

Societal Relations to Nature

Outline of a Critical Theory in the ecological crisis

“A stone is a coagulated pattern of dynamic relationships.”

Hans-Peter Duerr (2001)

1. Preliminary Remarks

Almost a hundred years ago – in 1905, to be exact – the young physicist Albert Einstein published an essay entitled “Zur Elektrodynamik bewegter Körper¹” in the *Annalen der Physik*, thereby founding the theory of relativity – and a new conception of space and time. In the very same year he proposed the hypothesis of the wave-particle, the dualistic nature of light, which led, 20 years later, to quantum theory. With these two moves Einstein opened the way for a scientific revolution, one that led to a radical change in the classical understanding of scientific objectivity and causal explanation within physics.

A year earlier, Max Weber had formulated two postulates in a programmatic article, which, according to his views at the time, would insure the “objectivity of social scientific knowledge”. First, empirical knowledge and value judgments were to be strictly separated; and, second, precise concepts were to be employed. These concepts, however, were to be constructed specifically for the social sciences. With the first postulate Weber aimed at achieving the ideal of objectivity found in the classical natural sciences of his time; while with the second he aimed at achieving a sharp division between the natural and social sciences entirely in keeping with the neo-Kantian tradition.

With respect to the second point, concepts were specifically social scientific concepts for Weber if they, on the one hand, were oriented towards a general cultural value (for example, that of purposive-instrumental rationality) and, on the other, if they enabled an interpretive understanding of the meaning of (as he put it) “cultural problems that affected people.” The goal of sociology, in other words, was to not to *explain* causal relations in the manner of the natural sciences but rather to *understand* the meaning of human action within, and for, given cultural worlds and processes of societal life.

One can see a line of demarcation running between Albert Einstein and Max Weber, one which Kant viewed as an epistemological gap: on one side of this line stands the realm of nature with its ‘order of effective causes;’ on the other, the realm of human action with its “order of determined purposes.’ Within this tradition of thought, it is a part of the epistemic structure of modern science to separate the epistemic cultures of the natural and social sciences from one another, and to keep them separate with the help of a whole series of dichotomizing concepts: nature vs. culture; natural causality vs. rules of action; causes vs. reasons; effect vs. meaning; explanation vs. understanding; material vs. symbolic; ... and so on.

¹ In English: “On the Electrodynamics of Moving Bodies”.

From the 1920's until today, social scientific conceptual schemes, methodological principles and research methods have all been developed and differentiated within an ongoing controversy over Max Weber's epistemological program for the social sciences. Sociological theory-building remains a process of relating to or rejecting this program. In this sense Max Weber is a sociological classic par excellence. To this day, for example, he has provided the Frankfurt School with the counterpoint to its own compositions. Critiques of Weber's methodology, of his understanding of purposive-instrumental rationality, of his theories of modernization and rationalization, have all been a part of the finger exercises of every critical theorist.² In this way, Horkheimer was able to distinguish critical theory from traditional theory, and, at the same time, to take up a position beyond the demarcation line. In good Marxist tradition, Critical Theory understood itself, as a critique of bourgeois society and as a fermenting agent for societal change.

What remained vague, however, was the conceptual constitution of a critical theory, so understood. Max Weber had already foreseen that theories of society would have to change as society changed. Critical Theory has only seldom reflected on the peculiarly metaphorical closing passages of Weber's plea for objectivity in the social sciences. After he once again emphasized that an often unconscious orientation towards significant cultural problems and general ideas of value had influenced the concepts and methods of the social sciences, he refers, with a vague hint to a possible end of the social sciences, so conceived:

But at some point the colors change: the meaning of the points of view that had been used unreflectively becomes uncertain, the way is lost in the twilight. The light cast by significant cultural problems moves on by. And then science too prepares to change its intellectual location and its conceptual apparatus (Weber 1973: 261f)

By the end of the 1970s it had become clear that Marxist oriented critiques of society and knowledge had lost their way in the twilight, as Weber had warned, and that a new "significant cultural problem" had arisen. Of course, no one seriously doubts that in capitalist societies capital, in its various forms and relations, influences every sector of society; but for most people the belief has surely died that a more life-enhancing society, with more reasonable basic structures, can be achieved by means of a revolutionary negation of capitalism. At the same time the danger to humanity's natural conditions of life have more and more taken a central place in public awareness – not the least because of the growing political-ecology movement. In the 1980's the idea of an ecological crisis was made very concrete by catastrophes in places such as Bhopal, Seveso and Chernobyl. In Germany, the usual political-administrative procedures were no longer able to regulate conflicts, such as those over the Runway West at the Frankfurt am Main airport, the nuclear power plant at Brockdorf or the nuclear reprocessing plant at Wackersdorf. The ecological crisis was experienced as a *crisis of the political* and, as such, as a problem internal to society (Jahn 1991).

What was decisive here was the fact that these problems could not simply be blamed on the capitalist mode of production, since the states in which 'really existing socialism' was to be found had problems at least as serious, and these problems, both in terms of their causes and their consequences, affected humanity as a whole. But if the world has been changed to such

² For example, Habermas (1981) developed his *Theory of Communicative Action* with Weber's theory of rationality as background, and Juergen Ritsert (1996) developed his *Logic of the Social Sciences* through a confrontation with Weber's understanding of objectivity and the controversy over value judgments provoked by this.

an extent by the ecological crisis that the very survival of the species is threatened then humanity is surely faced with a “significant cultural problem” of an entirely new dimension. Orienting oneself towards this new kind of problem, and acting to “change the intellectual location and conceptual apparatus” of the social sciences as Max Weber foresaw a hundred years ago, seemed, at the beginning of the 1980s, to be a particularly central theoretical and political challenge.

During this period a flood of literature commented on and analyzed the ecological crisis, often from an ethical or religious point of view (but including romantic or reactionary analyses as well). This literature assumed various forms: a critique of the belief in progress, or of the mode of industrial production, or of technology, or of Western rationality, or of patriarchy, or of the experimental, analytical and computing natural sciences. However, numerous scientific projects were also begun during this period that attempted to face up to the new political and theoretical challenges – for example, the project, in Darmstadt, to develop a “social natural science” (Boehme and Schramm 1985). In Frankfurt, a new mode of *social-ecological research* was developed within this political-intellectual milieu. This program, saw itself both as a part of, but also as a definite critique of, this milieu. Slowly this research program has become more and more concrete, and a ‘critical theory of societal relations to nature’ is meant to provide its theoretical orientation.

2. The Social-Ecological Research Project and its Program

We have been working on this project since the middle of the 1980’s, with the aim of making *ecological crisis phenomena* the theoretical, empirical and political reference point of research at the Institute for Social-Ecological Research (ISOE).³ It was clear from the very beginning that pursuing the kind of research proposed meant rethinking current scientific concepts. There were many others with similar ideas. But we did not want just to demand, justify or design a new *type of research*; the goal was to actually practice this kind of research, within the existing boundary conditions and restrictions. We can’t go into the history of the project, with all its ups and downs, here⁴, but this much may be said: it is no longer a question of a unique enterprise. Social-ecological research has become a wide-ranging field over the last few years, to such an extent that the Federal Ministry of Education and Research has established it as one of its funding program. Internationally, it is linking up more and more with sustainability research, while the line between it and global change research is increasingly porous.

Research that is problem-oriented and interdisciplinary, in its widest sense, is now being pursued both in and outside of the university, in various organizational forms and with various theoretical and methodological approaches. It has many of the characteristics of a ‘new mode of knowledge production’ (‘mode 2’) (Gibbons et al. 1994), of the sort currently discussed internationally within the sociology of science. This refers to the production of knowledge in an applied context, with transdisciplinarity, social responsibility and reflexivity all playing important roles.

The concept of *societal relations to nature* has been the focusing point of our theoretical and empirical work since the beginning. What is called ‘environmental problems’ or ‘ecological

³ The ‘we’ here refers not only to the two authors of this paper but also to all members of the institute who together carry out its work and research.

⁴ For the beginning of ISOE, see Forschungsgruppe Soziale-Ökologie (1987), for current details, see ISOE 2002 or <http://www.isoe.de>.

risks' within public discourse is translated by us into a *crisis* of societal relations to nature. This provides the reference point of our research, and a *critique* of how society deals with this crisis provides its theoretical and methodological guidelines. To be sure, with this specific constellation of crisis and critique we have definitely situated the project within the tradition of Critical Theory; but Critical Theory has provided at best a beginning point on the way to our goals, and merely interpreting and commenting on the rich tradition of the Frankfurt School has not been seen as a promising road to go down.

In developing the project, and in realizing it in the practice of research, we made certain methodological decisions that have had many consequences, opening particular perspectives for critiques, while closing off others:

- Research should be both theoretical and empirical in character.
- Research should not be directed at the great scheme of things; rather it should concentrate on limitable social-ecological phenomena and problem-complexes.
- Social-ecological problem-complexes should be reworked in a methodologically transparent way into scientific problems.
- Research results should be made available to societally relevant practices, technologies or interpretations.

Viewed politically, this can be seen as a reformist perspective, one that aims at changes in everyday life, as well as in the 'transformation core' of society⁵. Missing here is a messianism, an eschatological background, and a revolutionary pathos. Also missing is a belief in an historically ordained revolutionary subject. (These are missing, in fact, because changing laboratory practices is more important to us than appearing in newspaper's feature pages). At the same time, we share Critical Theory's fundamental normative intention – to give expression to the daily experience of suffering and the violent distortions of individual life, instead of merely optimize a given technical or political-administrative system.

3. Social-Ecology and Critical Theory

There are many connections between the project of social-ecological research and Frankfurt Critical Theory, not only theoretical but also personal. One passage from the *Sociological Excursions* from 1956 was, and remains, a particularly important key text for us. For there, in a manner that today somewhat surprises, the object of a critical theory of society is not reduced to internal societal relations but expanded instead to include an enlarged external *constellation of relationships*:

“The relationship between individual and society cannot be separated from that to nature; ... a science of society has, as an essential task, the duty of researching the laws governing the development of that interdependency, and to deduce the forms assumed by the individual, society and nature in their historical dynamic.” (Institute for Social Research 1956: 53)

⁵ In all countries which reproduce themselves societally on the basis of a particular level of industrialization, technology and science a complex structure has arisen in which the sciences, the economy, industry, administration and the military operate in a coordinated manner. Changes within society stem from this complex structure. We call this complex the *transformation core* of society (Becker 1990). Here, politics, science and the economy are tightly entwined, with the lines between them blurred and constantly in motion. However, the transformation core is also where visions for possible futures with real chances of success arise, and where scientific-technical or political and legal solutions to social and ecological problems are worked out.

Individual, society and nature are treated here as a *constellation*. However, it is not clear here, and this is often the case with Frankfurt School texts, if one is speaking about concepts or about a reality which is to be grasped by these concepts. What has been called, within the ecological tradition of thought⁶, the human *environment*, is divided here into two concepts: *nature* and *society*. And from the very beginning the human being is introduced as an *individual* rather than as an *organism*, as, for example, it is treated in human ecology.

The relationship between individual and society has been a widely accepted core topic of classical sociology, but the insight that needs to be added, and the one which scientific sociology has less often pursued, is that “the nature found by human beings is always societally pre-formed. This insight has remained the preserve of dialectical philosophy and its materialistic heirs.” (Ibid. 44) From this point of view, it is not only the human being understood as an individual that is *socialized* but nature as well. A science of society must, then, conduct research into three relationships, with their respective differentiations: individual/society; society/nature/ and individual/nature, with all of these permeated by gender relations.

Social-ecological research would be a specific activity within such a social science.⁷ So far, it has concentrated for the most part on the relationship between society and nature, while the relationship between individuals and their (internal and external) nature, the classical theme of anthropology, has remained a marginal concern.

Can one base social-ecological research on “dialectical philosophy and its materialistic heirs”? If one follows the traditional line of Marxist thought, then this would only be possible in the form of a critique of capitalism; for the modes of production, in Marx’s view, dominate relations of nature – the ‘socializing of nature’ meant for him the ‘appropriation of nature’ under the conditions of the capitalist modes of production and domination. But this says nothing about how this socialization of nature takes form concretely under specific historical conditions, nor about which *natural* preconditions are required for such a capitalistic socialization. At the end of the 1970’s there were many attempts within the conceptual framework of a Marxist critique of political economy to develop something like a political ecology.⁸ But these attempts remained at the level of conceptual generality, and could only describe the concrete physical-material conditions and ecological consequences of production in a vague way. At the same time, they were unable to break the connection of a critique of capitalism with a theory of revolution imbued with a philosophy of history.

Axel Honneth, the new director of the Frankfurt Institute of Social Research, in his March 2001 programmatic address on the future of the institute, made the point that, after the dismantling of the very idea of a philosophy of history, “the older Critical Theory’s background conception dissolved into nothing over night.” The new background conception is, for him, the theory of communicative action (Habermas 1981). He sees this threatened by two factors: on the one hand, by a tendency in sociology toward “de-normativization” and on the other, by “naturalistic tendencies” arising in philosophy. In response, followers of the communicative turn in critical theory have attempted, on the one hand, to ground anew the

⁶ In Ernst Haeckel’s classic formulation, *ecology* means the relationships of an organism to its biotic and abiotic environment.

⁷ Such an understanding of social ecology has been recently criticized as “socio-centric.” Cf. Kropp (2002)

⁸ How difficult this task could be can be seen from a dissertation written 20 years ago (Methe 1981), in which it is attempted, in almost 1000 pages, to portray the debate in a structured way.

normative basis of a critical theory of society while, on the other, attempting to defend it against everything that looks to them like “naturalistic tendencies.”

Within such a framework, the development of a social ecology, together with its theory of societal relations to nature, is hardly possible.⁹ For that reason, it is only to be expected that such questions are not addressed at all in the Institute for Social Research’s new program. Almost all attempts within the framework of Critical Theory to articulate the problem of nature have been linked to the older theory, whether this be Horkheimer’s critical writings on science, or Adorno’s aesthetic or Herbert Marcuse’s critique of science.

Neither the older Critical Theory nor the newer version (after the *linguistic turn*) is therefore adequate as a basis for developing our program for an empirically oriented social ecology and its central concept of societal relations to nature. The reason for this has a lot to do with Critical Theory’s problematic view of the natural sciences: both the older and the newer versions of Critical Theory have ignored the constitutive conditions of modern natural sciences, following instead a neo-Kantian path leading to a methodological division of the social from the natural sciences, as well as a demarcation of their conditions of discovery and justification, of genesis and validity. At the same time, Critical Theory has taken on board logical positivism’s claim that questions of genesis have no relevance for the validity of theories within the natural sciences, a claim which they have vehemently rejected in the case of the social sciences.¹⁰ The radical, and deeply unsettling changes within physics, which the theorists of the older school must surely have experienced first hand, were hardly registered by them.

And things have not changed much since the *linguistic turn*. Horkheimer’s insistent question concerning the constitutive conditions of science has never been asked of the natural sciences. In any case, once the conceptual division between genesis and validity is made, any kind of a critical theory has no choice but to make use of it. Horkheimer, in his *Traditional and Critical Theory*, only attempted this in a serious way with respect to the social sciences. Generalizing his strategy of critique, however, would mean also investigating more closely the relationships between genesis, justification and application in individual cases within the natural sciences. But this would necessarily lead to making distinctions among different epistemic cultures within the natural sciences in general, and even within individual disciplines, with respect to how these relationships are constituted, and where and how they are analyzed. One can in fact make the argument that the critical potential of the natural sciences arises precisely by means of differences and conflicts within individual epistemic cultures; it is there that alternatives are drawn up and new alliances are forged, and it is there that the constellation of genesis, justification and contexts of application is subject to change. (Beck 1986)

The global identification of the natural sciences with positivism and instrumental reason was, for us, one of the greatest hurdles thrown up by Critical Theory. We were convinced that social-ecological research is possible only on the basis of an equal partnership between the natural and social sciences. Therefore this hurdle had to be overcome. At the same time, we did not wish to give up the critique of instrumental reason. That meant for us, however, that it

⁹ On this point see, for example, Becker (1996) or Görg (1999). To what extent there has been a change of position in Habermas’ *The Future of Human Nature* (2001) is not yet clear.

¹⁰ In the writings of the Frankfurt School one finds numerous references to philosophical texts in which the natural sciences are discussed but no citations of texts from the natural sciences themselves. The authors of both the older Critical Theory and the more recent version have apparently dealt with the natural sciences only through the medium of an academic philosophical discourse.

had to be pursued within the natural sciences as well, and, at the same time that it had to seek allies there. But then Horkheimer's distinction between traditional and critical theory becomes a distinction that must be reformulated and applied within the natural sciences as well as within the social sciences, and worked out theoretically within each respectively. Methodologically, we treat this distinction, then, as applying to various types of science and scientific practices, and not to entire scientific meta-cultures, such as the natural and social sciences

We can sum up as follows: A critical theory of societal relations to nature cannot be developed from a global critique of instrumental reason. The identification of the natural sciences with a positivistic 'traditional theory' is untenable.

Furthermore, it can be shown that all the characteristics of a critical theory of society as postulated by Horkheimer can also be found within the natural sciences (for the most part, to be sure, outside the academic mainstream): theory is understood to be a moment within a societal practice; research is part of the object of research; there is no gap between thinking and acting that needs to be overcome by some form of decisionism; research is self-reflective and context-sensitive. This also means, by the way, that it is possible to anchor a feminist critique of knowledge within the natural sciences.

However, this raises the question, already touched on briefly, of where, and in what form, 'critical potentialities' arise within the natural and technical sciences, critical potentialities capable of actively changing the constellation of genesis, justification and contexts of application. Are they taken over from societal or social scientific discourses; or formed internally – for example, as a critique of those constellations found in concrete research programs and concrete modes of theory construction in experiments, laboratory practice and modeling?

There are examples of both variations of a self-reflective natural science. Donna Haraway (1995), for example, has developed her critique of gene and information technology within the context of a feminist social constructivism. She belongs to a growing group of natural scientists who critically reflect on their own research practices from a social perspective, thereby ignoring for themselves the line of demarcation between the natural and social sciences.

On the other hand, there are many examples of critical reflection on science arising from the practice of research itself, in particular concerning questions of the application of research results. In molecular biology, information science and even in physics we can observe critical reflections from a social perspective.

Such observations indicate that, although the institutional and epistemic division between the natural and social sciences continues to exist, and in some areas has even hardened, this division has, for those taking a critical perspective, come to be seen as a societal construction, generated and supported by structures and institutions of power. Furthermore, the traditional line of demarcation between the natural and the social sciences is more and more being erased by the actual developments within the sciences.

This can be seen in the new, advanced areas of science – for instance, research on complex non-linear systems – where certain mathematical methods and modeling techniques are applied to both 'natural' and 'societal' systems. At the same time, there is a lively transfer of concepts among disciplines from very different scientific cultures. Is a physicist who models

finance markets with mathematical models doing natural science or social science? The distinction no longer makes any sense here.

What still remains unclear in all of this, however, is how a critical perspective can emerge in the case of such research, a perspective oriented towards the analysis of the embedding of science within societal relationships of power and domination. Does this perspective arise through the method or through the object?

One cannot answer this question a priori in terms of the philosophy of science. We consider answers such as “Mathematics can’t be critical” as being as unhelpful as “Whoever deals seriously with violations of human rights is doing critical science.” One needs to look for empirical answers here; and what must be examined is where - in which approaches and research projects, and in which areas of science - do critical perspectives emerge? The term ‘critical’ is being used here to indicate that possible social or ecological consequences are being taken into account, or research is being pursued with the aim of furthering more reasonable societal relationships. On the basis of such empirical investigations, questions of an apparently philosophical nature concerning the societal constitution of scientific objects, or those concerning the selectivity of methods with regard to particular interests, assume a more than academic interest.

4. Societal Relations to Nature

Meanwhile, very different topics and problems are being dealt with as part of social-ecological research under the heading of ‘societal relations to nature.’ However, two levels of discourse should be kept clearly separated:

1. At the first level, the level of *conceptual generality*, an attempt is made to determine the relationship between society and nature with general concepts, in a manner similar to what has always been the case in classical Critical Theory. At this level, it is easy to link up with that tradition, in particular with its *critique of the domination of nature*, and the ideas of emancipation connected with this. Paradigmatic in this respect is still Horkheimer’s and Adorno’s “Dialectic of Enlightenment” (1948). Here one often speaks of *the* societal relation to nature (in the singular), which is, at this level of conceptual generality, held to be a conceptual ‘structure of mediation’ – a ‘dialectical relation’ in which the concepts ‘society’ and ‘nature’ refer constitutively to one another.
2. Social-ecological research, however, takes place at the same time, and for the most part, at a second level, the level of empirical specificity. Here the relationships in which individual men and women find themselves are investigated in concrete situations, or particular societal sub-sectors are studied empirically and theoretically, with respect to their respective social and natural environments. Society and nature are thus treated not as totalities, as non-differentiated entities that relate to one another, but instead, as different societal and natural elements, selectively and dynamically linked. At this level, therefore, one has to work with a plural concept of societal relations to nature, and connecting with the tradition of Critical Theory becomes possible only with great difficulty.

Social-ecological research must operate at both levels. The use of general defining concepts at the first level makes the provision of a conceptual vocabulary possible, one needed to speak of a societal relation to nature in a structured way, and to make statements about the specific relationships found at the second level. Understanding these specific relationships

‘dialectically’, for example, helps to keep the constitutive co-dependency of societal and natural concepts in view. Less helpful for the practice of research, however, is to conceive of ‘nature as a created world.’ To be sure, such a concept can be employed as a normative ideal-limit, useful for raising fundamental objections to a blanket acceptance of everything that is technically doable. But how can one then seek practical solutions to social-ecological problems, since these always involve interventions in the “created world” in one form or another?

The meanings of such general defining concepts, however, are too crude to be useful for precise empirical and theoretical studies; they lead either to obscurity, or invite a false, because too quick, consensus. For this reason, an independent justification of the use of concepts specific to particular empirical research practices is needed. The distinction between internal and external nature, worked out within the tradition of Critical Theory, as well as its concept of an orthogonal relationship between first and second nature, are helpful in this connection.

The distinction between the two levels of discourse makes it clear that it is not easy, and probably not useful, to want to define the term *societal relations to nature* unambiguously, or to give it one generally accepted meaning. Within social-ecological research there are two uses of the term: in one, the term is used as a *name to mark* the relationship between society and nature;¹¹ it would make sense here to speak of a ‘relationship between society and nature.’ In its other use, however, it refers to a *concept* used to *analyze* and understand concrete relations between society and nature in all their given empirical specificity. We use the term ‘societal relations to nature’ mostly in terms of this second use as a theoretical concept that orients our concrete research practices.

We did not, however, derive the concept of ‘societal relations to nature’ from a general principle; rather, we developed it recursively, in the course of our empirical studies of concrete ecological crisis phenomena. We use the concept, to begin with, to describe, in a overall way, all the networks of mediating relations and forms of behavior that are to be found among individuals, society and nature, as well as any patterns arising within these.

The concept of ‘societal relations to nature’ can be further refined, first of all, by the thesis that such relations must be regulated in every society in such a way so as to sustain the cross-generational continuation of societal processes necessary for life; if not, then these processes collapse. The *regulation* of material and energy flows, however, is linked to a multiplicity of cultural *symbolizations* and embedded thereby in societal structures and processes of communication. The meaning of given patterns regulation, and their dependency on societal norms and power relations, are determined within such symbolic contexts. These symbolic contexts also shape the manner in which subjective needs (e.g., hunger, thirst) are projected onto individual, natural objects, and the way the latter are constituted as food or drink.

Societal relations to nature, therefore, are symbolically mediated material-energetic patterns of regulation. This does not yet tell us, however, at which level the nexus of regulated relations are to be located, and where research is to be carried out. Societal-relations to nature take form both directly through the interaction of individual actions and at the level of institutions and differentiated functional systems. In any case, it is a matter of historically

¹¹ In its simple descriptive use, the term ‘societal relations to nature’ can be replaced without loss of information by ‘relationship between society and nature.’ Instead of ‘relationship’ one could also speak of ‘relation,’ ‘interaction’ or ‘interdependency.’ All of these descriptive terms have the same level of vagueness; they can be used as a *passé-partout* for all sorts of things.

variable relations which have been constructed within various areas of action, relations both to the “external” and to the “internal” nature of individuals.

The concept of “societal relations to nature” can be refined further by a closer look at the forms and practices in which, and through which, societies attempt to materially regulate, and culturally symbolize, their relationship to nature. An *ecological crisis* displays the manner in which particular patterns of regulation fail, and, as a result, crisis phenomena emerge at local, regional and global levels. A phenomenology of an ecological crisis can provide a guideline, highlighting individual societal relations to nature as ecologically significant. Crisis phenomena display themselves in the pollution and poisoning of individual environmental media (water, soil, air); these then accumulate to become global ecological threats – the growth of industrial production and population, or the scarcity of resources (water, energy, raw materials), agriculturally useful cultivable land and food stuffs. If one follows these crisis phenomena back to the actions that intercede in a regulatory way between society and nature, then one can identify particularly endangered, and dangerous societal relations to nature: work and production, sexual desire and reproduction, and nutrition and land use.

However, the failure of individual patterns of regulation also appear in those many parts of the world where *poverty and underdevelopment* determine life. There, food, water, energy, clothing, housing, land and work are all lacking. In response, an attempt has been made, within the discourse of developmental policy, to use the concept of *basic needs* to define a field of developmental policy interventions. On this view, in order to make a life worthy of human beings possible, basic needs must be adequately satisfied. In the catalogue of basic needs, as listed by the United Nations, for example, we find nutrition, clothing and housing, hygiene and health care, primary education, work, personal freedom and cultural identity. Implicit in this list is a conception of very different levels of need, pointing to essential conditions of life for human beings as natural beings (nutrition) at one level, to general conditions of societal life (work, clothing, housing) at another, to the conditions of life in a modern society (primary education, hygiene and health care) at yet another, and to the conditions of a democratic constitutional state (personal freedom and cultural identity) at a final level.

The concept of basic needs is a controversial within the discourse of developmental policy, and is being gradually supplanted by other concepts.¹² In the course of the debate over the concept it has become clear that there are no objective criteria for a definition of ‘basic needs.’ Despite this, a broad consensus has emerged concerning a nucleus of indispensable ‘core basic needs,’ whose lack of satisfaction would make human life impossible. Like other forms of life, human beings also need nourishing food, water, protection from heat, cold and enemies, the possibility of movement and of sexual reproduction. One can speak here of biologically given ‘life functions’. In contrast to other forms of life, however, the human mode of life is, in addition, characterized by work and production, on the one hand, and the possibility of cultural symbolization, on the other. And just as it is possible to identify indispensable ‘basic needs’ so it is also possible to single out *primary societal relations to nature* that are, to a certain extent anyway, universally present yet, at the same time, always already thoroughly culturally shaped. These primary societal relations to nature cannot be derived from anthropological theories.¹³ Despite this, they possess a high degree of

¹² For example, within the framework of the debate over sustainability, by the concepts of “quality of life” and “human development,” where ideas of justice play a large role (Nussbaum and Sen 1993).

¹³ The catalogue of primary societal relations to nature that we use in our research corresponds, for the most part, with that provided by Otfried Höffe’s (2002) “minimal anthropology” or Martha Nussbaum’s (1998)

plausibility, and are fruitful for empirical research, in that work and production, reproduction, nutrition and housing are characterized both as primary societal relations to nature and as social-ecological crisis fields.

The spectrum of primary societal relations to nature is broader than that of the biological life functions, since their regulation is indispensable for both societal and individual reproduction. In Marxist discourse the significance of the relations of production is particularly stressed, while in feminist discourse it is gender relations that plays the central role. Both sets of relations may be interpreted as *regimes of regulation* for primary societal relations to nature. The difference between societal labor and capitalist commodity production, on the one hand, and sex and gender, on the other, refers to the historical forms in which production and reproduction are regulated. Without production and sexual reproduction, the reproduction and evolution of societal life would not be possible. For this reason their regulation regimes pre-form the modes in which other societal relations to nature are regulated. They limit to a certain extent, that is, the space of possible regulations, within which very different patterns of regulation can take shape.

We have distinguished analytically between anthropologically given primary societal relations to nature and their specific regimes of regulation. The latter pre-form the social, economic, political, scientific-technical, aesthetic, religious forms of life within which, and by means of which, societies materially regulate and culturally symbolize their relations to nature in historically specific ways. In this way, culturally specific well-established patterns of regulation take shape, which in turn can interact in very complicated ways.

Such patterns of regulation may be analyzed at different levels:

- At a micro-level of *individual satisfaction of needs*, patterns of regulation are linked closely to the corporeality of human beings and their psychophysical processes (e.g., feelings of deprivation, modes of perception, motivation, notions of identity). Here it is a matter of culturally shaped forms of need satisfaction. This does not take place, however, independent of the cultural practices of everyday life and their established norms.
- At a meso-level, patterns of regulation are strongly determined by societal *supply systems*, for example, water, energy and food stuffs supply systems, as well as by *technical infrastructures* (e.g., for transportation or communication). The possibility of need satisfaction here is dependent on the availability of goods essential for life, as well the possibility of access to the technical infrastructure, with these being shaped at the same time by cultural symbolic systems, epistemic models, power structures and property relations.
- At a macro-level, both *patterns of regulation of societal relations to nature* and social integration stabilize themselves in the form of production relations, property relations or gender relations.

For each of these levels it is possible to formulate statements about the specific shaping of societal relations to nature to which very different changes in the physical and organic environment are linked.¹⁴ The patterns of regulation at the different levels must, to repeat, act

“anthropological basic functions.” However, since we treat these primary societal relations to nature always in connection to ecological crisis phenomena they take on a different weighting.

¹⁴ For an example of such a statement about the specific shaping of societal relations to nature, see the development of “locomotion” as a primary societal relation to nature in the context of several mobility research

together, and their mediation can either succeed or not. If the latter occurs then second order regulation problems arise, requiring a regulation of regulations (Jahn and Wehling 1998: 88).

5. Reconstructions: A New Space for Thinking

ISOE finds itself currently in a phase of its work where it is necessary to take stock of what has been achieved so far and, at the same time, on the basis of a changed societal and scientific context and new experience, to review and revise our program. For this reason it is important to ask how we have used the concept of ‘societal relations to nature’ so far.

1. Fifteen years ago, our starting point was the argument that it was not possible, as was normally the case then in environmental research, to understand societal relations to nature simply from a naturalistic perspective, and then only with the concepts and methods of the natural sciences; for in this case they would be conceived as merely *relations in nature*. At the same time, we also rejected a purely societal perspective, one using methods provided only by the social sciences; for this would conceptualize societal relations to nature as mere *relations in society*. This argument allowed for a double-sided critique – against naturalism, on the one hand, and culturalist and soci-centric approach, on the other. Ulrich Beck’s suggestive formulation, “Nature can no longer be understood *without* society, society no longer *without* nature” (Beck 1986: 107), was, to a certain extent, useful for taking a stand against both forms of reductionism. With this, we rejected having to decide between two alternatives, a situation that Klaus Eder has succinctly formulated:

The relationship between nature and society can be theoretically conceptualized in two mutually exclusive ways: as a naturalizing of society or as a socializing of nature. These alternatives divide theoretical discourse on the relationship between nature and society into two camps: a naturalistic and a culturalistic. (Eder 1988: 27)

In contrast, we hold that social-ecological crisis phenomena (such as the pollution of drinking water or anthropogenic climate change) can be adequately described and understood neither as a ‘socializing of nature’ nor as a ‘naturalizing of society’. These crisis phenomena are to be found within both a ‘socialized nature’ and a ‘naturalized society;’ this is the root of our attempt to replace a logically clear *either-or* way of thinking with a logically ambiguous *neither-nor* and *both-and*.

Assuming this double-sided position opened up *new space for thinking* for us, in which we were first able to formulate and consider seriously social-ecological problems as such and not separately, as something social here and something ecological there. The paradoxes and contradictions of a *neither-nor* way of thinking, and a *both-and* way derived from it, are not, in this space for thinking at least, an expression of a conceptual weakness; rather they are the most appropriate articulation of the case. As a result, a good deal of theoretical imaginativeness has been set free, leading to the introduction of concept-pairs that can be used to describe these paradoxes. Effect/interpretation, regulation/representation, and material/symbolic are some examples of these concept-pairs, which we have used to describe the hybrid forms of particular societal relations to nature (for instance, locomotion, housing, nutrition) within the new space for thinking.

projects (the best example being, “Urban Life Compatible Forms of Mobility – Strategies for Action Aimed at a Sustainable Development of Traffic in Urban Regions” (City: mobile); cf. Bergmann and Jahn 1999).

However it was first necessary to make some distinctions as clear as possible within this new space for thinking, one charged with an array of dazzling meanings. In a project on urban mobility, for example, this led to distinguishing empirically between spatial mobility, social-spatial mobility and social mobility, that is, distinguishing locomotion in space from reaching a social location and both of these from movement between social positions.

Such distinctions allow us to bring theoretical descriptions into relation with one another in a new way, and in doing so, to criticize their limited individual truth at the same time. The figure of a double-sided critique of naturalism and culturalism has been applied in various constellations to many different cases over the last several years. This has enabled us to keep our new space for thinking open, while filling it at the same time with an array of multifaceted meanings.

2. Retrospectively this can be seen as both a discourse strategy, one that has been often difficult to comprehend, and as a specific procedure for formulating a critique. The following aspects are important:

a) *Reformulations*: One can take the statement, “Environmental problems are an expression of a crisis within societal relations to nature”, as programmatic. In a similar way we have reformulated a whole series of diverse discourse elements. In this way the rather intuitive idea of societal relations to nature has gradually become a heuristically fruitful concept. However, there was a need here to distinguish the more traditional concept of *crisis* that is used in this context from the more contemporary concept of *risk*, while making the concept of crisis more precise in the process. In this way it has been possible within our projects to rework conceptually the unresolved tension between risk sociology and environmental research as found within the natural sciences.

b) *Charging with meaning*: By means of these reformulations we have gradually charged the rather bulky concept of ‘societal relations to nature’ with diverse meanings, embellishing it with a semantic richness at the same time. In doing so, links to very different discourses, and to seemingly disparate theoretical elements, have emerged. Examples of these links include: publicly circulating beliefs concerning an imminent ecological catastrophe; crisis interpretations within political ecology; debates within the philosophy of nature and the philosophy of culture concerning the displacement of the difference between nature and culture within the ecological crisis; conceptions of nature sketched within the older version of Critical Theory; feminist critiques of society, science and technology; anthropological and political debates on human needs; the description of societal relations to nature within ecosystems theory; and models of critical states as found in complexity research. All of these were brought into the new space for thinking and subjected there to the double-sided critique of naturalism and culturalism. In this way unusual connections between heterogeneous theoretical elements became possible, with some of these elements having been already still further refined, while others are in the process of being worked on. At present, for example, we are working on linking the rather traditional social scientific concept of crisis to the newer theory of complex non-linear systems, in order to be able to model social-ecological crisis dynamics and transformations also mathematically.

c) *Empirical differentiation*: Talking about a crisis in societal relations to nature in general terms was not much help to us. In order to make it possible to carry out our program empirically it was necessary to differentiate among various primary societal relations to nature with the aid of anthropologically marked life-functions. However, the point of

reference here is not society but rather the conditions of life of socialized individuals, that is, *individual relations to nature*, so to speak. Here, facing the challenges presented by cultural anthropology and its various *concepts of 'need'* in particular, as developed within the discourse on developmental policy, was very helpful. These too were brought into the new space for thinking and subjected to the double-sided critique.

We came to the conclusion that even ostensibly purely biological needs (such as breathing, food and drink; sleep, or protection from cold and heat) exist, as far as socialized human beings are concerned, only in culturally shaped, and therefore subjectively and socially interpreted forms. This became particularly clear with respect to the difficult question of how one can bring together differences between sex and gender, and love and sexuality with reproduction or demographic developments (Hummel 2000).

3. This kind of movement in thought by means of a double-sided critique of naturalism and culturalism opens up a perspective on the shaping and collusive action of specific, culturally established patterns of regulation for particular societal relations to nature at various levels.

From the examples already mentioned one can see an overarching structure: all societal relations to nature may be described in terms of *both-and* concepts; and these can then be reformulated for purposes of critique in terms of *neither-nor* concepts, so that such descriptions can be seen as both true and false at the same time. Instead of speaking of a 'dialectic' here one can use, by analogy, the term 'complementary' from early quantum physics. The Danish physicist Niels Bohr introduced the idea of *complementarity* in 1927. This refers to micro-objects which are, under different experimental conditions, describable by means of two different statements, each of which seems to logically exclude the other, yet each of which must be held to be empirically true. For example, an electron displays wave-like properties in one set of experiments and particle-like properties in another. A complete description of quantum phenomena at the atomic and sub-atomic levels requires, therefore, concepts that exclude each other mutually within the classical physics of macroscopic objects. The principle of *correspondence*, also introduced by Bohr within early quantum physics, provided quantum physicists with an elegant escape from their logical difficulties. With it the micro-world of quantum objects becomes, by means of measurements and observations, connected to the directly accessible and experienceable macroscopic world. Thus, physical phenomena are only constituted in the interaction between macroscopic measuring instruments and the atomic and sub-atomic micro-world. The principle of correspondence enables one to represent the truth of both descriptions consistently and, at the same time, to determine their limits (Meyer-Abich 1965; Fischer 1987).

It was already clear to Bohr that the physical principle of complementarity, and its related principle of correspondence, were simply special cases of an idea with significance far beyond physics. This is the idea that observers are part of what they observed, and that they can only observe something by changing it. Or put differently: observation of a system always takes place within that system by changing it.

Moreover, since physical phenomena are only constituted within the interaction of macroscopic measuring instruments and the sub-atomic world, all the properties of quantum physical objects are relational in character, which, viewed logically, must be described by means of two-place predicates. A property is never simply ascribed to a 'thing; 'rather it is always ascribed to a 'thing' in relation to at least one other 'thing,' one functioning as a measuring instrument.

Very early there was an attempt made to transfer the principle of complementarity to mental or communicative phenomena. The result was usually a loss of conceptual precision. We suggest, nonetheless, using it as a methodological principle for social-ecological research. As such it offers the new space for thinking created by the double-sided critique of naturalism and culturalism the possibility of describing social-ecological phenomena as complementary. One can then compare these complementary descriptions with one another, placing them in a conceptual relation, and through this separating the respective true statements from the respective false ones. Put differently: In this way, the limits of such descriptions can be determined. At the same time, this the methodological use of the idea of complementarity allows us to work out our concepts of crisis and critique, as well as that of societal relations to nature, not merely within a social science context, which has mostly been the case, but also within a the conceptual world of the natural sciences.

Perhaps this could be made somewhat clearer by saying that, for us, *critique* does not arise out of a process of dealing with conditions deemed worthy of critique, with the latter being compared with some kind of norm; rather, critique, for us, is directed at theoretical demarcations that mask a societal reality. To this extent, it is a matter of a politically motivated critique of knowledge.

To expand on this a bit, let us look at a distinction, effect/interpretation, which we have often used in our studies: Descriptions of patterns of causality ('context of effecting') and patterns of symbolic representations ('context of interpretation') are mutually referential and, at the same time, limited by a third party. Following Whitehead (2000), one can speak of a *perception of causality*, with this applying even to animals. Animal forms of perception are dependent on at least rudimentary forms of symbolization, and these constantly produce new symbolizations. To be sure, one can distinguish here analytically between 'effect' and 'interpretation'; but this distinction does not separate natural phenomena from social phenomena; rather, it is a matter of two sides of the same thing. To this extent 'effect' and 'interpretation' are complementary descriptions carried out by an observer, and not a form of strict demarcation of different classes of objects; and these descriptions, moreover, are limited by possibilities of perception either inherent in the phenomena or inherent in the observer.

5. Concluding Remarks

The method of double-sided critique can be applied in all situations where societal problems are transformed into scientific ones. It is itself an epistemic instrument for such transformations. Social-ecological research is part of a problem-formation process in which the relationships between science and society assumes extremely different forms¹⁵. In such problem-formation processes *critical states* come into being, and it is here that we can intervene with our research, sometimes with foreseeable consequences, but often with consequences that are unforeseeable. Here, a connection between *crisis and critique* becomes evident: research discovers to what extent critical states which could turn into crisis phenomena are present, and then a critique of reductionistic descriptions makes intervention possible.

The older Critical Theory organized its own theorization in terms of reflections on the dialectic of crisis and critique. This mode of reflection may now be renewed and, at the same

¹⁵ This point is worked out extensively in Becker 2002.

time, transformed with the aid of state-of-the-art concepts and ways of thinking taken from the natural sciences. It is no longer a matter of a philosophical reflection on the relationship between crisis and critique; rather, it is a question of a methodologically oriented new constitution of this relationship. Whether our suggestion to develop a new methodological concept of critique with the aid of the concepts of complementarity and correspondence drawn from quantum physics will prove fruitful remains open; so far we have used these concepts only heuristically.

Another attempt to reformulate traditional ideas and theory making with the help of modes of thought derived from the natural sciences makes use of the theory of complex dynamic systems. And in the even more recent complexity research there are many starting points for describing the objective side of *crises*. The classical social scientific descriptions of crises can, with the aid of such concepts, be rewritten.

But then, no doubt, the subjective side, as exemplified, for instance, in the consciousness of ecological crises, will be missing in such revised descriptions. Look at purely physically, what is missing in complexity theory is some kind of theory of the internal perception and observation of complex systems. Such a theory has to be formulated at a level comparable to that reached in quantum physics. Only in this way would it be possible to seriously ask questions about observables, that is, empirical variables, or the much more difficult questions about the constitution of objects.

Until these questions are dealt with, complexity theory remains 'naturalistic' – and in need of critique. However, the critique of instrumental reason found in the established tradition is of little help in this respect, since complexity theory will not survive its global critique. For classical Critical Theory, complexity theory would be a question of new and sophisticated variant of 'instrumental reason.' A sweeping critique of complexity theory, moreover, would not allow the recognition and use of the critical potential existing within the conceptual world of the natural sciences. Such a recognition, however, would make a double-sided critique possible.

This is a large program. If one strengthens the analogy to physics then a deficit becomes clear: social-ecological research has no equivalent to the abstract mode of description found in quantum theory (its mathematical structure), one which we could use to determine the truth and falsity of complementary descriptions, and set their limits. We remain dependent here on our intuitions, out of which arise temporally limited but theoretically justified agreements concerning correspondences. For this reason we must continue to speak of an *outline* of a theory of societal relations to nature. A theory that is, for the most part, context independent in the strict sense – having clearly operationalized concepts, a consistent conceptual structure and empirically testable theoretical statements – will probably never be formulated in our area of research – and, we would add, no such theory is desirable, for otherwise we would necessarily be faced with a reductionistic simplification. A new social-ecological science would then have defined a position for itself, to be sure, and constructed an impressive conceptual apparatus, but Max Weber's 'significant cultural problems' would pass it by, unseen and not understood.

Becker, E./ Th. Jahn (2005): Societal Relations to Nature. Outline of a Critical Theory in the ecological crisis. Published in German in Böhme, Gernot / Manzei, Alexandra (Ed.), Kritische Theorie der Technik und der Natur. 2003. München: Wilhelm Fink, 91-112