Science, Technology, Society: Prologue

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The idea that all the suffering and sacrifice that technical progress demands of us will eventually be rewarded was called into question at a very early stage. Hopes of an essentially religious nature have no place in the scientifically driven field of technology, where in cases of doubt, it is 'not the beginning, but the end that bears the burden'—at least according to Friedrich Georg Jünger (in his 1953 work *Die Perfektion der Technik* [The Perfection of Technology], 157). While this does not have to mean Wagner's *Götterdämmerung*, Jünger can certainly be credited with having exposed a dilemma which, translated into today's language and today's consciousness, might be worded as follows: As appalling as Seveso, Bhopal, Harrisburg and Chernobyl all were, the risks and costs of safely storing and disposing of spent radioactive fuel rods—there are now some 50,000 tones of them in the USA alone—will ultimately have to be borne not by us, but by future generations.

Bearing in mind that Jünger wrote these lines long before there was any talk of ergonomics, environmental friendliness and sustainability, one cannot help but be impressed by the far-sightedness of his argument that the link traditionally made between technical progress and prosperity rests on an arithmetical error: When companies strive to make profits and to create surplus value, this of itself cannot be interpreted as evidence of economic good sense. Their profitability is in fact illusory, for their losses still exist even if they have been removed from view. Ford, for example, owes its ascendancy as one of the most successful automotive groups in the world to an infrastructure focused on its own interests, to a 'transport collective' which, given the way in which it squanders resources, might better be described as the 'collective of the greatest deficit'. Technology for Jünger, therefore, far from creating surplus value actually does the exact opposite inasmuch as it erodes precisely those standing reserves upon which it is most dependent. Nature's resources are tapped wherever possible in order to generate still more energy with which to expand the

'collective': 'Technology does not generate riches', he writes, 'but it is through technology that we are able to acquire, process and consume riches. The consumption now taking place is not only unremitting, but is becoming increasingly voracious and rapacious. We are plundering on an unprecedented scale, ever more and ever more reckless plundering being one of technology's salient characteristics and one without which it could not flourish. Any theory that fails to take account of this, that ignores the foundations upon which both work and business rest, is bound to be skewed' (Jünger 1953, 28). The economy of the 'technical collective' is a bogus economy, Jünger argues, because instead of managing its objects, it actually only consumes them. The work invested in them is not production, but consumption. Natural resources are mined only to go up in smoke. Our waters are being turned into sewers and our forests, flora and fauna destroyed (ibid., 30 f.).

Jünger describes the 'social figuration'—to use Elias's term—that sustains and drives this process as the 'technical collective', by which he means that consortium of structures and organizations that allows for humans only in the form of 'workers' (E. Jünger 1982). The 'technical collective' has a tendency to be both planetary and totalitarian. Whereas it first manifests itself as specific collectives with specific plans, it invariably mutates into a universal mechanism with a universal plan—into what we would now call global society. It sweeps aside the social orders, empires and cultic powers of old, steamrollers individuality and makes plunder and waste on a massive scale the norm. Nothing is left untouched; nothing is deemed so sacrosanct as to be worth preserving. That which was stable is rendered dynamic, that which was immobile mobile. Not even those legal and political structures that have proved their worth through history are left unscathed and those norms that in the pretechnical world guaranteed stability are demoted to the status of provisional regulations that can be replaced by others whenever this becomes expedient. The law itself has become no more than a code of conduct and just as its primary institution, namely that of private property, is losing its formative power, so too landed property—immovable property *par excellence*—is losing its social and economic supremacy. Property is becoming increasingly dependent on ever more expansive circulation with countless rights of

first refusal, rights of way and rights of official intervention extending even as far as the right of expropriation being adopted in the interests of the 'technical collective'. 'Property no longer controls circulation; circulation now controls property', as Jünger puts it (1953, 304, 358).

Jünger grew up with a technology that had its roots in a classically mechanistic, Newtonian universe. To the extent that it was relevant to the everyday life of society at all, it conformed by and large to the capitalist imperative. The modern technology that Jünger has since found himself facing, on the other hand, goes far beyond the traditional profit motive of any single business. Its spatial and temporal scope and power to infiltrate every aspect of life—whether intentionally or not—far surpass anything that any single company, or indeed any single state, might aspire to. Technology these days is subject to laws other than those of the market and as such is gaining weight and having more and more of an influence on investment decisions. The more important considerations of content—abstracted from those of the market—become, the more they stretch the economic risks of long-term investments to the limit of what any individual company can afford to bear. One consequence of this is that more and more of these decisions are now having to be made in the political arena, at the preparliamentary level and by and large detached from market forces. Yet the unholy alliance of industrial, military and party-political interests that actually makes these decisions does not bear any responsibility for their consequences. These days it is more likely to be the formative power of the political (as opposed to the democratic) principle that defines the direction in which technology, and hence society as a whole, are to develop. It was not the market economy that gave us nuclear power, motorways, the aerospace and arms industries. They all came about as a result of political decisions and policies—albeit implemented according to the rules of the market economy. The failure of the Transrapid project that was to have established a maglev link between Hamburg and Berlin is a case in point. The project would not pay off, we were told, although it was only after the politicians had withdrawn their profit guarantee that the sums were found no longer to add up. The decision to drop the project, therefore, was first and foremost a political decision based on social, rather than economic considerations.

It is above all those consequences of technological innovation that the market economy prefers to ignore—I am thinking here of environmental problems, changes in the human genome and such like—that cry out for transnational intervention. Traditional economic control mechanisms simply do not work here, especially as more and more of today's technologies no longer serve economic ends: 'It is an ever greater degree of technicity to which the economy is now subject. We are heading for a situation in which the technicity of the work process is more important than any profit it might yield' (Jünger 1953, 35). Yet in Jünger's eyes, it is not just the traditional relationship between the market forces and technology that is being eroded, but that between science and technology as well: 'Technological progress is causing the relationship between science and technology to change, with science becoming increasingly subservient to the demands of technology. This shift in power is evident in the way in which scientists these days are likely to be hired by those industrial labs and research institutes in which their knowledge can be used for technical ends. The natural sciences are fast becoming a mere adjunct discipline of technology and the more willingly they submit to its demands, the more likely they are to flourish. 'Pure' science is in decline, because our concern now is no longer to understand the laws of nature, but rather to apply these laws and turn them to our advantage' (ibid., 100).

If, instead of technical development being subject—through money—to the laws of economics, it is now economics that is subject to an ever greater degree of technicity, then we are bound to ask who will author and shape its continued development. Jünger's answer to this question is rather vague. According to him, the bourgeois system of private property has degenerated into 'a façade for a system of anonymous participation' and 'it is behind this façade that the obfuscation of influence begins, that controls emerge that are themselves beyond the bounds of controllability' (ibid., 276). What he does not explain, however, is who is behind this unholy alliance of industrial, military and party-political interests that makes political decisions at the preparliamentary level, but without accepting any responsibility at all for their consequences. Marx was certainly aware of just how explosive any substitution of economic control mechanisms—which for him invariably meant money

begetting money—would be: 'If you strip [money] of this societal power, then you will have to give it to people instead—to people upon people' (1953). We know from experience what this can mean—both from the 'German experiment' under Hitler and from the Russian under Stalin. The technologies themselves do not give rise to motives and interests. It is always the people behind them who do this, albeit often unwittingly and unwillingly; after all, they are also the ones who ultimately make the decisions. Exposing these decisions and ensuring that they are made as consciously as possible is all the more important, the more invasive the technology to be implemented is—the possible (inadvertent) consequences of genetic engineering and nuclear technology being a case in point. 'Strictly speaking', or so the Spanish philosopher, José Ortega y Gasset once concluded, 'liberal democracy and technology are so inextricably intertwined and interdependent that the one would be inconceivable without the other, which is why we could do with a third, more general term to embrace them both' (*The Revolt of the Masses* 1956).

During the Weimar Republic, an age in which technology for the first time began to attract the attention of sociologists not merely as an instrument of will—the nature of that will remaining a moot point—but rather as an ordering principle *sui generis*, the development of which was proving increasingly, and above all destructively, consequential, the circumspect state was thought to be the only control mechanism capable of taking the place of the blind laws of economics. This, at least, was the view propagated by the Leipzig School—by sociologists such as Hans Freyer, Arnold Gehlen and Helmut Schelsky. Technology, argued Freyer, was a 'system with its own origins and its own developmental tendencies, but on a planetary scale', in other words a network—to use Latour's term—'capable of creating its own interrelationships and dependencies between people' (*Der Staat* [The State] 1925, 176 f.). The extraordinary dynamism unleashed by technology, a dynamism tantamount to an anthropological and social revolution, could be harnessed, Freyer claimed, only by a conscious actor, meaning the state. Technology for the state was not just a means of satisfying needs, but also a political 'instrument of power'. It is interesting to note that now, 80 years later, a very similar view has recently been heard from a most unexpected quarter. In his

latest book, *State-Building* (2004), Francis Fukuyama emphasizes the necessity and importance of strong, functional state institutions. Just over a decade earlier, he had proclaimed 'The End of History' (1992) on the grounds that the market economy and liberal democracy represented the highest stage and hence the closing chapter of human history. Freyer also talked of the end of history, albeit rather more cautiously, preferring to call it the 'perfectability of history' (*Theorie des gegenwärtigen Zeitalters* [Cultural Theory at the Threshold of the Modern Age] 1955). So as we can see, history repeats itself. But let us return to Friedrich Georg Jünger.

Jünger takes a somewhat different view from that of Freyer and his contemporary equivalent is not Fukuyama, but Jean-Marie Guéhenno (*The End of Democracy* 1994). The more technologically advanced a state becomes, Guéhenno argues, the greater its capacity for exerting control and hence the more powerful it becomes. This, however, cannot prevent the state itself from being remodeled in the interests of the 'technical collective': 'For with every act of technization, the more the causal mechanisms of technology infiltrate the state, meaning that every increase in technology brings with it, of necessity, an increase in mechanical determinism that changes the very nature of the state itself, unleashing within it the very automatism to which all engineering ultimately aspires (…)' (Guéhenno 1994, 111). Using a related diction in keeping with our times, this could be paraphrased as follows: 'State laws have become merely prescriptive, the law itself mere method and the nation state judicial space. The degeneration of the law into nothing more than the procedure by which people's activities are subdivided according to purely functional criteria undermines the autonomy of state policy. Questioning its legitimacy is almost as absurd as reflecting on the 'legitimacy' or 'illegitimacy' of a computer program. The gentle humming of the social machinery is an end in itself' (ibid., 12, 87). In a world full of rituals, procedural rules and algorithms, machines assume the same significance as that once invested in priests in a world full of gods.

For Martin Heidegger (*Die Technik und die Kehre* [The Question Concerning Technology] 1962), the hegemony of modern technology can be attributed to an ancient, but quintessentially technical worldview—namely to that of metaphysics. Its origins are to be found in

Plato's interpretation of being as an idea, its justification in Kant's transcendental deduction of the various categories of knowledge as conditions of the possibility of reality and, finally, its apotheosis in the metaphysics of Nietzsche's will to power. Technology, for Heidegger, is not just the most recent offshoot and culmination of Western metaphysics, but is actually the very essence of the same. When Heidegger talks of metaphysics, his theme is invariably its technical—meaning its denotative, arithmetical and predictable—character. Heidegger's question, then, concerns technology not as mechanization, but rather as a way of unmasking, of producing truth. It follows, at least for Heidegger, that scientific method has its roots in technology and not *vice versa*. The conditions of the possibility of technical fabrication are at the same time the conditions of the possibility of reality.

For Arnold Gehlen, too, 'the development of technology *viewed in its entirety* points to an inscrutable and unconscious, but consistently pursued logic that can only be described using terms such as the progressive *objectivization* of human labor and performance and the progressive *disburdening* of man'—a process which in historical terms culminates in the automaton, a machine that renders man's intellectual capacity technically superfluous. What fascinates us about automatism, says Gehlen, is the prerational, hyperpractical drive of a technology which for thousands of years manifested itself in magic and in the transcendental before achieving perfection in the form of the machine (*Die Seele im technischen Zeitalter* [The Soul in the Age of Technology] 1957, 15, 19). Helmut Schelsky (1961) builds on this by describing modern technology as 'not so much pure technology as a kind of *science of technology*'. Modern technology's salient characteristic, namely analysis and synthesis, is the human spirit itself, he argues. As the real philosopher of modern technology, Kant encapsulates the decisive truth of the modern in his formula: *We know because we fabricate*, to which Schelsky adds: 'We produce scientific civilization not just as technology, but—of necessity—and to a much greater extent, as society and as soul. What this means is that that intermediate phase in which our outward mastery of nature, as expressed in technology and in the organized quality of *civilization*, could be told apart from the inward-looking enhancement of intellectual creativity as expressed in *culture*, cannot be sustained. As

a social and spiritual being, man has become a techno-scientific operation of production, which also explains why the so-called humanities are being infiltrated and even displaced by the social sciences and psychology to such an extent that they are becoming functional sciences, which ultimately means production sciences' (*Der Mensch in der wissenschaftlichen Zivilisation* [Man in Scientific Civilization] 1961, 16 f.). That is more or less the situation in which we are at present.

Man's interaction with his environment—the word 'environment' here being used to mean an amalgam of both the natural world and society—is being disrupted by technology. And because technology can affect the environment's physical make-up and change its material properties, decisions whose purpose is to initiate concrete action should always be made at the level of substance and quality. This can and indeed should be done through social discourse, through the exchange of arguments on substance. Until now, however, such decisions have generally been left to the autopoiesis of the market, where what gets done is whatever promises maximum profits. As I have already said, Friedrich Georg Jünger was among the first to lament this state of affairs and was at the same time highly critical of his fellow social philosophers for ceding their decision-making powers in this field to the state. But if neither the market nor the state has the competence required to make the relevant decisions, who or what should take their place as our decision-making authority? Answering this question implies what Beck (1993) would call a fundamental 'redefinition of the political'.

The basic problem of (post)modern democracy is above all else a procedural one. Niklas Luhmann drew our attention to this as far back as 1969, when he suggested that we need now, more than ever before, a rationally and intuitively accepted procedural consensus so well founded that any political decisions made on its basis would be respected even if only on account of their provenance ('procedural legitimation'). This is especially true of the postmodern, polycentric social structures that Luhmann had in mind. In such a society, there are no longer any neutral actors whose very neutrality is enough to lend credibility to their definition of the optimum for society as a whole. Optimization strategies, it seems, are conceivable only as a bundling of those specific interests that are included in the social negotiating process. In principle, the issue today is how to

strike an institutional balance between plebiscitary elements, the competence and sovereignty of experts and parliamentary democracy. The participatory decision-making procedures to be institutionalized must reflect the will of the citizenry, while at the same time constituting a clear and efficient solution of the problems to be solved. What we need is the will to prioritize such policies as are anchored in the population at large —in other words to channel into a democratic framework that which in any case happens, albeit obscurely and as a result of the impenetrable interaction of the most diverse interests. To be able to achieve this, however, we will first have to implement such institutions and procedures as will enable and facilitate democratic participation.

In a 'society without a centre and without leadership' (Luhmann 1981), there can no longer be any privileged place from which society as a whole can be criticized—and with binding effect too. All criticism is bound to find itself confronted with the dilemma that conflicts these days can no longer be understood in black and white terms. The standards and topoi of criticism are having to be constantly redefined. Criticism in a functionally differentiated society, or so it seems, is conceivable only as what Japp (1991) calls 'notorious communication by contradiction'—as criticism that is constantly reinventing and reorganizing itself in the most diverse places. If, therefore, we were to summarize this situation in terms of a paradox, then we could say that if the cement holding society together is its plurality, then criticism, as already said, can subsist only as 'notorious communication by contradiction' and without any sure ground to move on. After all, for every interest—self-imposed restraint in the field of genetic engineering, for example—there is bound to be an equally justifiable counter-interest. And because our postmodern self-image does not allow for any privileged place from which we could critically reflect on society as a whole—a position which, owing to the impossibility of a single, binding standard, would have to exist outside that society—, criticism these days is possible only from within, which in turn means that it is bound to be both local and temporary in nature.

Schelsky once said that as a social and spiritual being, modern man had himself become an object of production, an operation of a techno-scientific nature. Freyer, meanwhile, viewed technology as a system capable of creating its own unique interrelationships and dependencies between the people who constitute the world community. When now, more than half a century later, Callon and Latour accord non-humans the same actor status as is normally reserved for humans, one cannot help but be reminded of the Leipzig School's early theories. What the natural sciences once dichotomized as 'nature', 'technology' and 'society', they argue, is in fact a complex of interrelationships. According to Latour, for example, nature, technology and society are inseparable, being both the co-evolutionary result of *and*, at the same time, actors in the process by which an all encompassing network takes shape. Today's social relations could be neither created nor maintained without technical artifacts. 'The human', he continues, 'cannot be apprehended (at all) (…) without restoring to it the other half of itself, meaning things' (*Wir sind nie modern gewesen* [We were never modern] 2002, 82 f.). The life of society would be inconceivable without the participation of non-humans, of machines and artifacts. Without these, says Latour, we would live like baboons. After all, it is these very artifacts that stabilize human coexistence and it is because of them that the relationship between science, politics and society is changing.

The once clear-cut distinction between scientific laboratories in which theories and phenomena are examined by means of experimentation on the one hand and on the other, a political situation outside the lab in which lay people grapple with values, opinions and passions, is becoming increasingly blurred: 'These days, we are all involved in collective experiments in which both humans and non-humans are jumbled together (…). We are now experiencing the end of science as a self-contained and autonomous system' (Latour 2001a). Whereas such a science 'claimed that absolute knowledge could cool political and personal passions', these days, it does nothing more than to serve up the 'same old boring facts'. The latest 'science war', which the Sokal affair may not have triggered, but certainly helped escalate, can be viewed as the final death throes of this 'old' science. What we are now witnessing is the transition from science to research, from object to project, from the implementation of acquired knowledge to experimentation. Experiments these days are performed in real time and on a scale of 1:1. We are all involved in and affected by them. The concept of the expert should therefore be replaced by that of the co-researcher, for 'as consumers,

activists or citizens, we are all co-researchers'. To be able to take account of this development in human coexistence at the political level, we first need new forms of democratic representation. The list of actors who influence science needs to be extended and can no longer be confined to specialists. So far, so good. But Latour takes his demands one step further, arguing that because in future years, both human and non-human beings will be even more intimately involved with each other than they are now, the latter must also be granted a say in what he calls a 'parliament of things' (2001b). A democracy that is not only 'representative', but 'technical' as well must grant both humans and non-humans alike both a seat and a vote, says Latour. In his eyes, the fact that postmodern society consists not only of human, but also of non-human beings is leading to a situation in which 'our morals, a large part of our abilities and more and more of our rules and regulations are now being delegated to things' and 'anyone who wants to understand humans must be willing to take an interest in huge numbers of non-human delegates as well'. These are also actors in society, says Latour, and play a 'much larger role in the fine socialization of humanity (…) than we think' (Latour 1995, also 2001b).

What we are looking for, in other words, are contemporary forms of democratic representation, for institutions and procedures committed to involving the citizenry in the process of shaping society's future. Contrary to what both Freyer and Fukuyama have argued, it is no longer the state, or at least not the state alone, that is set to take the place of market forces. That public space in which democratic exchange and debate are to take place is described by Gibbons et al. as the *agora*—a term borrowed from the Greek *polis*. It is here that those actors involved in the solving of a given problem encounter those affected by it—and on an equal footing too (*The New Production of Knowledge* 1994; *Re-Thinking Science* 2002). Such 'hybrid fora' will make use of such techniques as 'consensus conferences', 'focus groups' and 'citizens' juries'. Yet no matter which form the *agora* is given, it is vital that a procedure for making decisions within the *agora* be defined. To do this, one can indeed draw on such tried and tested tools of microsociology and group dynamics as the planning cell (Dienel 1992), the future workshop (Jungk & Müllert 1983), open-space scenarios (Maleh 2000) or mediation (Breidenbach 1995).

When one reviews the 20th century debate of the relationship between science, technology and society, one cannot help but notice that the greatest changes with regard to the *formative aspect* of technology have in turn led to changes with regard to the question of who the subject of the future technological development of society will be—from market forces to the state to contemporary forms of participatory democracy and now, most recently, to the *agora* or 'parliament of things'.

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