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### **Transgressing the Boundaries: An Experimental Reconnoitre**

Since the societal influence on climate change and the progressive disappearance of species was officially accepted at the UN conference 'Environment and Development' in Rio de Janeiro in 1992, research on the human-environment interaction has increased. In the German-speaking area, the establishment of the programme 'focus on the environment 1993-1995' in Switzerland, the 1994 report of the 'Council of Environmental Experts' and the public sponsorship of interdisciplinary environmental research in Germany mark the beginning of this process. 'Transdisciplinarity' is the magic formula to describe the collaboration of different academic disciplines on environmental problems. It indicates that there is a real problem (not only one of academic construction) that could probably be solved if a broad spectrum of specialist knowledge is applied.

In our current research project financed by the Volkswagen Foundation under the sponsorship programme 'Nachwuchsförderung in der fächerübergreifenden Umweltforschung', we are working together from the perspectives of ecology and sociology to analyse one aspect of the accelerated urbanization of the earth's human population during the twentieth century. We are investigating the relationship between changes in the vegetation of frequently disturbed habitats in rural areas (which are subject to human intervention), and the shift in rural lifestyles towards urbanism. When considering the problem of interdisciplinary research we found out that there is very little reflection on the question of how to combine the methods of sociology with those of ecology. We feel that this problem is symptomatic of the barriers in thought and communication between the sciences and the humanities, and would therefore like to present our methodological considerations in this research paper. In the

first part we outline the division between the two academic cultures (1). We then go on to explain our method for combining ecological and sociological research on the basis of the concept of track interpretation (2). In our concluding remarks we sum up the insights from the preceding discussion and draw conclusions for interdisciplinary approaches in environmental research (3).

### **The Division Between the Two Academic Cultures and Obstacles to Innovation in Environmental Research**

In the mid-1990's the physicist Alan Sokal (1996: 62) 'decided to try a modest (although admittedly uncontrolled) experiment'. With the intention 'to test the prevailing intellectual standards' (62) within the discourse of the humanities, he submitted an essay entitled 'Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity', in which he drew parallels between quantum gravitation and the discourse of postmodernity, to the renowned cultural journal *Social Text*. The essay appeared in a special edition of *Social Text* in the spring/summer of 1996, which contained various contributions on the subject of the 'science wars'. Sokal then published a second article entitled 'A Physicist Experiments with Cultural Studies' in the journal *Lingua Franca*, in which he presented his first essay as a parody. He claimed he had only submitted the first piece to *Social Text* in order to answer the following question: 'Would a leading North American journal of cultural studies – whose editorial collective includes such luminaries as Fredric Jameson and Andrew Ross – publish an article liberally salted with nonsense if (a) it sounded good and (b) it flattered the editors' ideological preconceptions?' (62). 'The answer, unfortunately,' Sokal continued, 'is yes' (62). He drew two conclusions from this experience: firstly, the subjectivism of those disciplines in the humanities which described themselves as 'postmodern', their methodological credo of antirealism, relativism and the refutation of objectivism, were unfounded and impossible to put into practice. In addition, he claimed, 'some fashionable sectors of the American academic Left have been getting intellectually

lazy' (64), in that they no longer tested their arguments for content, judging them instead by the extent to which they conformed to their own views. Those who were taken in by Sokal, on the other hand, objected that they had not shared the views that he had presented in his essay, but had published the text as a contribution by a physicist who took interest in philosophy and metaphysics (Robbins and Ross, 1996). In the subsequent heated discussions, scholars of the humanities who did not describe themselves as postmodernists pointed out that scientific and technical rationality is itself not completely divorced from cultural milieu, social settings and political influence (see e.g. Aronowitz 1997). Influences of this kind, which are invariably exercised by the subject on any scholarly or cognitive process, give cause to doubt the objectivity of any academic pursuit.

This episode in recent scholarship, now generally referred to as the 'Sokal Affair', demonstrates clearly how barriers in thought and communication between the sciences and the humanities persist, despite all attempts at promoting inter- or transdisciplinarity. As early as 1959, Charles Percy Snow (1959) in his Cambridge Lecture gave a vivid description of these two disciplinary traditions, which continue to exist as independent cultures. Yet the attitude of both the culture of science/technology and that of the humanities/literary studies towards the opposing culture is characterised largely by ignorance. According to Snow's diagnosis, reciprocal misunderstandings that can even be tinged with hostility are actively cultivated, even if their overall effect on the intellectual climate is negative. In other words, even if they reduce the potential of academic research to solve real problems.

This blockade is particularly noticeable in environmental research. Even though this field of research evolved from the insight that changes in the environment induced by man can endanger the human race, as yet few methodological models have been developed which might enable scholars to overcome the barriers between the two academic cultures, and

to investigate the relationship between nature and man systematically. Even anthropology, which encompasses both the natural and the cultural dimensions of human existence, has become polarised in the course of these 'science wars' (see Little 1999), notwithstanding its concern to reflect on methods of analysing the relationship between man and his environment (see Vayda 1996). The mindsets of the two academic cultures are influential here. The only form of environmental research that is possible within these conditions is applied research. It is true that sociologists carry out acceptance studies or economic analyses when, for example, physicists are developing new energy sources or zoologists are establishing new nature reserves. Here a peaceful coexistence is possible, because the research concerns belong to separate domains and the areas of competence are clearly defined from the outset. However, as these forms of applied research are exclusively geared towards implementing specific programmes of action within specific contexts, they are unlikely to result in any academic innovation, or in a crossing of the boundaries between the disciplines.

It therefore seems appropriate to ask what it is that legitimates this strict division between the sciences and the humanities. From the perspective of the history of ideas, it is obviously the assumption that nature and intellect, the physical and the mental, are categorically opposed to each other. This tenet of natural philosophy, which can be traced back to Rene Descartes, is in all probability the most solid basis for the schism, even today. However, environmental research need not comply with this tenet of natural philosophy. It need not subscribe to any specific natural philosophy or metaphysics when sketching a framework for possible relations between man and nature; it is free to be open to all natural-philosophical conceptions. The only prerequisite for investigating the network that links nature and man is the simple insight that human

action changes nature and that these changes can be observed and systematically examined as regular relations.

### **Freeing Environmental Research from the Presuppositions of Natural Philosophy**

This liberation of research from a concrete natural-philosophical or metaphysical basis leads on to the recognition that both the sciences and the humanities have developed methods of researching the networks of interrelation between human action and the non-human environment. Admittedly, this recognition is merely a first step towards overcoming the lack of communication between the two disciplinary cultures. Instead of voicing uncomprehending or pejorative statements, or even developing reductive academic conceptions, this recognition exerts a gentle pressure on academics from a variety of backgrounds to comment on the strategies and results of research carried out by the opposing disciplinary culture, and to acknowledge them as contributions to environmental research. The more definite the pressure to collect information on a common research topic and to communicate with each other in the context of both disciplines about the details of various phenomena, the more urgent becomes the need to clarify the relationship between these different methodological approaches to the structures linking man and nature. How can we, in the course of an investigation into a specific subject, develop a common language which, on the one hand, preserves the particularity of the respective disciplinary perspective yet, on the other, is able to convey relevant findings about the common research topic in a comprehensible manner?

Faced with necessity of creating a communicative foundation for our common research project, we turned to the paradigm of the interpretation of tracks as expounded by, among others, Carlo Ginzburg (1979), Gerhard Hard (1995), Umberto Eco and Thomas Sebeok (1983), which has as yet

proved to be a suitable methodological framework.<sup>1</sup> As in the semiotic tradition, we consider a track to be a form of sign: it points the observer directly towards the object that created it. A fire produces smoke, a horse leaves characteristic hoof marks, and a burglar may leave finger prints. Signs such as smoke or a finger print are indices (Peirce 1983: 65-6). They are not a product of the imagination; they exist in precisely the same way as the object they point to exists. There is no smoke without fire, and, similarly, no hoof print without a horse. However, something only becomes an index when it is interpreted as such. If the observer does not recognise the hoof print as such, or considers it to be a mere unevenness in the clay, he will not conclude that a horse has passed that way. Such interpretative processes are naturally subject to error: the mark in the clay could have been left by a cow, and, seen from the distance, a whirlwind looks to the uninformed observer very much like a column of smoke. We therefore need to submit every index, and the possible causal circumstances to which it could be pointing, to critical examination, and to ask whether a general rule can be found for the circumstances in which the indicated event always appears. Taking this final question as our point of departure, we have been seeking indices for concrete, existing relations between man and nature, and investigating whether the relations that we assume exist have genuine substance, or are merely products of our imagination.

Our research project begins with the observation that localities in predominantly rural areas have ruderal plant communities with a higher proportion of native species and so-called old immigrants (archaeophytes, immigrated before 1500) than localities situated close to highly populated areas. The latter have a higher proportion of neophytes (so-called aliens, immigrated after 1500) which means that neophytes are particularly

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<sup>1</sup> Here, we are drawing in particular on Gerhard Hard's concept of the reader of tracks; however, our observations owe more to semiotic pragmatism than to French semiology.

widespread in urban areas (McKinney 2002; Roy et al. 1999). By 'ruderal' plant communities we mean plants that occur primarily in inhabited areas, in locations which are frequently subject to human influence and intervention. Ecological research relates the progressive disappearance of native and archaeophyte ruderal species to the destruction of the locations in which they occur, and the disruption of their dispersal paths, i.e. vectors of seed spread like migrating flocks of sheep (Fischer et al. 1996). In other words, the phenomenon is explained as a consequence of environmental changes resulting from human intervention.

These two developments can be regarded as parallel, but unrelated, phenomena. Alternatively, they may prompt us to seek a different, more constructive explanation.<sup>2</sup> Given the interrelation of human action and nature, such an explanation should, in our view, take greater account of human intervention. Could the transformation of social structures be the cause of these ecological phenomena? It is true that, since the 1950s, changes have become apparent in the social structures of rural inhabited areas to which terms such as 'deruralisation' (*Entagrarisierung*) and 'urbanisation' (*Verstädterung*) are generally applied (Henkel 1999: 90-124). If the propagation of archaeophytes and neophytes is affected by circumstances induced by society, then this could serve as an explanation of the aforementioned phenomena. By formulating this hypothesis, then, which assumes a connection between changes in ruderal species and the transformation of rural lifestyles, we have turned two phenomena which were initially regarded as unrelated into a track. We will now illustrate, by drawing on two examples from our fieldwork, how this hypothesis enables us to interpret these signs as indices for a causal object.

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<sup>2</sup> Charles S. Peirce (1960: 106) describes this procedure as an abductive conclusion: 'Abduction is the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea; for induction does nothing but determine a value, and deduction merely evolves the necessary consequences of a pure hypothesis. Deduction proves that something *must* be; Induction shows that something *actually is* operative; Abduction merely suggests that something *may be*. Its only justification is that from its suggestion deduction can draw a prediction which can be tested by induction, and

Our fieldwork was carried out in Wetterau, an old area of cultivated land which is situated to the north of Frankfurt am Main and stretches through the Taunus hills to the west to the foothills of the Vogelsberg to the east. As a region which is traditionally agricultural in character, this area has been subject to various changes since the 1950s. Particularly worthy of note are the structural changes in agriculture, but also, of course, the expansion of Frankfurt as a centre for the services sector, the arrival of manufacturing industries at various locations in the region with good transport connections, and finally, the expansion of the suburbs, which are important as administrative and trade centres (Friedberg, Bad Nauheim, Butzbach, etc.).

In the course of our investigation we have drawn on data from a study carried out from 1974 to 1981 by Dr. Wolfgang Ludwig of species of ruderal plant communities in this region. If this study is compared with the results of the survey of ruderal flora that we carried out in the course of our project in 2002 and 2003, a development becomes apparent in the various localities which is described in the relevant secondary literature as a trend for 'classic' ruderal plant communities in villages (Dechent 1988; Otte and Ludwig 1990; Lienenbecker and Raabe 1993): many of the ruderal native species and archaeophytes which were previously typical for villages, such as, for example wild spinach (*Chenopodium bonus-henricus*), lion's tail (*Leonurus cardiaca*), henbane (*Hyoscamus niger*), have decreased drastically in frequency. An exception, however, is for example the Scotch thistle (*Onopordum acanthium*), which, in contradiction to the trend has not declined, but has even grown a little more common. As this phenomenon cannot be explained simply by means of ecological or regional factors, the only possibility for an exclusively biological approach is to except the Scotch thistle from the general trend as an 'anomaly'.

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that, if we are ever to learn anything or to understand phenomena at all, it must be by abduction that this is to be brought about.'

Within the context of our hypothesis, however, this phenomenon becomes a track which points towards a particular pattern of human action as causal object. And indeed, in the course of our study of ruderal flora we on several occasions found the Scotch thistle – both as a young plant and as a flowering specimen – in flower beds which had otherwise been completely freed of ‘weeds’. This finding invites the assumption that this weed had occasionally been consciously spared by the gardener, presumably because he or she attributed a particular aesthetic value to its impressively large and attractive flowers. This, then, means nothing less than that cultural factors have a direct influence on the composition and development of species communities.<sup>3</sup> This is hardly surprising when one considers that humans have, over centuries of utilisation, selected and cultivated certain species communities, even if this process has generally been oriented rather less towards aesthetic criteria than seems to have been the case with the Scotch thistle.

Our second example, therefore, also refers to a track which points to the unintended consequences of a certain pattern of action. The Australian goosefoot (*Chenopodium pumilio*), generally classified as a neophyte, occurred in the centre of Frankfurt am Main in the 1970s and early 1980s (Ludwig 1972; Ludwig, unpubl. data), however, as can be seen from our historical data, there was no attested occurrence in the Wetterau area. During our first study we were able to locate the *Chenopodium pumilio* within the area of investigation: it was found at the final stop of a bus route which ran from this location to the Nord-Westzentrum underground station in Frankfurt. Within the context of our interdisciplinary hypothesis, this observation serves as an index for a pattern of action which could of caused the spread of *Chenopodium pumilio*. It is highly possible that someone could have stepped in something unpleasant in Frankfurt while in the immediate vicinity of a seed-bearing plant, been unable to remove it from his shoe in the bus,

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<sup>3</sup> This insight is not, of course, a new one. See, for example, Harris 1996.

but, upon arrival at the final stop, have scraped off the offending substance on the edge of the pavement at the bus stop. Whether or not the dispersal took place in precisely this manner, it can safely be concluded that commuters can function as a vector of seed dispersal. Therefore it is more probable that *Chenopodium pumilio* would spread to areas with many residents who work in Frankfurt, than to localities with fewer commuters. This also means that the occurrence of this plant species in a certain locality is not 'coincidental', i.e., lacking an appropriate biological explanation but rather an index for the changes that 'urbanisation' as a social process can cause on the level of plant communities.

The two indices sketched here could point towards concrete links within the network between man and nature. As it is self-evident that nature is also subject to changes effected by human actions, these changes should also be taken into consideration by research. When reconstructing relations of cause and effect within nature, we should also be sure to include the formative actions of human beings in the equation. Admittedly, the resulting conclusions will frequently be hypothetical in character: we are unable to state with certainty whether the relations we assume above have a basis in fact; that is to say, whether we have discovered rules that explain the phenomena that we have taken as indices, or whether these phenomena are the result of mere coincidence. However, the primary concern within interdisciplinary environmental research should, in our opinion, be the development of a framework which departs from traditional disciplinary thought patterns and does not posit a strict separation between the physical and the mental spheres.

## **Conclusions**

The habitual distinction between nature and intellect as two fundamentally different spheres of reality can be avoided in the field of environmental research. By adopting the methodology of track

interpretation, the research process is no longer bound from the outset to a mode of interpreting data on the basis of an assumed division between the human and non-human spheres. This methodology enables us instead to form a variety of natural philosophical or metaphysical hypotheses on the connections and relations between nature and man. Thus the methodology of track interpretation virtually necessitates an approximation between the two disciplinary traditions described so aptly by Snow. The scientifically-oriented environmental researcher is obliged to take the human being seriously as an agency that influences the environment, and to include him in his analysis of the causal chain. The environmental researcher who is oriented toward the humanities, by contrast, must test his interpretation against the object under scrutiny and ascertain whether the relation between two occurrences is a mechanical and causal or a functional one, or whether it is merely coincidental.

It is obvious, therefore, that our conception of the paradigm of track interpretation enables us to examine individual indices which point towards concrete instances of interaction between nature and man, and to extrapolate from them a generalised rule. This rule then allows us to make predictions about the influence of various aspects of human lifestyles on ruderal flora. Only when the effects of these patterns of action on these ecosystems have been investigated more widely will it be possible to formulate an explanation that has application beyond the isolated occurrence. By collecting data according to the methodological standards of our respective disciplines, we avoid reaching pat conclusions in the manner of a self-fulfilling prophecy. That is to say, while we are still in the process of collecting data, we cannot know whether they will support or refute our hypothesis. Whether the indices are confirmed, and the transformation in lifestyles has some explanatory value for the observed phenomena, or whether they can be explained by recourse to mere physical factors, is something that will only become apparent at the evaluation stage.

Finally, it should be noted that Sokal also based his experiment on a hypothesis that evidently enabled him to 'read' his various experiences with the discourse of humanities as 'tracks'. In the course of his experiment, he tests the reliability of this hypothesis. However, as Ian Hacking (1983) has demonstrated, every experiment is simultaneously an intervention, for which the experimenter carries the responsibility. If our experiment with informed interdisciplinary research will show that the same methodological principles are operative in both disciplinary camps, we can perhaps intervene to bring the 'science wars' to a close and devote ourselves to more important issues.

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