves in this case remained confined to the context of conventional language games, however, and hence to academic discourse. Eloquence became an end in itself, while the reality beyond the ivory tower continued on apace, utterly oblivious to the same. After all, this reality cannot exhaust itself in the fact of being a text. In social reproduction, however, in the practical, everyday business of post-academic science, the idea that we are a text writing itself, a discourse taking place of its own accord, a game of signifiers without a signified, cannot survive long. Scientific theories are not novels. This is especially true of the natural sciences and of technology as the social manifestation of the same. Even Lyotard, of all people, knew this—which is more than can be said of some of his followers. Textualism undoubtedly has its inner-academic merits, and to dismiss it out of hand as no more than semantic sophistry (Henscheid 1986; Laermann 1985; 1986) is in my view an unjustifiable overreaction that probably owes more to inner-academic rivalries than anything else. Yet there can be no doubting the legitimacy of the demand that follows on from this—namely that instead of indulging in endless meta-reflection we should be forging ahead to the things themselves. For there really is a different approach to embracing the truth out there, and this is the approach that Latour called 'that of the world, not the word' (Latour 1988b, 173).

Academic science, which brings me to the *second type of reaction*, to the more *contemplative interpretation*, has made itself the subject of its own research. It has become increasingly self-reflective, partly because of the ever greater difficulty of producing genuine innovations within the context of its traditional language games, and partly because of the ever greater pressure it is under to prove its relevance to society at large. This raises the question of how the 'practice turn' can be acknowledged, interpreted and processed by a theory bound by the language games of academic science, for even if there is no place for post-academic knowledge in the ivory tower (unless of course the institutional conditions are changed), there still has to be a reaction, even if that reaction remains firmly within the framework of established academic science.

One key dilemma of the university as an academic knowledge factory resides in the fact that transdisciplinarity is now a key requirement of the everyday practice of social reproduction. This makes it very different from academic science, in which transdisciplinarity is not so much a genuine necessity as nostalgic wishful thinking. As in the past, academics are still wont to lend themselves their own distinctive profile within their own disciplines and to use jargon to exclude outsiders. This explains why most attempts to establish interdisciplinarity or transdisciplinarity at universities are doomed to fail. Nor is it by any means certain that the success of the same would be desirable, as the most likely outcome would be no more than a conglomeration of the knowledge contributed by each discipline. Unlike in the academic context, in which calls for interdisciplinarity and transdisciplinarity tend to express a nostalgic yearning for some long-lost unity, transdisciplinarity in the everyday practice of social reproduction arises automatically by virtue of the shared definition of a problem in a specific context. It is not an end in itself. As we have already pointed out, there is more to building a house than just an understanding of the abstract laws of statics.

That academic science is at least sensitive to the necessity of overcoming boundaries—even if recognition alone is not enough to translate into action—is evident in the current discussion of the *Practice Turn* (Schatzki et al. 2001), which itself draws heavily on those who laid the groundwork (Pinch 2001). Philosophical reflections on the practical

relevance of knowledge are to be found even in Wittgenstein, for example, whose concept of language games allowed him to distinguish between various forms of knowledge as ability that abides by implicit rules. It is not by chance that in their later works, both Lyotard (1986) and Bloor (1983; 2001) explicitly acknowledge their indebtedness to this concept.

Among contemporary sociologists, two authors spring to mind who have tried to take account of the problem of practice by moving beyond the traditional disciplinary dualism of action and structure. The first is Pierre Bourdieu, who in his highly ambitious *Theory of Practice* tried to link key aspects and conditions of practical action such as habitus, social context, practical meaning and the incorporation of knowledge (1979; 1987). The second is Giddens, who approached the problem from a different angle, and whose *Theory of Structuration* uses the terms 'practical consciousness' and 'social space-time' in acknowledgement of the key role that social practice plays in the evolution of the social (1979; 1988).

Haraway (1995a, b), and last, but not least, Latour (2002; 2005), who despite using the language of linguistics apprehend humans' interaction with their environment as production rather than communication, both have their sights trained firmly on the interaction of humans and non-humans. Practice, in their eyes, is defined primarily by artefacts, without which what we call 'society' (today) would not (or no longer) be possible at all.

The name Latour can at the same time be regarded as representative of a more recent, more empirical, approach to science and technology research (cf. Bammé 2004a). Both *science studies* and *technology studies* are vehemently opposed to the prior assumptions that have become so dear to academic science's self-image. Instead of merely theorizing about epistemological fictions, *science studies* analyses the everyday practice of *science in the making* empirically and 'in situ'. What carries a lot of weight here, or so it has turned out, are such technical artefacts as measuring instruments and computers, as well as the premises and equipment available. These cannot be reduced to the function of mere adjuncts to the epistemic process, for as *epistemic objects* they actually help shape what is perceived (*wahrgenommen*), and hence what is taken for truth (*Wahrheit*). As science opens up to society and the everyday life of society becomes increasingly

scientized, so the dividing line between *science* and *technology studies* is becoming increasingly blurred. The latter is in fact an inner-academic reaction to the failure of academic sociologists to take account of technology. While they use their empirically sharpened eyes to criticize the way in which technical artefacts are reduced to mere adjuncts, they also resist any generalized interpretation of technology as a social determinant.

Critique of the patterns of interpretation now so dear to academic science by more recent organizational research can also be interpreted as an inner-academic reflection on contemporary *practice turns* (Ortmann 2003; Probst 1987; Westerlund & Sjöstrand 1981; Weyer 1997). It distances itself both from the straightforward concept of rational choice, which is in turn based on the economic model of purposeful action, and from the Weberian view of the organization as a bureaucratically hierarchical embodiment of formal rationality. The action of actors who, motivated by the utility calculus or by an idealistic set of norms, by and large adhere to the imperatives of the social subsystems to which they belong, is being replaced by the informal practices and activities of networks whose decisions are made without certainty, and hence are bound to have unintended consequences. The concept of emergence is gaining ground at the expense of that of function.

The *practice turn* has impacted in a similar fashion on *gender studies*, according to which gender is not a passive condition, but rather an action, that of *doing gender* (cf. Butler 1991; 1995; von Braun & Stephan 2000). Essentializations of gender along biological or psychological lines are being discarded, as are such disembodied post-modernist interpretations as interpreting gender as binary code within discourse and texts. Reifications of gender, no matter what kind of underlying structure they draw on—biological, psychological etc.—are at the same time giving way to stagings and to practices, which, although essential to the constitution of the individual self-image, do not by any means guarantee its reproduction.

Just as *women's studies* eventually mutated into *gender studies*—a line of research whose feminist perspective is perhaps best represented by Judith Butler—, so the issues raised by *gender studies* had to be reformulated by the emergent discipline of *cultural studies* (Bromley et al. 1999; Lutter & Reisenleitner 2002), which turned its attention to all those everyday

modes of conduct and practices in which elements of 'different cultures' can be said to have a role to play and be mutually influential. It is these that lend expression to a fundamental critique of the homogenizing tendencies of traditional anthropology, which regards culture either as a sphere of shared norms and values or as a semiotic system which, being applicable to a collective in its entirety, serves to differentiate that collective from other collectives with other cultures. Multiculturalism no longer manifests itself in a clash of intellectual systems, but rather rests on a reflective, and ultimately unpredictable *bricolage* of different complexes of practices and forms of knowledge, whose value in practice merits their constant refashioning as tools (Swidler 1986).

The basic thrust of all these approaches, which in one way or another can all be interpreted as *inner-academic* expressions of the *practice turn* of contemporary science, and which Reckwitz, in his synopsis (2002b), groups together under the heading 'Cultural Theories', is clear. They are directed first and foremost against the structuralism and system theory of Durkheim, Luhmann and others of that tradition. As one of the most outspoken advocates of the *practice turn*, Latour follows Tarde (2001; 2007) in explicitly setting himself apart from those social sciences that are following in Durkheim's footsteps. One characteristic of structuralism and system theory—and in this respect they are both very academic indeed—is their localization of the social in transcendent structures that have no meaning for those actually involved, and which are apparent in all their regularity only to the social scientist, i.e. to an academic observer (Krawietz & Welker 1992). Yet once the experiments have left the ivory tower and society itself has become the laboratory—to borrow Latour's metaphor—and once we ourselves, with all our myriad skills, have become players and participants in these experiments, then we are bound to be both experts and lay people at the same time with the result that there is little sense in judging scientific and everyday knowledge hierarchically. The only criterion that counts is that knowledge be socially robust. It follows that the objective perspective of the onlooker is losing much of its significance.

Yet what is also being targeted here is the methodological individualism of established theories of practice. These may take the form of purpose-oriented variants based on the academic figure of the *Homo oeco-*

nomicus—as expressed in the contemporary concept of *rational choice*—, according to which the social comes about of its own accord as the product of innumerable individual actions and interests which, taken together, yield a market price, a contractual norm or a resource allocation matrix. Alternatively, they may be bound rather by the academic figure of the *Homo sociologicus*, which localizes the social on the level of social precepts that define which types of individual action are possible—a set of *normative* rules whose purpose is to prevent endless confrontation between different, and possibly conflicting, interests. The question of how the inter-subjective coordination of potentially contradictory actions by different actors is possible is answered here by reference to the influence of social expectations and roles and hence in normative terms.

In a comparative study, Reckwitz (2006) pointed out that although the theoretical approaches generally grouped together under the heading ‘cultural theories’ or even ‘socioconstructivism’ in conceptual terms draw on such eclectic sources as structuralism, semiotics and post-structuralism, phenomenology, hermeneutics, pragmatism and radical constructivism, they still localize the social on a level that is different from that of the purpose- and norm-oriented approaches of the *Homo oeconomicus* and *Homo sociologicus*. Cultural theories, being a result of the *interpretative turn* or *cultural turn* of the late 1970s, no longer view the problem of social order as a problem of coordination that can be solved with the aid of the utility calculus or normative rules and regulations, but rather see it as residing in whatever it is that induces actors to regard the world as orderly and to be active in the same. This, however, presupposes the existence of collectively shared knowledge systems, sign systems, cultural codes and horizons of meaning that regulate the attribution of meaning to objects in the world and hence how these are ‘understood’. The various approaches differ in terms of how they understand what it is that distinguishes individual systems of meaning and knowledge systems. Drawing on an abundance of material, Reckwitz in his synopsis differentiates between three modes of cultural theory: *mentalism*, *textualism* and the *theory of social practice*. Although the latter, like the former two, has also undergone an interpretative turn, it actually goes a step further.

The theories that Reckwitz allocates to the early stage of *mentalism* apprehend the 'social', or rather 'culture' in cognitive terms: either from a 'subjectivist perspective' as *intentional*, meaning as a meaningfully focused act of consciousness in which 'something is understood as something', or from an 'objectivist perspective' as *structural*, i.e. as a subconscious set of rules comparable with a cultural grammar that generates the relevant meanings within the individual consciousness. Reckwitz cites Alfred Schütz as an example of the first of these and Claude Lévi-Strauss as an example of the second.

Reckwitz describes *textualism*, which is in any case a critical response to *mentalism*, as those forms of social and cultural analysis which, having arisen almost as a by-product of post-structuralism, radical hermeneutics and radical-constructivist system theory, localize the social, and hence cultural knowledge systems, on the level of text, of discourse, of 'public symbols' and ultimately of 'communication'—in Luhmann's sense of the word. If mentalism regards culture as being hidden 'inside' the individual, the exact opposite is the case for textualism, which perceives it as being extraneous to the individual and to be found only in discourse, texts, symbols and communication sequences. These are the things that are structured by knowledge systems and cultural codes. The examples Reckwitz cites include Foucault's post-structuralist discourse theory, which seeks 'epistemes' and formative rules on the level of discourse, the semiotic analyses in the work of Roland Barthes (1957), who seeks to reconstruct the 'publicly visible' signifiers contained in everyday objects, Clifford Geertz's radical hermeneutics, which apprehends culture as text (cf. Brown 1987) and finally Luhmann's pegging of the social to the codes and semantics of communication sequences 'in the environment' of psychological systems.

Setting itself apart from *mentalism* and *textualism*, which it accuses of conceptual 'intellectualism' and the 'intellectualization' of social life, the *theory of social practice* apprehends the collective knowledge systems of culture not as intellectual 'knowing that ...', nor as the purely cognitive schemata of observation, nor merely as the codes contained within communication sequences, but rather as practical ability, as 'know-how', as a conglomerate of everyday techniques and practical understanding in the sense of 'agreeing

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on something'. This theory sees the social not in a collective 'spirit', nor in a conglomerate of texts and symbols, but rather in 'social practice', understood as know-how-dependent behavioural routines, which are held together by practical 'understanding' and whose underlying knowledge is not only 'incorporated' in the active subject (the actor), but also takes the form of routinized relations between the subject and material artefacts (or 'actants', as Latour calls them). Actions are not grasped as targeted and discrete units; instead they are embedded in an all-embracing, socially shared practice context, which derives its coherence from implicit, methodological and interpretative knowledge. It is in this complex of typified, routinized and 'understandable' practice, in other words in the collectivity of modes of behaviour bound by a specific 'practical ability', that the social is manifested and not, as previous approaches claimed, in 'intersubjectivity', in 'communication', or in an orientation to certain norms. Distinctions between a micro and macro or an active and a structural level therefore make little sense, for in reality, these are purely interpenetrative. Flying in the face of all the rules of standard academic practice to date, therefore, the answer to the question of how this complex nexus can be empirically and analytically unravelled must be as follows: Forget all previous assumptions! Follow the actors themselves into their world—however 'unknown and despised' that world may be (Latour 1988b, 169, 173).

The emergence of scientific theories and shift of empirical epistemic interest can be traced back to two basic causes as a rule: both are reactions either to previous theories or to real changes in the social environment. Whereas the first are often, though not always, borne of the publish-or-perish imperative—which has been known to produce everything from petty skirmishing to unabashed mud-slinging—the latter have to do with the underlying fault-lines, as when reality and the interpretation of reality drift too far apart, for example. And even when the changes are real, the aforementioned reactions in most cases relate only to filtered versions of the same—as seen through spectacles tinted by the concepts and categories of existing patterns of interpretation.

The change we are currently experiencing in academic science's self-image can indeed be described without exaggeration as an 'epistemic breach' (Bachelard 1978), as a 'second academic revolution' (Etzkowitz

1990) or as 'epistemic drift' (Elzinga 1997). Its impact is two-fold: on the one hand it marks the transition from academic to post-academic science; science is becoming responsive to external purposes, is intervening directly in social problem zones and in doing so altering not just its traditional institutional ties and organizational structures, but even its own epistemic foundations (Bonß & Hartmann 1985; Funtowicz & Ravetz 1993; 2001; Gibbons et al. 1994; Nowotny et al. 2002; Ziman 1996; 2002). By intervening constructively in social reproduction, it is accomplishing a practice turn in the original sense of the term (cf. Bammé 2004c), as opposed to the metaphorical sense still being used by hidebound academic science (cf. Reckwitz 2006). In the first case, one could follow Lyotard in saying that the rules of the game are themselves being changed, whereas all that has changed in the second case are the moves, the game architecture per se having been left untouched. Science in the first case is reacting radically to structural discrepancies in its relevance to social reality, while in the second case the reaction is immanent and hence extremely moderate, taking the form of contemplative variations in previous patterns of interpretation. Reckwitz sees this second variation as belonging to the history of dogma, in the course of which academic patterns of interpretation have moved away from the abstract and become increasingly concrete, shifting from structural theory to purpose- and norm-oriented theories of practice to *Cultural Studies* and there from mentalism via textualism to theories of social practice. The most recent development in inner-academic patterns of interpretation, namely the *theoretical representation* of social practice, in a certain sense constitutes the contemplative counterpart to the actively interventive and formative practice of post-academic science. What academic science offers are theories *about* social practice, in other words the exact opposite of what practice really means. The same old rituals are used to 'explain' changed forms of knowledge-based practice (Esser 1991; 1993). Even if elaborate language games are used in order to talk *about* practice, however, this does not of itself constitute practical action, but rather remains ensconced within the realm of the contemplative. All that has happened is that the standard repertoire of academic routines has been enlarged by the addition of another topic. Delivering an innovative 'explanation' may indeed be very satisfying, but that is exactly where the

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problem resides. The moves may vary, the rules of the game do not. Even when what is at issue is the incorporation of scientific knowledge in social practice, academic science has done almost nothing towards the practical realization of the same, nor has it made so much as the slightest attempt to transfer scientific knowledge to such a constellation of social practices as would justify the implicitly dramatic concept of a 'practice turn'. And it is in this respect that academic science differs from post-academic science.

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