3

From Industrial Society to Risk Society:
Questions of Survival, Social Structure and Ecological Enlightenment

Are Risks Timeless?

Aren't risks at least as old as industrial society, possibly even as old as the human race itself? Isn't all life subject to the risk of death? Aren't and weren't all societies in all epochs 'risk societies'?

On the contrary, should we not (or must we not) be discussing the fact that since the beginning of industrialization, threats – famines, epidemics or natural catastrophes – have been continually reduced? To list only a few key advances: the reduction of infant mortality, the 'bonus years' (Imhof), the achievements of the welfare state, the enormous progress in technological perfection over the past hundred years. Isn't the Federal Republic of Germany, in particular, an Eldorado of bureaucratically organized care and caution?

At a conference on risk at Cardiff University in February 1996, the British sociologist Hilary Rose suggested that 'risk society' has a German taste, a flavour of wealth and security. Perhaps only a few countries, and certainly not Britain, can *afford* to be risk societies? A few weeks later, the 'BSE crisis', a textbook example of risk society, began. Even today, in 1999, this crisis is far from played out. No one knows how many other countries may be affected by the disease, or what its long-term consequences may be. Thus BSE highlights the growing importance of 'aware unawareness' in risk production and

risk definition because the precise mode of its transmission across species is a mystery and it may have a long gestation period (Adam, 1998: 163–92). Meanwhile, its purely economic impact has been considerable. The latest estimate from the BSE inquiry in 1998 puts its costs, in the UK alone, at £3 billion, measured in terms of compensation paid to farmers and the costs of destroying infected cattle and disposing of their remains. The BSE crisis also provides ample evidence of how risks and their contested social definitions cut across borders – of states and of scientific disciplines. If, for example, you had gone into the mountains of southern Bavaria in the summer of 1996 and visited a lonely *Wirtshaus* (small local restaurant), your menu would probably have borne a photograph showing the local farmer, arm in arm with his smiling family and surrounded by family cattle, as a means of building personal trust to counter the omnipresence of the BSE risk. The implicit message: 'Please trust me. You can enjoy this family steak safely here. Forget about that risky British BSE beef!' However, the BSE crisis cannot be 'kept on one side' politically either and has flooded into key areas of politics – health politics, agricultural politics, foreign politics, trade politics, European politics – illustrating again the specific 'and'-characteristic of risk conflicts.

Still, it may be objected, certainly there are 'new risks', such as nuclear power, chemical and biotechnical production, but, considered mathematically or physically, aren't these dangers not of great scope, but also of exceedingly small, actually negligible, probability? Looking at them coolly and rationally, does that not imply that they should be given a lesser status than long-accepted risks, such as the incredible carnage on the highways or the risks to smokers?

Certainly, ultimate security is denied to us human beings. But is it not also true that the unavoidable 'residual risks' are the downside of the opportunities – for prosperity, relatively high social security and general comfort – that developed industrial society offers to the majority of its members in a historically unparalleled manner? Isn't risk primarily an 'energizing principle' (Giddens) for the active exploration of new worlds and markets? Is the mostly negative dramatization of such risks not in the end a typical media spectacle, ignoring established expert opinion, a 'new German anxiety', or a millennium fever, as untenable and just as short-lived as the débâcle regarding the 'railroad sickness' from the end of the previous century?

And finally, aren't risks a central concern of the engineering and physical sciences? What business has the sociologist here? Isn't that once again typical?

The Calculus of Risk: Predictable Security in the Face of an Open Future

Human dramas – plagues, famines and natural disasters, the looming power of gods and demons – may or may not quantifiably equal the destructive potential of modern mega-technologies in hazardousness. They differ essentially from 'risks' in my sense since they are not based on decisions, or, more specifically, decisions that focus on techno-economic advantages and opportunities and accept hazards as simply the dark side of progress. This is my first point: risks presume industrial, that is, techno-economic, decisions and considerations of utility. They differ from 'war damage' by their 'normal birth', or, more precisely, their 'peaceful origin' in the centres of rationality and prosperity with the blessings of the guarantors of law and order. They differ from pre-industrial natural disasters by their origin in decision-making, which is of course conducted never by individuals but by entire organizations and political groups.[1]

The consequence is fundamental: pre-industrial hazards, no matter how large and devastating, were 'strokes of fate' raining down on humankind from 'outside' and attributable to an 'other' – gods, demons or Nature. Here too there were countless accusations, but they were directed against the gods or God, 'religiously motivated', to put it simply, and not – like industrial risks – politically charged. For with the origin of industrial risks in decision-making the problem of social accountability and responsibility irrevocably arises, even in those areas where the prevailing rules of science and law permit accountability only in exceptional cases. People, firms, state agencies and politicians are responsible for industrial risks. As we sociologists say, the social roots of risks block the 'externalizability' of the problem of accountability.[2]

Therefore, it is not the number of dead and wounded, but rather a social feature, their industrial self-generation, which makes the hazards of mega-technology a political issue. The question remains, however: must one not view and assess the past two hundred years as a period of continual growth in calculability and precautions in dealing with industrially produced insecurities and destruction? In fact, a very promising approach, and one barely explored to date, is to trace the (political) institutional history of evolving industrial society as the conflict-laden emergence of a system of rules for dealing with industrially produced risks and insecurities (see Ewald, 1986, 1991; Böhret, 1987; Evers and Nowotny, 1987; Lau, 1989; Schwarz and Thompson, 1990; Hildebrandt et al., 1994; Yearley, 1994; Bonß, 1995; Lash et al., 1996; Wynne, 1996a, 1996b).

The idea of reacting to the uncertainties that lie in opening and conquering new markets or in developing and implementing new technologies with collective agreements – insurance contracts, for instance, which burden the individual with general fees just as much as they relieve him or her from dramatic damage cases – is hardly a new social invention. Its origins go back to the beginnings of intercontinental navigation, but with the growth of industrial capitalism, insurance was continually perfected and expanded into nearly all problem areas of social action. Consequences that at first affect only the individual become 'risks', systematically caused, statistically describable and in that sense 'predictable' types of events, which can therefore also be subjected to supra-individual and political rules of recognition, compensation and avoidance.

The calculus of risks connects the physical, the engineering and the social sciences. It can be applied to completely disparate phenomena not only in health management – from the risks of smoking to those of nuclear power – but also to economic risks, risks of old age, of unemployment and underemployment, of traffic accidents, of certain phases of life, and so forth. In addition, it permits a type of 'technological moralization' which no longer need employ moral and ethical imperatives directly. To give an example, the place of the 'categorical imperative' is taken by the mortality rates under certain conditions of air pollution. In this sense, one could say that the calculus of risk exemplifies a type of ethics without morality, the mathematical ethics of the technological age. The triumph of the calculus of risks would probably not have been possible if fundamental advantages were not tied to it.

The first of these lies in the fact that risks open the opportunity to document statistically consequences that were at first always personalized and shifted onto individuals. In this way risk de-individualizes. Risks are revealed as systematic events, which are accordingly in need of a general political regulation. Through the statistical description of risks (say in the form of accident probabilities) the blinkers of individualization drop off – and this is not yet sufficiently the case with environmental diseases such as pseudo-croup, asthma or even cancer. A field for corresponding political action is opened up: accidents on the job, for instance, are not blamed on those whose health they have already ruined anyway, but are stripped of their individual origin and related instead to the plant organization, the lack of precautions, and so on.

A second advantage is closely connected to the first: insurance payments are agreed on and guaranteed on a no-fault basis (setting aside the extreme cases of gross negligence or intentional damage). In

that way, legal battles over causation become unnecessary and moral outrage is moderated. Instead, an incentive for prevention is created for businesses, in proportion to the magnitude of the insurance costs – or perhaps not.

The decisive thing, however, is ultimately that in this manner the industrial system is made capable of dealing with its own unforeseeable future. The calculus of risks, protection by insurance liability laws, and the like, promise the impossible: future events that have not yet occurred become the object of current action – prevention, compensation or precautionary after-care. As the French sociologist François Ewald (1986) shows in detailed studies, the 'invention' of the calculus of risks lies in making the incalculable calculable, with the help of accident statistics, through generalizable settlement formulae as well as through the generalized exchange principle of 'money for damages'. In this way, a norm system of rules for social accountability, compensation and precautions, always very controversial in its details, creates present security in the face of an open uncertain future. Modernity, which brings uncertainty to every niche of existence, finds its counter-principle in a *social compact against industrially produced hazards and damages*, stitched together out of public and private insurance agreements; and, thus, activating and renewing *trust* in corporations and government.

Politically and programmatically, this pact for the containment and 'just' distribution of the consequences of the standard industrial revolution is an early *Third Way* because it is situated somewhere between socialism and liberalism. On the one side it is based on the systematic creation of consequences and hazards, but at the same time it involves public and private insurance (welfare state) *and* active individuals in preventing and compensating for them. The consensus that can be achieved with it always remains unstable, conflict-laden and in need of revision. For that very reason, however, it represents the core, the inner 'social logic' of the consensus on progress, which – in principle – legitimated techno-economic development in the first industrial modernity. Where this 'security pact' is violated wholesale, flagrantly and systematically, the consensus on progress itself is consequently at stake.

Risk and Threat: On the Overlapping of Normal and Exceptional Conditions

My decisive idea, and the one that leads us further, is that this is precisely what has happened in a series of technological challenges

with which we are concerned today – nuclear power, many types of chemical and bio-technological production as well as the continuing and threatening ecological destruction. The foundations of the established risk logic are being subverted or suspended.[3]

Put another way, since the middle of the twentieth century the social institutions of industrial society have been confronted with the historically unprecedented possibility of the destruction through decision-making of all life on this planet. This distinguishes our epoch not only from the early phase of the industrial revolution, but also from all other cultures and social forms, no matter how diverse and contradictory these may have been in detail. If a fire breaks out, the fire brigade comes; if a traffic accident occurs, the insurance pays. This interplay between beforehand and afterwards, between the future and security in the here and now, because precautions have been taken even for the worst imaginable case, has been revoked in the age of nuclear, chemical and genetic technology. In all the brilliance of their perfection, nuclear power plants have suspended the principle of insurance not only in the economic, but also in the medical, psychological, cultural and religious sense. *The residual risk society has become an uninsured society*, with protection paradoxically diminishing as the danger grows. Turned around politically, this implies, as demonstrated by the 'nuclear exit-politics' of Germany's current Red–Green government, that raising the insurance level of nuclear power plants is a 'safe' ticket out of the atomic age.

Ultimately, there is no institution, neither concrete nor probably even conceivable, that would be prepared for the 'WIA', the 'worst imaginable accident', and there is no social order that could guarantee its social and political constitution in this worst possible case.[4] There are many, however, which are specialized in the only remaining possibility: denying the dangers. For after-care, which guarantees security even against hazards, is replaced by the dogma of technological infallibility, which will be refuted by the next accident. The queen of error, science, becomes the guardian of this taboo. Only 'communist' reactors, but not those in West Germany, are empirical creations of the human hand which can toss all their theories onto the scrap-heap. Even the simple question 'What if it does happen after all?' ends up in the void of unpreparedness for after-care. Correspondingly, political stability in risk societies is the stability of not thinking about things.

Put more precisely, nuclear, chemical, genetic and ecological megahazards abolish the four pillars of the calculus of risks. First, one is concerned here with global, often irreparable, damage that can no

longer be limited; the concept of monetary compensation therefore fails. Second, precautionary after-care is excluded for the worst imaginable accident in the case of fatal hazards; the security concept of anticipatory monitoring of results fails. Third, the 'accident' loses its delimitations in time and space, and therefore its meaning. It becomes an event with a beginning and no end; an 'open-ended festival' of creeping, galloping and overlapping waves of destruction. But that implies: standards of normality, measuring procedures and therefore the basis for calculating the hazards are abolished; incomparable entities are compared and calculation turns into obfuscation.

The problem of the incalculability of consequences and damage becomes clear with particular vividness in the lack of accountability for them. The scientific and legal recognition and attribution of hazards takes place in our society according to the principle of causality, the polluter-pays principle. But what strikes engineers and lawyers as self-evident, even virtually demanded by ethics, has extremely dubious, paradoxical consequences in the realm of mega-hazards. One example: the legal proceedings against the lead crystal factory in the community of Altenstadt in the Upper Palatinate.[5]

Flecks of lead and arsenic the size of a penny had fallen on the town, and fluoride vapours had turned leaves brown, etched windows and caused bricks to crumble away. Residents were suffering from skin rashes, nausea and headaches. There was no question where all of that originated. The white dust was pouring visibly from the smokestacks of the factory. A clear case. A clear case? On the tenth day of the trial the presiding judge offered to drop charges in return for a fine of DM 10,000, a result which is typical of environmental crimes in the Federal Republic (1996: 21,000 investigations, forty-nine convictions with prison terms, thirty-one of those suspended, the rest dropped).

How is that possible? It is not only the lack of laws and not merely the legendary shortcomings in applying them which protect the criminals. The reasons lie deeper and cannot be eliminated by the staunch appeals to the police and the law-makers that issue ever more loudly from the ranks of the environmentalists. A conviction is blocked by the very thing that was supposed to achieve it: the strict application of the (individually interpreted) polluter-pays principle.

In the case of the lead crystal factory, the commission of the crime could not be and was not denied by anyone. A mitigating factor came into play for the culprits: there were three other glass factories in the vicinity which emitted the same pollutants. Notice: the more pollution is committed, the less is committed.

More precisely: the more liberally the acceptable levels are set, the greater the number of smokestacks and discharge pipes through which pollutants and toxins are emitted, the lower the 'residual probability' that a culprit can be made responsible for the general sniffling and coughing, that is to say, the less pollution is produced. Whereas at the same time – one does not exclude the other – the general level of contamination and pollution is increasing. Welcome to the real-life travesty of the hazard technocracy![6]

This example illustrates three points: first, the importance of meta-norms of risk definitions, here the legal norms of how to attribute causes and consequences to actors under conditions of high complexity and contingency. If it is necessary to name one and only one actor, in the overwhelming majority of cases *no* actor can be named.

This is even more true because, second, a significant number of technologically induced hazards, such as those associated with chemical pollution, atomic radiation and genetically modified organisms, are characterized by an inaccessibility to the human senses. They operate outside the capacity of (unaided) human perception. Everyday life is 'blind' in relation to hazards which threaten life and thus depends in its inner decisions on experts and counter-experts. Not only the potential harm but this '*expropriation of the senses*' by global risks makes life insecure.

Third, there is a significant interrelationship between *ignoring* a risk which cannot be attributed according to the meta-norms of risk definition in law and science and *enforcing* risk production as a consequence of industrial action and production.

This organized irresponsibility is based fundamentally on a confusion of centuries. The hazards to which we are exposed date from a different century than the promises of security which attempt to subdue them. Herein lies the foundation for both phenomena: the periodic outbreak of the contradictions of highly organized security bureaucracies and the possibility of normalizing these 'hazard shocks' over and over again. At the threshold of the twenty-first century, the challenges of the age of atomic, genetic and chemical technology are being handled with concepts and recipes that are derived from early industrial society of the nineteenth and the early twentieth centuries.[7]

Is there an operational criterion for distinguishing between risks and threats? The economy itself reveals the boundary line of what is tolerable with economic precision, through the refusal of private insurance. Where the logic of private insurance disengages, where the economic risks of insurance appear too large or too unpredictable to insurance concerns, the boundary that separates 'predictable' risks

from uncontrollable threats has obviously been breached again and again in large and small ways.

Two types of consequences are connected in principle to this overstepping of the bounds. First, the *social* pillars of the calculus of risks fail; security degenerates into mere technical safety. The secret of the calculus of risks, however, is that technical *and* social components work together: limitation, accountability, compensation, precautionary after-care. These are now running in neutral, and social and political security can be created solely by means of a contradictory maximizing of technical superlatives.

Second, a central part of this political dynamic is the social contradiction between highly developed safety bureaucracies, on the one hand, and the open legalization of previously unseen, gigantic threats, on the other, without any possibility of after-care. A society which is oriented from top to toe towards security and health is confronted with the shock of their diametrical opposites, destruction and threats which scorn any precautions against them.

Two contrary lines of historical development are converging in late twentieth-century Europe: a level of security founded on the perfection of techno-bureaucratic norms and controls, and the spread and challenge of historically new hazards which slip through all the meshes of law, technology and politics. This contradiction, which is not of a technical, but of a social and political character, remains hidden in the 'confusion of centuries' (Günther Anders). And this will continue so long as the old industrial patterns of rationality and control last. It will break up to the extent that improbable events become probable. 'Normal accidents' is the name Charles Perrow (1984) gives in his book to this predictability with which what was considered impossible occurs – and the more emphatically it is denied, the sooner, more destructively and shockingly it occurs. In the chain of publicly revealed catastrophes, near-catastrophes, whitewashed security faults and scandals the technically centred claim to the control of governmental and industrial authority shatters – quite independently of the established measure of hazards: the number of dead, the danger of the contaminations, and so on.

The central social-historical and political potential of ecological, nuclear, chemical and genetic hazards lies in the collapse of administration, in the collapse of techno-scientific and legal rationality and of institutional political security guarantees which those hazards conjure up for everyone. That potential lies in the unmasking of the concretely existing anarchy which has grown out of the denial of the social production and administration of mega-hazards.[8]

Hazards of the nuclear and chemical age, therefore, have a social as well as a physical explosiveness. As the hazards appear, the institutions which are responsible for them, and then again not responsible, are pressed into competition with the security claims they are compelled to issue, a competition from which they can only emerge as losers. On the one hand, they come under permanent pressure to make even the safest things safer; on the other hand, this overtaxes expectations and sharpens attention, so that in the end not only accidents, but even the suspicion of them, can cause the façades of security claims to collapse. The other side of the recognition of hazards is the failure of the institutions that derive their justification from the non-existence of hazard. That is why the 'social birth' of a hazard is an event which is equally improbable and dramatic, traumatic and unsettling to the entire society.

Precisely because of their explosiveness in social and political space, hazards remain distorted objects, ambiguous, interpretable, resembling modern mythological creatures, which now appear to be an earthworm, now again a dragon, depending on perspective and the state of interests. The ambiguity of risks also has its basis in the revolutions which their official unambiguity had to provoke. The institutions of developed industrial society – politics, law, engineering sciences, industrial concerns – accordingly command a broad arsenal for 'normalizing' non-calculable hazards. They can be underestimated, compared out of existence or made anonymous causally and legally. These instruments of a symbolic politics of detoxification enjoy correspondingly great significance and popularity (this is shown by Fischer, 1989).

Ministers of the environment, no matter what their party affiliation, are not to be envied. Hampered by the scope of their ministry and its financial endowment, they must keep the causes largely constant and counter the cycle of destruction in a primarily symbolic fashion. A 'good' minister of the environment ultimately is the one who stages activities in a publicity-grabbing way, piling up laws, creating bureaucratic jurisdictions, centralizing information. He or she may even dive into the Rhine with a daredevil smile or try a spoonful of contaminated whey powder, provided the media eyes of a frightened public are trained upon him/her. Dogged adherence to a line must be sold with the same TV smile and 'good arguments' as a 180-degree shift in direction.

But gradually, one accident at a time, the logic of the institutionalized non-management of problems can turn into its opposite: what does probability-based safety – and thus the entire scientific diagnosis – mean for the evaluation of the worst imaginable accident, whose

occurrence would leave the experts' theories intact but destroy their lives?

Sooner or later the question will arise as to the value of a legal system that regulates and pursues every detail of the technically manageable minor risks, but legalizes the mega-hazards by virtue of its authority, to the extent they cannot be minimized technically, and burdens everyone with them, including those who resist.

How can a democratic political authority be maintained which must counter the escalating consciousness of hazards with energetic safety claims, but in that very process puts itself constantly on the defensive and risks its entire credibility with every accident or sign of an accident?

The Role of Technology and the Natural Sciences in Risk Society

There is a public dispute over a new ethics of research in order to avoid incalculable and inhuman results. To limit oneself to that debate is to misunderstand the degree and type of involvement of the engineering sciences in the production of hazards. An ethical renewal of the sciences, even if it were not to become entangled in the thicket of ethical viewpoints, would be like a bicycle brake on an intercontinental jet, considering the autonomization of technological development and its interconnections with economic interests. Moreover, we are concerned not merely with the ethics of research, but also with its logic and with the unity of culprits and judges (experts) of the engineering sciences in the technocracy of hazards.

An initial insight is central: in matters of hazards, no one is an expert – particularly not the experts. Predictions of risk contain a double fuzziness. First, they presume cultural acceptance and cannot produce it. There is no scientific bridge between destruction and protest or between destruction and acceptance. Acceptable risks are ultimately accepted risks. Second, new knowledge can turn normality into hazards overnight. Nuclear energy and the hole in the ozone layer are prominent examples. Therefore: the advancement of science refutes its original claims of safety. *It is the successes of science which sow the doubts as to its risk predictions.*

But conversely, it is also true that acute danger passes the monopoly of interpretation to those who caused it, of all people. In the shock of the catastrophe, people speak of rem, Becquerels or ethylene glycol as if they know what such words mean, and they must do so in

order to find their way in the most everyday matters. This contradiction must be exposed. On the one hand, the engineering sciences involuntarily enact their own self-refutation in their contradictory risk diagnoses. On the other, they continue to administer the privilege handed down to them from the Kaiser's day, the right to determine according to their own internal standards the global social question of the most intensely political nature: how safe is safe enough?

The power of the hard sciences here rests on a simple social construct. They are granted the binding authority – binding for law and politics – to decide on the basis of their own standards what the 'state of technology' demands. But since this general clause is the legal standard for safety, private organizations and committees (for instance, the Society of German Engineers, the Institute for Standards) decide in Germany the amount of hazards to which everyone can be subjected (see Wolf, 1987). This is a situation that the Schröder government is going to change.

If one asks, for instance, what level of exposure to artificially produced radioactivity must be tolerated by the populace, that is, where the threshold of tolerance separating normality from hazardousness is situated, then the Atomic Energy Act gives the general answer that the necessary precautions are to correspond to 'the state of technology' (Sec. 7 II No. 3). This phrase is fleshed out in the 'Guidelines' of the Reactor Safety Commission – an 'advisory council' of the Ministry of the Environment in which representatives of engineering companies hold sway. When the Green Minister of the Environment, Jürgen Trittin, came to office in 1998, the first thing he did was to dismiss this commission, thus removing from the nuclear industry one of its major instruments of (no-)risk power definition.

In air pollution policy, noise protection and water policy one always finds the same pattern: laws prescribe the general programme. But anyone who wishes to know how large a continuing ration of standardized pollution citizens are expected to tolerate needs to consult the 'Ordinance on Large Combustion Facilities' or the 'Technical Instructions: Air Quality' and similar works for the (literally) 'irritating' details.

Even the classical instruments of political direction – statutes and administrative regulations – are empty in their central statements. They juggle with the 'state of technology', thus undercutting their own competence, and in its place they elevate 'scientific and technical expertise' to the throne of the civilization of threat.

This *monopoly of scientists and engineers in the diagnosis of hazards*, however, is simultaneously being called into question by the

'reality crisis' of the natural and engineering sciences in their dealings with the hazards they produce. It has not been true only since Chernobyl, but there it first became palpable to a broad public: safety and probable safety, seemingly so close, are worlds apart. The engineering sciences always have only probable safety at their command. Thus, even if two or three nuclear reactors blow up tomorrow, their statements remain true.

Wolf Häfele, the dean of the German reactor industry, wrote in 1974:

> It is precisely the interplay between theory and experiment or trial and error which is no longer possible for reactor technology. . . . Reactor engineers take account of this dilemma by dividing the problem of technical safety into sub-problems. But even the splitting of the problem can only serve to approximate ultimate safety. . . . The remaining 'residual risk' opens the door to the realm of the 'hypothetical'. . . . The interchange between theory and experiment, which leads to truth in the traditional sense, is no longer possible. . . . I believe it is this ultimate indecisiveness hidden in our plans which explains the particular sensitivities of public debates on the safety of nuclear reactors.
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> (*Häfele, 1974: 247*)

What one hears here is nothing less than the contradiction between experimental logic and atomic peril. Just as sociologists cannot force society into a test tube, engineers cannot let people's reactors blow up all around them in order to test their safety, unless they turn the world into a laboratory. Theories of nuclear reactor safety are testable only after they are built, not beforehand. The expedient of testing partial systems amplifies the contingencies of their interaction, and thus contains sources of error which cannot themselves be controlled experimentally.

If one compares this with the logic of research that was originally agreed upon, this amounts to its sheer reversal. We no longer find the progression, first laboratory then application. Instead, testing comes after application and production precedes research. The dilemma into which the mega-hazards have plunged scientific logic applies across the board; that is, for nuclear, chemical and genetic experiments *science hovers blindly above the boundary of threats*. Test-tube babies must first be produced, genetically engineered artificial creatures released and reactors built, in order that their properties and safety can be studied. The question of safety, then, must be answered affirmatively before it can even be raised. The authority of the engineers is undermined by this 'safety circle'.

Through the anticipation of application before it has been fully explored, science has itself abolished the boundary between laboratory and society (Kohn and Weyer, 1989; Beck, 1995). Concomitantly, the conditions of freedom of research have shifted. Freedom of research implies freedom of application. Today, anyone who demands or grants only freedom of research abolishes research. The power of technology is based in its command of practice. Engineers can directly apply things, where politics must first advise, convince, vote and then push them through against resistance. This makes technology capable of conducting a policy of the *fait accompli*, which not only puts politicians and the public under constant pressure to react, but also puts them at the mercy of the engineers' judgement for assessment and avoidance of disaster. This power grows with the velocity of the innovations, the lack of clarity regarding their consequences and hazards, and it grows even though the credibility of technological promises of safety is thereby undermined.

Where the monopoly of technology becomes a monopoly on concealed social change, it must be called into question and cancelled by the principle of division of powers – like the earlier 'legal transcendence of the sovereign'. Internally, this implies a redistribution of the burdens of proof and, externally, the liberation of doubt (see Beck, 1995: ch. 8). In all central social issues and committees relative to technological development, systematic alternatives, dissenting voices, dissenting experts and an interdisciplinary diversity would have to be combined. The exposure of scientific uncertainty is the liberation of politics, law and the public sphere from their expert patronization by technocracy. Thus the public acknowledgement of uncertainty opens the space for democratization.

The Ecological Conflict in Society

If risk society does not mean only a technical challenge, then the question arises: what political dynamics, what social structure, what conflict scenarios arise from the legalization and normalization of global and uncontrollable systematic threats? To reduce things to an admittedly crude formula: hunger is hierarchical. Even following the Second World War, not everyone went hungry. Nuclear contamination, however, is egalitarian and in that sense 'democratic'. Nitrates in the ground water do not stop at the general director's water tap (see Beck, 1992: ch. 1).[9]

All suffering, all misery, all violence inflicted by people on other people to this point recognized the category of the Other – workers,

Jews, blacks, asylum-seekers, dissidents, and so forth – and those apparently unaffected could retreat behind this category. *The 'end of the Other', the end of all our carefully cultivated opportunities for distancing ourselves, is what we have become able to experience with the advent of nuclear and chemical contamination.* Misery can be marginalized, but that is no longer true of hazards in the age of nuclear, chemical and genetic technology. It is there that the peculiar and novel political force of those threats lies. Their power is the power of threat, which eliminates all the protective zones and social differentiations within and between nation-states.

It may be true that in the storm tide of threat 'we're all in the same boat', as the cliché goes. But, as is so often the case, here too there are captains, passengers, helmsmen, engineers, and men and women overboard. In other words, there are countries, sectors and enterprises which *profit* from the production of risk, and others which find their economic existence threatened together with their physical well-being. If, for instance, the Adriatic or the North Sea dies or they are perceived socially as 'hazardous to health' – this difference is cancelled with respect to economic effects – then it is not just the North Sea or the Adriatic which die, along with the life those seas contain and make possible. The economic life in all the towns, sectors and coastal countries that live directly or indirectly from the commercialization of the sea is also extinguished. At the apex of the future, which reaches into the horizon of the present day, industrial civilization is transformed into a kind of 'world cup' of the global risk society. Destruction of nature and destruction of markets coincide here. It is not what one has or is able to do that determines one's social position and future, but rather where and from what one lives and to what extent others are permitted in a prearranged unaccountability to pollute one's possessions and abilities in the guise of 'environment'.

Even passionate denial, which can certainly count on full official support, has its limits. The revenge of the abstract expert dispute on hazards is its geographic concretion. One can dispute everything, operating the official whitewashing machinery in high gear. That does not prevent, but only accelerates, the destruction. In this way, 'toxin-absorbing regions' come into being, crossing national boundaries and old institutional lines of conflict, creating geographical positions whose 'fate' coincides with the industrial destruction of nature (see Beck, 1995: ch. 6).

The greenhouse effect, for example, will raise temperatures and sea levels around the world through the melting of the polar icecaps. The period of warming will submerge entire coastal regions, turn

farmland into desert, shift climatic zones in unpredictable ways and dramatically accelerate the extinction of species. *The poorest in the world will be hit the hardest.* They will be least able to adapt themselves to the changes in the environment. Those who find themselves deprived of the basis of their economic existence will flee the zone of misery. A veritable Exodus of eco-refugees and climatic asylum-seekers will flood across the wealthy North; crises in the Third and Fourth Worlds could escalate into wars. Even the climate of world politics will change at a faster pace than is imaginable today. So far, all these are just projections, but we must take them seriously. When they have become reality, it will already be too late to take action.

Many things would be easier here if those countries on the way to industrialization could be spared the mistakes of the highly industrialized countries. But the unchecked expansion of the industrial society is still considered the *via regia* that promises the mastery of many problems – not only those of poverty – so that the prevailing misery often displaces the abstract issues of environmental destruction.

'Threats to nature' are not only that; pointing them out also threatens property, capital, jobs, trade union power, the economic foundation of whole sectors and regions, and the structure of nation-states and global markets. So there are 'side-effects' to nature and 'side-effects of side-effects' within the basic institutions of first modernity.

Put another way: there is a major distinction between the conflict field of wealth production – '*goods*' – from which the nineteenth century derived the experience and premises of industrial and class society, and the conflict field of hazard production – '*bads*' – in the developed nuclear and chemical age, to which we are only just beginning to become sensitive in sociology. It probably lies in the fact that wealth production produced the antagonisms between capital and labour, while the systematic chemical, nuclear and genetic threats bring about polarizations between capital and capital – and thus also between labour and labour – cutting across the social order. If the social welfare state had to be forced through against the concerted resistance of the private investors, who were called on to pay in the form of wage and fringe-benefit costs, then *ecological threats split the business camp*. At first glance, it is impossible to discern where and how the boundary runs; or, more accurately, who receives the power, and from where, to cause the boundary to run in what way.

While it may still be possible to speak of the 'environment' on the level of an individual operation, this talk becomes simply fictitious on the level of the overall economy, because there a type of 'Russian

roulette' is being played behind the increasingly thin walls of the 'environment'. If it is suddenly revealed and publicized in the mass media that certain products contain certain 'toxins' (information policy and mass media coverage is of key importance considering the fact that hazards are generally imperceptible in everyday life), then entire markets may collapse and invested capital and effort are instantly devalued.

No matter how abstract the threats may be, their concretizations are ultimately just as irreversible and regionally identifiable. What is denied collects itself into geographical positions, into 'loser regions' which have to pay the tab for the damage and its 'unaccountability' with their economic existence. In this 'ecological expropriation', we are facing the historical novelty of a devaluation of capital and achievement, while relationships of ownership and sometimes even the characteristics of the goods remain constant. Sectors that had nothing or very little causally to do with the production of the threat – agriculture, the food industry, tourism, fisheries, but also retail trade and parts of the service industry – are also among those most affected.

Where the (world) economy splits into risk winners and risk losers – in a manner difficult to define – this polarization will also make its mark upon the structure of employment. First, new types of antagonisms that are specific to countries, sectors and enterprises arise between groups of employees and correspondingly within and between trade union interest organizations. Second, these are, so to speak, third-hand antagonisms, derived from those between factions of capital, which turn the 'fate of workers' into 'fate' in a further and fundamental dimension. Third, with the intensified consciousness of the corresponding lines of conflict, a sector-specific alliance of the old 'class opponents', labour and capital, may arise. The consequence may be a confrontation between this union–management bloc and other mixed factions over and above the divisions of class differences which have been narrowed under the pressure of 'ecological politicization'.[10]

One has to wonder what an ecological labour movement would really mean. The production and definition of hazards aims largely at the level of products, which escapes almost completely from the influence of the works councils and workers' groups and falls completely under the jurisdiction of management. And this is still at the intra-organizational level. Hazards are produced by business operations, to be sure, but they are defined and evaluated socially – in the mass media, in the experts' debate, in the jungle of interpretations and jurisdictions, in courts or with strategic-intellectual dodges,

in a milieu and in contexts, that is to say, to which the majority of workers are totally alien. We are dealing with 'scientific battles' waged over the heads of the workers, and fought out instead by intellectual strategies in intellectual milieux. The definition of hazards eludes the grasp of workers and even, as things stand, the approach of trade unions for the most part. Workers and unions are not even those primarily affected; that group consists of the enterprises and management. But as secondary targets they must count on losing their jobs if worst comes to worst.

Even a latent risk definition hits them in the centre of their pride in achievement, their promise of a usable commodity. Labour and labour power can no longer conceive of themselves only as the source of wealth, but must also be perceived socially as the motive force for threat and destruction. The labour society is not only running out of labour, the only thing which gives meaning and solidity to life, as Hannah Arendt puts it ironically, it is also losing even this residual meaning.

Somewhat crudely, one can say in conclusion: what is 'environment' for the polluting industry is the basis of economic existence for the affected loser regions and loser sectors. The consequence is: political systems in their architecture as nation-states, on the one hand, and large-scale ecological conflict positions, on the other, become mutually autonomous and create 'geopolitical' shifts which place the domestic and international structure of economic and military blocs under completely new stresses, but also offer new opportunities. *The phase of risk society politics which is beginning to make itself heard today in the arena of disarmament and detente in the East–West relationship can no longer be understood nationally, but only internationally, because the social mechanics of risk situations disregards the nation-state and its alliance systems.* In that sense, apparently iron-clad political, military and economic constellations are becoming mobile, and this forces or, better, permits, a new 'European global domestic policy' (Genscher).

Political Reflexivity: The Counterforce of Threat and the Opportunities for Influence by Social Movements

Risk conflict is certainly not the first conflict which modern societies have had to master, but it is one of the most fundamental. Class conflicts or revolutions change power relations and exchange elites, but they hold fast to the goals of techno-economic progress and

clash over mutually recognized civil rights. The double face of 'self-annihilating progress', however, produces conflicts that cast doubt on the social basis of rationality – science, law, democracy. In that way, society is placed under permanent pressure to negotiate foundations without a foundation. It experiences an institutional destabilization, in which all decisions – from local government policy on speed limits and 'parking lots' to the manufacturing details of industrial goods to the fundamental issues of energy supply, law and technological development – can suddenly be sucked into fundamental political conflicts.

While the façades remain intact, quasi-governmental power positions arise in the research laboratories, nuclear power plants, genetic factories, editorial offices, courts, and so on, in the milieu of hazards, dependent on definitions and publicity. Put another way: as the contradictions of the security- and safety-obligated state are stirred up, systems come to require action and become subject-dependent. The courageous Davids of this world get their chance, and so do social movements. The colossal interdependence of threat definitions – the collapse of markets, property rights, trade union power and political responsibility – brings about key positions and media of 'risk-definition' which cross the social and professional hierarchy.

One can use all one's powers of conviction to pile up arguments for the institutional non-existence of suicidal threats; one need not deny one iota of hope to the institutional hegemony; one can even draw on the distraction of the social movements and the limitations of their political effectiveness; and one must still recognize with equal realism that all this is countered by the opposing power of threat. It is constant and permanent, not tied to interpretations denying it, and even present in places demonstrators have long since abandoned. The probability of improbable accidents grows with time and the number of implemented mega-technologies. Every 'event' arouses memories of all the other ones, all over the world.

Different types of revolutions have been contrasted: coups d'état, the class struggle, civilian resistance, and so on. They all have in common the empowering and disempowering of social subjects. Revolution as an autonomized process, as a hidden, latent, permanent condition, in which conditions are involved against their own interests, while political structures or property and power relations remain unchanged – this is a possibility which so far, to my knowledge, has neither been taken into consideration nor thought through. But it is precisely this conceptual scheme into which the *social power of threat* fits (even if it is a social power only in relation to political movements

that activate it). It is the product of the deed, requiring no political authorization and no authentication. Once in existence, public awareness of it endangers all institutions – from business to science, from law to politics – which have produced and legitimated it.

Everyone asks: from where will the opposing forces come? It is probably not very promising to place large or small ads for the missing 'revolutionary subject' in hip papers of the subculture. It feels good, of course, to appeal to reason with all the strictness at one's command, and it can do no harm, precisely because a realistic view of experience has shown that it leaves few traces behind. One could also found another circle for the solution of global problems. Certainly, it is to be hoped that political parties will catch on.

If all this does not suffice to stimulate alternative political action, however, then there remains the knowledge of the activatable political reflexivity of the hazard potential.[11] Three Mile Island, Chernobyl, Hanau, Biblis, Wackersdorf, and so forth: the global experiment of nuclear energy (toxic chemistry, genetic engineering, virtual reality machines, and so on) has by now taken over the roles of its own critics, perhaps even more convincingly and effectively than the political counter-movements could ever have managed on their own. This becomes clear not only in the world-wide, unpaid negative advertising at peak news times and on the front pages of papers, but also in the fact that everyone between the Alpine chalets and the North Sea mud flats now understands and speaks the language of the nuclear critics. Under the dictates of necessity, people have passed a kind of crash course in the contradictions of hazard administration in risk society: on the arbitrariness of acceptable levels and calculation procedures or the unimaginability of the long-term consequences and the possibilities of making them anonymous through statistics. They have learned more information, more vividly and more clearly than even the most critical critique could have ever taught them or demanded of them.

The most enduring, convincing and effective critics of nuclear energy (or the genetic industry and so forth) are not the demonstrators outside the fences or the critical public (no matter how important and indispensable they may be). The most influential opponent of the threat industry is the threat industry itself.

To put it differently, the power of the new social movements is based not only on themselves, but also on the quality and scope of the contradictions in which the hazard-producing and -administering industries are involved in risk society. Those contradictions become public and scandalous through the needling activities of the social

movements. Thus, there is not only an autonomous process of the suppression of dangers, but there are also opposite tendencies to uncover this suppression, even though they are much less marked and always dependent on the civil courage of individuals and the vigilance of social movements. Catastrophes that touch the vital nerves of society in a context of highly developed bureaucratic safety and welfare arouse the sensationalist greed of the mass media, threaten markets, make sales prospects unpredictable, devalue capital and set streams of voters in motion. Thus the evening news ultimately exceeds even the fantasies of countercultural dissent; daily newspaper reading becomes an exercise in technology critique.

This oppositional power of the unintended revelation of hazards depends of course on overall social conditions, which have so far been fulfilled in only a few countries: parliamentary democracy, (relative) independence of the press, and advanced production of wealth in which the invisible threat of cancer is not overridden for the majority of the populace by acute undernourishment and famine.

In the cooperation from within and without over and above the boundary lines of the subsystems, there are also symptoms of strength, which have so far remained almost unnoticed. The socially most astonishing, most surprising and perhaps least understood phenomenon of the last twenty years, not only in Germany, is *individualization*, the unexpected renaissance of an 'enormous subjectivity' – inside and outside of the institutions (see Beck, 1992: part II; Beck and Beck-Gernsheim, 1995). In this sense it is not an exaggeration to say that *citizens' groups have taken the initiative thematically in this society*. It was they who put the themes of an endangered world on the social agenda, against the resistance of the established parties. Nowhere does this become so clear as in the spectre of the 'new unity' which is haunting Europe. The compulsion to perform ecological lip-service is universal. It unites the Christian Social Union with the Communists, and the chemical industry with its Green critics. All products, absolutely all products, are 'safe for the environment', to say the least. There are rumours that the chemical concerns plan to take out full-page ads announcing themselves as a registered conservation association.

Admittedly this is all just packaging, programmatic opportunism, and perhaps really intentional rethinking now and then. The actions and the points of origin of the facts are largely untouched by it. Yet it remains true: the themes of the future, which are now on everyone's lips, have not originated from the farsightedness of the rulers or from the struggle in parliament – and certainly not from the

cathedrals of power in business, science and the state. They have been put on the social agenda against the concentrated resistance of this institutionalized ignorance by the entangled, moralizing groups and splinter groups fighting each other over the true path, split and plagued by doubts. *Democratic subversion has won a quite improbable thematic victory*. And this in Germany, breaking with an authoritarian everyday culture which, historically, has enabled all official nonsense and insanity with its anticipatory obedience.

The Utopia of Ecological Democracy

Europe is called to a new social project and has already set off on it. After the implosion of the East–West conflict and the emergence of states without enemies (Beck, 1998b), the international themes of the risk civilization are moving into the resulting vacuum. One sign of this is the pressure for global ecological politics and transnational arrangements which technology, science and business produce. Another is the dawning of the large and small, the creeping and the galloping suicidal hazards everywhere in the world, and a final sign comes from the elevated standards of promised safety and rationality in developed welfare state capitalism.

These are the horrendous opportunities that offer themselves to a European global domestic policy, not only in the foundation and building of the 'European house', but also by the highly industrialized countries assuming a large portion of the costs for the necessary corrective measures. In the place where the dynamic of industrial development had its origin, in Europe, enlightenment on and against industrial society could also begin. This project of an ecological enlightenment would have to be designed and fought for both on the macro and micro levels. Even in everyday life, because the threats overturn well-worn routine everywhere and represent a spectacular challenge for civil courage – at jobs in industry; in the practices of doctors where people come with their fears and questions; in research which can block off or reveal; in the courts; in the monitoring of the administration; and, not least, in the editorial offices of the mass media, where the invisible can be made culturally discernible. There are many concrete concerns in the relationship of the 'European house' to its neighbours on this planet. Among them is the impossibility of appearing any longer with the self-confidence of the donating wealthy, but rather admitting our destructive industrial role and correcting it in thought and action.

The technological project, the technological dogmatism of industrialism, must not simply be extended to the ecological crisis, lest an ever more perfect technocracy result from the public dramatization of the dangers. *Industrial society has produced a 'truncated democracy', in which questions of the technological change of society remain beyond the reach of political-parliamentary decision-making.* As things stand, one can say 'no' to techno-economic progress, but that will not change its course in any way. It is a blank cheque to be honoured – beyond agreement or refusal. Even ethics, which everybody calls for, is, under these conditions, nothing but a bicycle brake on an intercontinental aeroplane. We are living in an age of technological fatalism, an 'industrial middle ages', that must be overcome by more democracy – the production of accountability, redistribution of the burdens of proof, division of powers between the producers and the evaluators of hazards, public disputes on technological alternatives.[12] This in turn requires different organizational forms for science and business, science and the public sphere, science and politics, technology and law, and so forth.

The ecological extension of democracy then means: playing off the concert of voices and powers, the development of the independence of politics, law, the public sphere and daily life against the dangerous and false security of a 'society conceived in the abstract'.

My suggestion contains two interlocking principles: first, carrying out a division of powers and, second, the creation of a public sphere. Only a strong, competent public debate, 'armed' with scientific arguments, is capable of separating the scientific wheat from the chaff and allowing the institutions for directing technology – politics and law – to reconquer the power of their own judgement.

The means: with regard to all issues that are central to society, dissenting voices, alternative experts, an interdisciplinary variety and, not least, alternatives to be developed systematically must always be combined. The public sphere in cooperation with a kind of 'public science' would act as a secondary body charged with the 'discursive checking' of scientific laboratory results in the crossfire of opinions. Their particular responsibility would comprise all issues that concern the broad outlines and dangers of scientific civilization and are chronically excluded in standard science. The public would have the role of an 'open upper chamber'. It would be charged to apply the standard 'How do we wish to live?' to scientific plans, results and hazards.

That presupposes that research will fundamentally take account of the public's questions and be addressed to them and not just multiply our common problems in an economic short-circuit with industry.

Perhaps it would be possible that through these two steps – an opening of science from within and the filtering out of its limitations in a public test of its practice – politics and science could successively hone their direction-finding and self-monitoring instruments – instruments that are now largely inactive.

The cultural blindness of daily life in the civilization of threat can ultimately not be removed; but culture 'sees' in symbols. The images in the news of skeletal trees or of dying seals have opened people's eyes. Making the threats publicly visible and arousing attention in detail, in one's own living space – these are cultural eyes through which the 'blind *citoyens*' can perhaps win back the autonomy of their own judgement.

To conclude with a question: what would happen if radioactivity itched? Realists, also called cynics, will answer: people would invent something, perhaps a salve, to 'turn off' the itching. A profitable, never-ending business then. Certainly, explanations would soon arise and would enjoy great public acceptance: they would claim that the itching had no meaning, that it might be correlated to other factors besides radioactivity, and that it was innocuous in any case, unpleasant but demonstrably harmless. If everyone ran around scratching themselves and with rashes on their skin, and if photo sessions with fashion models as well as management meetings of the united denial institutes took place with all participants scratching themselves, it would have to be assumed that such explanations would have little chance of surviving. In that case, nuclear policy, as well as dealings with modern mega-hazards in general, would confront a completely changed situation: the object being disputed and negotiated would be culturally perceptible.[13]

That is precisely where the future of democracy is being decided: are we dependent in all the details of life-and-death issues on the judgement of experts, even dissenting experts, or will we win back the competence to make our own judgement through a culturally created perceptibility of the hazards? Is the only alternative still an authoritarian technocracy or a critical one? Or is there a way to counter the incapacitation and expropriation of daily life in the age of risk?