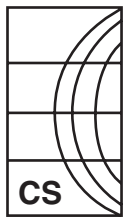

The Unknown in Process

Dynamic Connections of Ignorance, Non-Knowledge and Related Concepts

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abstract: In contemporary debates on risk in modern societies, on reflexive modernity and a general crisis of knowledge, concepts and terms such as ignorance, non-knowledge or negative knowledge are used to denote that there can be knowledge about what is not known. Many of these terms are not only used with different meanings, sometimes antithetic to one another in their implications, but they often propose tree-like taxonomies without broaching the issue of the further connectivity of different types of unknowns between the limbs of the tree. In this article, an attempt is made to simplify and integrate different connotations in sociological usage of concepts that try to grasp the unknown and to outline the dynamic and recursive relations of these types of knowledge and the way they can change over time. This is illustrated with examples from large-scale ecological design projects.

keywords: ignorance ✦ non-knowledge ✦ public ecology ✦ sociology of knowledge ✦ theory building

Introduction

Knowledge, in its broadest sense, can be understood as a justified belief that is connected to purpose, a use, and is associated with intentionality. In the first half of the 20th century, the sociology of knowledge began as the study of the social origins of knowledge and of its effects on social development. In addition, in recent years the focus on unknown processes and variables is becoming increasingly important in theorizing about society and the production of knowledge in the 21st century. Especially in writings on reflexive modernity, the risk or knowledge society, as well as debates on

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a general crisis of knowledge in current intellectual thought, concepts and terms such as ignorance, non-knowledge or negative knowledge are used to denote that something can and indeed must be known about what is unknown.[1] The debate on non-knowledge and ignorance, of course, goes at least back to Socrates' insistence that his 'wisdom' lay in knowing what he did not know; occasionally referred to as 'nonknowledge' (Jaspers, 1951), but mostly as 'ignorance'. The terms used in today's debates, however, are increasingly used with different meanings, sometimes even antithetical to one another in their implications. Some of the current problems can be traced back to translations of the German word *Nichtwissen* into English as non-knowledge and ignorance; and vice versa. In contrast to false knowledge, non-knowledge and ignorance are generally seen as attempts to circumscribe the unknown. Like knowledge, ignorance or non-knowledge are conceptualized and constructed as a fundamental part of social life. This circumscription points to the well-known paradox: whenever new knowledge arises the perceived amount of non-knowledge increases at least proportionally, since 'every state of knowledge opens up even more notions of what is not known' (Krohn, 2001: 8141).

In this article, first some major streams in the debates on the importance of notions and concepts of the unknown are critically reviewed. Then I suggest how some of these different usages and connotations of concepts can be bundled so that a *dynamic* relation of different simple types of 'unknowns' and the way they can change over time can be outlined. This is illustrated with a discussion of the development of knowledge using the example of the redesign of former surface mining areas. Based on these reconstructions, a simple typology of notions of the unknown as well as their (sometimes) recursive relations to one other are suggested in which existing usages of knowledge about the unknown can be situated without excluding each other.

Contemporary Sociology and the Unknown

In his now classic book *Ignorance and Uncertainty* (1989), Michael Smithson observed that in the second half of the 20th century we 'have seen a flurry of new perspectives on uncertainty and ignorance whose magnitude arguably eclipses anything since the decade of 1660 which saw the emergence of modern probability theory' (Smithson, 1989: 3). Some four years later, Smithson wrote that it 'is still not entirely respectable to write about "ignorance" ' (Smithson, 1993: 133). However, even over a decade later the situation does not seem to be too different from what Smithson observed in the late 1980s. Quite the contrary seems to be the case. At any conference where a presentation is given on ignorance or non-knowledge, the debate afterwards circles around proper definitions, new taxonomies, or lengthy

new terms. The consequence seems to be that authors tend to give extended definitions of terms every single time they mention a social phenomenon dealing with the unknown. This has lead to an enormous increase in adjectives placed in front of the noun. Kerwin's 'unknown unknowns' (Kerwin, 1993), Smithson's 'meta-ignorance' (Smithson, 1989) or Ravetz's 'ignorance of ignorance' a.k.a. 'ignorance-squared' (Ravetz, 1993) are certainly among the terms that can be meaningfully applied in social analyses. However, 'unspecified known ignorance' vs 'specified known ignorance' (Böschen and Wehling, 2004) as well as combinations that lead for instance to terms like 'openly reducible personal ignorance' (Faber et al., 1993) are certainly well thought through, but they rarely lead to a clarification, since not only are they used counterintuitively at times, they are also only partially grounded in concrete examples. Some of the taxonomies, so it seems, are largely theory driven with little or no attention to or links with concrete examples or data.

Most importantly, the linearity in the known taxonomies does not allow for possible connections or dynamics between for instance 'unknown unknowns' and 'specified non-knowledge', although the empirical reality, as I specify below, more often than not suggests so. In short, the breadth of meanings that constitutes the multidimensional construct of unknown realms calls for a simplification. Accordingly, I suggest single-term denotations as much as possible from everyday language. At first sight it might appear unlikely that single-term denotations are going to change usage in any way that helps specialists or is accessible to outsiders. However, I believe that many of these terms I introduce denote what otherwise difficult to remember terms promise to do.

Into the Unknown: From Nescience to Ignorance

Although Michael Smithson observed that research on unknowns has not been prominent, he nevertheless acknowledges an increase and a general concern for uncertainty in science, based on the rapid amount of research being done, which has led to an accelerated 'turnover of what constitutes established scientific knowledge or truth' (Smithson, 1993: 134). Another reason for a growing interest in uncertainty is that science has increasingly merged with wider society so that the institutional borders between the scientific production of knowledge and the application of knowledge in the real world outside science have become blurred (Gross and Hoffmann-Riem, 2005; Krohn and Weyer, 1994). Among many others, authors like Ulrich Beck and Anthony Giddens have prominently pointed to the unintended and unwilled consequences in the current age of reflexive modernization. For Giddens, knowledge is the medium of reflexive modernization. For Beck, it is non-knowledge, since the unintended

side-effects of modernization can be regarded an expression of increasing non-knowledge, or of *Nicht-Wissen* (Beck, 1996).[2] In Beck's view, there are two types of non-knowledge. First, a type of non-knowledge that one does not want or need to know, and second, a non-knowledge that cannot be known. Beck's reference to a second modernity was made to point out a structural and epochal break, indicated, for instance, by an increase in the significance of 'non-knowledge' as a consequence of the rise of knowledge. Both Beck and Giddens observe that unpredictability and decreased control, together with unintended side-effects, are to be understood as the main driving force of contemporary societies. Beck, who has analysed modern society as risk society, claims that the notion of reflexive modernization disenchants modernity's own taken-for-granted premises and thus signifies a heightened awareness that the mastery of the modern world is impossible. This, Beck and others contend, points to a new era with new ambivalences, uncertainties and risks. To Beck, a new kind of society and personal life are in the making (Beck, 1999). Giddens in turn calls for active trust relationships since trust would increasingly be the key to a functioning relationship between the wider society and different expert systems (Giddens, 1990). Other authors, like Brian Wynne, have argued that until now it seems impossible to take unknown dynamics and variables into account, since this would be the more fundamental obstacle to today's risk assessment than the inability to analyse known interactions accurately (Wynne, 1992). It is central in this stream of thought to discuss the possibility of a shift away from traditional research strategies of reducing ignorance towards a greater capacity to cope with ignorance. This points to a shift that scientists, policy-makers and the public have begun to acknowledge; namely, that potentially harmful consequences cannot reliably be established by further research since they fall into the domain of ignorance (Hoffmann-Riem and Wynne, 2002).

Among classical sociologists, it is undoubtedly Georg Simmel who showed the keenest eye for unexpected events and surprising turns based on non-knowledge taking place in almost all fields of social life. It is probably also Simmel who, of all the classical sociologists, denoted the most space to the importance of *Nichtwissen* in the structuring of modern life: that is, a denotation that trust serves as a bridge between knowledge and non-knowledge as a structuring principle. Here the difficulties of grasping the unknown in sociology seem to have begun. In the English version of Simmel's essay on 'The Secret and the Secret Society', which appeared in the original German as a chapter in his *Soziologie* (Simmel, 1992), the translator Albion Small translates *Nichtwissen* sometimes as 'nescience' (e.g. Simmel, 1906: 444, 448) and sometimes as 'not knowing' (e.g. Simmel, 1906: 450) with no discernible rationale.[3] The symmetry in the German word *Nichtwissen*, which denotes that there can be knowledge (*Wissen*)

about what is not known, is not captured in the English word nescience, which, according to the *Oxford English Dictionary*, means the 'absence or lack of knowledge'.[4] Furthermore, nescience belongs to a fundamentally different epistemic class from non-knowledge or ignorance. No one can refer to their own current nescience because it is not part of their conscious and thus socially constructed non-knowledge. At most, people can refer to someone else's or their own earlier nescience. Hence, a sociological observer can only ascribe nescience in retrospect. However, a literal translation of the word *Nichtwissen* would have been non-knowledge (with or without the hyphen), a term rarely used in English-speaking sociology until the 1990s, and mainly in articles by authors whose native language was German. It can be assumed that non-knowledge in English-speaking sociology in most cases was a literal translation from the German *Nichtwissen*. Overall it appears that German authors writing in English use the term non-knowledge as a literal translation of the German *Nichtwissen* and English-speaking authors mostly talk about ignorance, when referring to the opposite of knowledge. To be sure, some authors, like Fritz Machlup, have singularly used the term non-knowledge in the English language to indicate that which is not knowledge, e.g. assumptions or beliefs (Machlup, 1962: 16).[5] More recent authors have used the term non-knowledge as indicating a type of knowledge about the unknown. Furthermore, as becomes clearer later, Simmel used the word *Nichtwissen* in a sense that comes close to some English-speaking authors' understanding of (specified) ignorance as well as non-knowledge as used in debates on risk and the knowledge society (see Beck, 1999; Stehr, 1994).

Most generally, Simmel saw non-knowledge as an important part of understanding the relation of what he called objective and subjective culture. One of the interests of Simmel was to detect the possibilities and the capacity of subjective culture, to use, absorb and transform elements of objective culture. However, this objective culture could come to develop into opposition to the subjective forces, which, in Simmel's writings, is the tragic conflict which permeates all domains of modern society. For Simmel it is important to see that the rift between objective and subjective culture can be bridged by trust in non-knowledge. For Simmel, 'trust, as the hypothesis of future conduct, which is sure enough to become the basis of practical action, is, as a hypothesis, a mediate condition between knowledge and non-knowledge' (Simmel, 1992: 393; see also Simmel, 1906: 450).[6] In his analyses of an accelerating modern society, objective culture was characterized by increasing non-knowledge. The 'objectification of culture has sharply differentiated the amounts of knowledge and non-knowledge', Simmel wrote (Simmel, 1992: 394; see also Simmel, 1906: 450). New unintended side-effects thus

develop via a widening rift between knowledge and non-knowledge, which calls for more trust among individuals interacting with each other as well as for more trust in interacting with the non-human world, such as modern technologies. In a similar vein, Heinrich Popitz (1968) has stressed the importance of *Nichtwissen* as a preventive action and a room for manoeuvre in treating delinquent behaviour. Thus, in this view, Simmel's notion of *Nichtwissen* appears to be very much the same as recent ideas on non-knowledge and ignorance in other fields of sociology. In general, 'whatever quantities of knowledge and non-knowledge must commingle, in order to make possible the detailed practical decision based upon confidence, will be determined by the historic epoch, the ranges of interests, and the individuals' (Simmel, 1992: 393–4; see also Simmel, 1906: 450).

In 1936, Merton, in his now classical sociological analysis of the concept of 'unanticipated consequences' (Merton, 1936), also elaborated this theme albeit mainly in reference to scientific activities. He identified five sources of unanticipated consequences in scientific research: ignorance, error, basic values, the so-called imperious immediacy of interest and, finally, the self-defeating prediction. Although Merton saw that unanticipated consequences based on ignorance can also have desirable effects (Merton, 1936: 895), he only developed this idea with regards to scientific research, called 'serendipity', that is, an anomalous finding that gives rise to a new theory (Merton, 1968: 157–62; but see Merton and Barber, 2004). He later elaborated the centrality of ignorance in that he detected two types of ignorance, unrecognized and specified ignorance. Specified ignorance, to Merton, is to be understood as 'a prelude to newly focused inquiry' (Merton, 1987: 8). Implicitly, Merton thus believes in a linear development in the growth of knowledge, although he sees that new knowledge always brings an awareness of more specified as well as unspecified ignorance (Merton, 1987: 8–9). That new knowledge also can develop into unspecified ignorance or other forms of knowledge does not seem to have interested Merton.

In the functionalist tradition, Moore and Tumin (1949), in their essay on 'Some Social Functions of Ignorance', defined ignorance 'as simply referring to "not knowing", that is, the absence of empirically valid knowledge'. Furthermore, Moore and Tumin want to keep ignorance as 'distinct from "error", whether of fact or of logic, and from the act of *ignoring* what is known' (Moore and Tumin, 1949: 788, n. 4; emphasis in the original). In this line, earlier debates on the importance of ignorance (e.g. Merton, 1987; Moore and Tumin, 1949; Popitz, 1968; Schneider, 1962) are used synonymously with today's debates on non-knowledge (e.g. Böschen and Wehling, 2004; Japp, 2000).

Out of the Unknown: From Ignorance to Extended Knowledge (and Back Again)

In general, terms like ignorance or non-knowledge are used when referring to any type of unknown outcome. In accordance with Smithson (1989), Stocking (1998: 166) defines ignorance as including 'absence of knowledge, probabilistic uncertainty, inaccuracy, irrelevance, and other sources of not knowing'.[7] Unlike the notion of risk, where probabilities are known, and in contrast to uncertainty, where probabilities are not all known (see Faber and Proops, 1998: 128–9), non-knowledge or ignorance refers to a realm that escapes recognition. Funtowicz and Ravetz (1990: 87–8) define ignorance as the 'deepest' of three sorts of uncertainty distinguished by inexactness, unreliability and ignorance. Brian Wynne also talks about risk when 'the system behaviour is basically well known, and chances of different outcomes can be defined and quantified by structured analysis of mechanisms and probabilities' (Wynne, 1992: 114). If one knows the important system parameters, but not the probability distributions, Wynne talks about uncertainties. Unlike Funtowicz and Ravetz, Wynne shies away from the idea that uncertainty exists on an objective scale ranging from risk to ignorance. Instead, Wynne suggests that risk, uncertainty and ignorance overlap each other, thus pointing to the fact that ignorance can be embedded within other forms of unknowns (Wynne, 1992: 116).

Departing from these debates and especially from Ulrich Beck's view on two types of non-knowledge, Knorr Cetina adds the term 'negative knowledge' to the collection of terms used by others, since negative knowledge does not mean 'non-knowledge, but knowledge of the limits of knowing, of the mistakes we make in trying to know, of the things that interfere with our knowing, of what we are not interested in and do not really want to know' (Knorr Cetina, 1999: 63),[8] and, one should add, perhaps are afraid to know. The importance of Knorr Cetina's approach lies in the fact that in the analysis of scientific decisions, the limits of knowing are admitted by bracketing out certain areas of knowledge and non-knowledge. However, this strategy can also lead to an acknowledgement of non-knowledge that so far has been neglected, but is suddenly taken seriously and may even be seen as fundamental. In general, Knorr Cetina's negative knowledge appears to be similar, if not the same, to the notion of 'closed ignorance' by the economists Faber and Proops. In their understanding, closed ignorance means that 'we either neglect problems themselves, or do not take notice of intuitive insights, experience, information, models and methods of solution which are available inside of society' (Faber and Proops, 1998: 117).[9]

Quite different from the aforementioned approaches, in Niklas Luhmann's systems theoretical perspective, non-knowledge does not mean a lack of knowledge, but rather, as Tacke (2001: 295) put it, 'a social construction, which is dependent on knowledge as its respective flip-side. Experts, for instance, specify non-knowledge according to existing knowledge, causal theory, and methods. As a consequence, risks are assessed in terms of probabilities.' Risk thus refers to non-knowledge. In this stream of thought, non-knowledge is regarded as the other side of knowledge, and consequently as the other half of a distinction (see Japp, 2000; Luhmann, 1992; Willke, 2002). However, as different as these ideas on non-knowledge are when compared to usages outside of systems theory, they still treat ignorance and non-knowledge – sometimes also lack of knowledge – as synonyms (e.g., Japp, 2000: 225; Tacke, 2001: 295).

Beneath the work of Beck and Luhmann, the German debate on *Nichtwissen* today has been led by Stefan Böschen and Peter Wehling. These authors, however fruitful and important their contributions are in many respects, simply translate Merton's terms of specified and unspecified ignorance into the German as two types of *Nichtwissen* (e.g. Böschen and Wehling, 2004: 42–3; Wehling, 2001), thus blurring the importance in connotation in the original as well as the current meaning of the German *Nichtwissen* a.k.a. non-knowledge. Furthermore, reminiscent of an early attempt by Weinstein and Weinstein (1978), Wehling (2001) in particular pleads for a type of precautionary objective non-knowledge, i.e. a concept of total unawareness of non-knowledge, where nescience (German: *Unwissen* or *Unwissenheit*) might have been a more apt term.

Summarizing and extrapolating some of the debates highlighted here, I now suggest a preliminary, simple categorization of notions of the unknown. First, I suggest that the English term 'ignorance' should function as a kind of cover term that generally points to the borders and the limits of knowing, including the intentional and the unintentional bracketing out of unknowns. In order to grasp the latter two categories, the term non-knowledge as a literal translation of the German *Nichtwissen* should be introduced, since this is also the original usage in classical sociological language, especially that of Georg Simmel. It is a type of knowledge where the limits and the borders of knowing are taken into account for future planning and action. The second subtype of ignorance can thus be called negative knowledge (Knorr Cetina), that is, a kind of knowledge about the unknown, but an active consideration that to think further into a certain direction will be unimportant. In the next category, I suggest another term, which so far has not been introduced, but points to several of the topics some of the above authors have implicitly pointed to: the development of new or 'extended knowledge', based on planning, tinkering or researching with non-knowledge. This extended knowledge, to be sure, can lead to the

social awareness of, for instance, new non-knowledge by uncovering limits of the newly gained knowledge. However, the new extended knowledge can also reveal that earlier ideas on reliable and accepted knowledge must be reinterpreted.

The word nescience, which was incorrectly used as a translation of Simmel's *Nichtwissen*, should rather be seen as a prerequisite for a total surprise beyond any type of anticipation. Nescience, as a total lack of knowledge, at first sight comes close to what Kerwin (1993: 179) has termed 'unknown unknowns', things not known that they are not known. It can also be seen as synonymous with Wynne's definition of indeterminacy when applied to environmental policy. It could also fill the place of Wehling's (2001) description of a complete unawareness of non-knowledge, since this unawareness can only be made 'visible' in sociological analysis, when, like knowledge, its social utterances, constructions or negotiations can be registered. However, as mentioned earlier, nescience belongs to a fundamentally different epistemic class from ignorance, since nescience can only be detected in retrospect. Thus, in sociological studies, the term nescience can only be used by a god-like sociological observer who already knows about the nescience of his or her object of study. More likely, nescience can be used as a category for reconstructing past events, for instance, in historical sociological studies where the lack of knowledge of a person or a certain group was crucial for the development of a certain technological device, as Stefan Böschen (2000) has done in his study on CFCs, DDT and Dioxin.

However, nescience can very well be a basis for understanding ignorance, negative knowledge, non-knowledge, as well as new, extended knowledge. This should generally point to the dynamic character of all kinds of knowledge production, a point that many of the debates on the theme have neglected or have only implicitly touched upon to date, since, as Wynne has nicely phrased it, any uncertainty or ignorance can only be defined 'by artificially "freezing" a surrounding context which may or may not be this in real-life' (Wynne, 1992: 116). In the following section, I illustrate how the highlighted connotations and meanings of notions of the unknown can be linked dynamically so that they can be used as tools for analysing different fields of knowledge, especially work dealing with processes of risky research and implementation activities.

Knowledge Dynamics: An Example from Ecological Design

The categorization of unknowns in Table 1 can be seen as framed by two core types: knowledge and nescience. If knowledge is a belief that is justified as true, based on nescience, a surprising event can occur that has been beyond the possibility of any expectancy and anticipation of the

Table 1 *A Categorization of Knowledge, Different Unknowns and Extended Knowledge*

Knowledge	A belief that was justified as true and is accepted by a group or certain individuals studied by a sociologist.
Ignorance	Knowledge about the limits of knowledge in a certain area; increases with every state of new knowledge.
Non-knowledge	Knowledge about what is not known but taking it into account for future planning.
Negative knowledge	Knowledge about what is not known, but considered as unimportant or even dangerous – can lead to non-knowledge.
Extended knowledge	Based on planning and/or research with non-knowledge – can also lead to new non-knowledge by uncovering limits of the newly gained knowledge.
Nescience	Lack of any knowledge: prerequisite for a total surprise beyond any type of anticipation – can lead to ignorance and non-knowledge, but belongs to a different epistemic class from the above terms.

actors involved. The retrospective recognition of nescience can lead to a state of ignorance, that is, a type of knowledge about the limits of knowing. This is where a consciousness about unknown realms and thus social construction can be registered by a sociological observer. Actors then can decide to frame this ignorance in a certain way to what Merton has coined specified ignorance. However, the empirical reality often shows that specified ignorance again can have at least two diametrically different meanings based on the reaction and evaluation of an observed event. First, there is what I call non-knowledge. It is a type of knowledge that can frame the unknown so that the unknown can be taken into account in future planning. Second, there can be negative knowledge: knowledge about what is not known, but considered as not worth being dealt with. Subsequently and at its most basic, the term extended knowledge means knowledge at a certain time t + 1.[10] However, extended knowledge can also inherit new knowledge about further gaps in knowledge and thus can function as the precursor of learning about new ignorance and non-knowledge, as is illustrated in Figure 1.

In order to illustrate the simple categorization in Table 1 and to derive a model of how these unknowns work together in social dynamics, I offer a concrete example of these unknowns as they pan out in science and decision-making in large-scale ecological landscape design in eastern Germany.

The post-mining landscapes in eastern German brown-coal mining areas south of the city of Leipzig in Saxony are characterized by massive

landscape devastation. In this area of Germany, by the late 1980s, mining had swallowed up some 300 km^2 of the landscape, of which only a small part had been made reusable again. However, brown-coal mining was not profitable after 1990. Consequently, mining was given up for the most part and since 1990 major efforts have been undertaken to catch up on remediation. The most obvious change in the appearance of the landscape can be observed by the transformation of many abandoned open pits into lakes. Fourteen new lakes with an overall surface of 60 km^2 have been designed and will lead to a completely new image of the former mining area. A 'New Lake District', as the area is now officially called, is taking shape (Eissmann and Rudolph, 2002; Kabisch, 2004; Linke and Schiffer, 2002). For the inhabitants, local investors and other stakeholder groups this situation is not only an economic challenge, but also a unique chance to master the ecological and structural change by creative landscaping. The path to this redesign of a whole landscape since 1990, its frequent – positive as well as negative – surprises and some devastating failures due to sometimes oppositional evaluations of forms of the unknown, all, in one way or the other, lead to learning from earlier planning steps by evaluating new forms of non-knowledge and ignorance.

The overall framework of the 'New Lake District' was developed by the Planning Department of West Saxony and handed over to the communal level. On this level, single plans by the town mayors trying to attract investors had to adapt to social as well as 'natural' conditions on the local scale. Lake Cospuden[11] was one of the first lakes to be created, being fully flooded in the summer of 2000. Beginning in 1991, after the last mining activities ended, the open pit filled with groundwater. In 1998, the natural flooding was supported with industrial water from a neighbouring surface mine. The water level was expected to rise by 3 cm daily. Based on this calculation and the existing knowledge from flooding of open cast pits from similar cases in other areas, the estimation in 1998 was that Lake Cospuden would be finished by arriving at its destined water level of 109 m in 2001, albeit no one *admittedly* exactly knew, since the calculation could only be made on a large amount of uncertainty. Thus, based on an informed consent about what was known and what was unknown, the stakeholder groups decided to start to act in spite of enormous non-knowledge. Soon after the beginning of the fast flooding process, it turned out that the flux of water could be further accelerated, so that the end of flooding actually took place more than a year earlier than originally estimated. Before that step was taken, the stakeholders and the local media agreed that flooding was a risky enterprise and that unexpected events were likely. Based on the fast flooding of Lake Cospuden, decisions thus had to be made on the basis of a considerable amount of unknowns especially in the areas of the acidification of the rising groundwater and the

endangering of slope stabilities. The actors involved in the design of the new lake agreed upon on what was not known and took it into account for future planning; that is, they decided to act in spite of well-defined non-knowledge. However, this type of unknown is fundamentally different from nescience, i.e. a situation where the probability of consequences is not known at all and where a total surprise beyond any type of anticipation can be registered. It also differs from a general knowledge about the limits of knowing in a certain area, as is indicated in the word ignorance. The aim thus was not to overcome or control uncertainty in flooding the lake, but to live and blossom on it.

For the actors involved, the possibility to accelerate flooding was spurred by the advertising for the EXPO (World Exposition) in Hanover. To finish flooding in the spring of 2000 was a welcome surprise, for others less so. It was positive for the shop owners and small businesses who built their dreams and future on tourism, so they hoped they could open their shops one season earlier than expected. It was seemingly negative for the engineers and companies implementing the lakeshores, the foundations, the dykes and the restoration of natural habitats, since they had to speed up their work considerably.

Overall, the plan to design a new lake had to be revised and accommodated to changes in the natural as well as the social conditions. Since fast flooding not only has a positive effect on slope stability but also on the water quality, it was decided overall not to stop the water flux, albeit the technical side of the implementation then had to take place on the basis of new ignorance, since the new situation opened up even more knowledge gaps, this time knowledge about the limits of knowing (ignorance) how to deal with 'super-fast flooding' and the monitoring of slope stabilization. However, the speed of flooding helped the engineers and scientists involved to learn and to extend their knowledge about what was not known (non-knowledge). As a consequence to the extreme speed in flooding, new technologies for the reclamation of devastated landscapes have been developed that are now used for similar cases of landscape design in former strip mining areas in Eastern Europe and South America. In other words, the accommodation to changing social conditions (here, the EXPO), lead to new knowledge and expertise for basic science. In turn, the new and extended knowledge can again lead to the perception of further ignorance, non-knowledge and variations of negative knowledge. In the case of Cospuden, this led to further extended knowledge on the causal relations and the proportions of iron, aluminium and magnesium in the water needed for flooding a former open cast pit at this speed (Berkner, 2004).

In order to illustrate how these different types of unknowns are linked together dynamically so that they do not appear as artificially frozen and as objective givens, Figure 1 should serve as a clarification. It must be

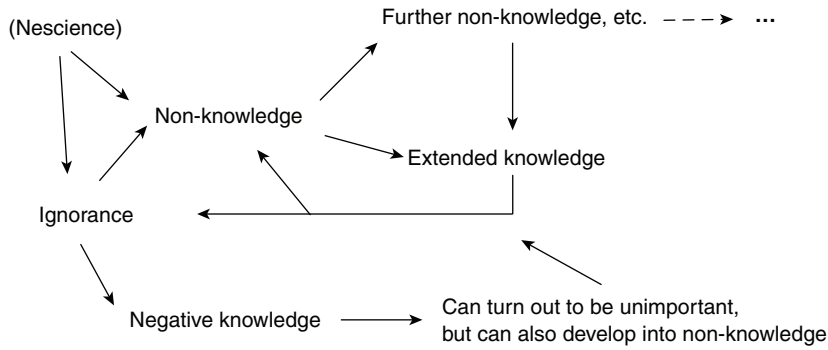

Figure 1 *Recursively Connected Types of Knowns and Unknowns*

noted that Figure 1 does not indicate that knowledge production or evaluation always begins with nescience because nescience is positioned on the far left of the figure. In many areas of social life, planners anticipate the borders of planning and the borders of the possibilities for a realization of a certain plan. The arrows in Figure 1 should be understood as conceptual linkages that can nevertheless have causal connection. The arrows from ignorance to its two subtypes, for instance, are to be understood as special cases of ignorance that are preceded by ignorance. However, negative knowledge and non-knowledge can also causally develop out of ignorance. The dashed arrow near further non-knowledge should indicate that the search for new knowledge can potentially lead to more and more unknowns instead of new knowledge, because formerly valid knowledge can be found to be invalid. Hence, ignorance, non-knowledge or negative knowledge can all stand at the defined beginning of an activity as well as on the beginning of a sociological observation.[12] Furthermore, the model indicates what steps can be undertaken or how different types of unknowns can be linked together, but it does not decide on concepts and practices to accomplish the stages in development of knowns and unknowns. Rather, the different stages should be useful to identify the complexity of the development to new or extended knowledge as well as new forms of the unknown.

The redesign of the landscape in the Leipzig area called for strategies that have the potential to handle different types of unknowns based on unexpected 'natural' changes. Knowledge claims thus have to be embedded in the learning process in such a way that new ignorance and non-knowledge could be absorbed so that the overall integrity of the landscape design process at Lake Cospuden could be upheld. The design to cope with different types of unknowns was able to accommodate revisions to issues that exposed new ignorance, although they were

previously agreed upon as valid knowledge. Subsequently, new, extended knowledge could be fed into the next step of the design of the landscape to (possibly) uncover further ignorance, non-knowledge or negative knowledge and thus could potentially question the new gained knowledge yet again (see Table 1 for the illustration of this cyclic connection). As implementations like large-scale ecological design projects cannot be based on the institutional conditions of unrestricted scientific knowledge production, they have to address the challenge to deal with what is known and what is unknown. A clear terminology might be a first step to handle this task, so that the recurrent exposure to new types of unknowns can be seen as chance and not as failure by acknowledging that surprising effects are probable, since they fall into the domain of ignorance, non-knowledge and negative knowledge.

Outlook

The simple model of recursively connected types of unknowns (Figure 1) serves two main goals: it defines several types of knowledge beyond the immediately known, and shows how they can be connected and dynamically linked in such a way that one usage of a concept does not categorically exclude another or overlap in such a way that meanings become blurred, but can potentially be causally linked to one another and each can play an important role in sociological research. The recursive character illustrated in the figure of development processes of the unknown shows that different types of unknowns are embedded within other types of unknowns as well as (potentially) an extension of other types. It also shows that each type has strengths and limitations for certain research questions and fields of sociological research. However, it can be assumed that with only minor changes many more existing usages and subcategories of knowledge about the unknown can be situated within the model, like the typologies of Faber and Proops (1998: 129), of Kerwin (1993: 178), or Smithson's (1989: 9) taxonomy of ignorance. The preceding typology allows adding other meanings, shadings and further limbs to the model. Only the naming of a few core types of unknowns has been presented in this article. To be sure, this categorization of notions of the unknown should not obliterate other understandings, but it appears more apt concerning its analytical clarity, as well as the causal connection between different terms and concepts in use in current and classical sociology.

Notes

1. To name but a few from different theoretical perspectives: Beck (1996), Knorr Cetina (1999), Luhmann (1992), Merton (1987), Smithson (1989) and Wallerstein (2004).

2. To add more terminological confusion, in a revised English version of Beck's essay on 'non-knowledge', *Nicht-Wissen* is translated as unawareness (Beck, 1999: 109–32).
3. An earlier version of Simmel's chapter appeared in German as 'Das Geheimnis'. However, in a new translation by Kurt Wolff from 1950 (Wolff, 1964: 307–76), *Nichtwissen* is uniformly translated as ignorance, with one exception, where Wolff used the term non-knowledge (Wolff, 1964: 312). It is not clear why Wolff changed this here. Based on this translation, the first usage of the term non-knowledge in a major social science and humanities journal can be found in Murphy (1964: 1257). However, in some of his other writings, Wolff occasionally used a notion of non-knowledge meaning a residual area of other forms of knowledge covering 'all that might be there but is not' (Wolff, 1943: 121), that is, a meaning different from Simmel's.
4. Nescience is derived from the Latin *nescire*, *ne-* not and *scire* to know. Despite the Latin origin of nescience, the term non-knowledge, which is quite unusual in current everyday English, can be traced back to the 16th century, whereas the usage of nescience, according to the *Oxford English Dictionary*, is from 1625.
5. In this sense, see also the usage in the literature on service economies, e.g. Ducatel (2000).
6. This and the following quotes by Simmel are modified translations from German based on the translation by Albion Small (Simmel, 1906).
7. More generally, Stocking (1998: 177) pleads for the further establishment of a sociology of scientific ignorance (SSI) to complement and expand the traditional sociology of scientific knowledge (SSK). Earlier, Stocking and Holstein (1993: 187) defined ignorance as 'absence of knowledge, and uncertainty, incompleteness, bias, error, and irrelevance'.
8. Knorr Cetina also talks about 'liminal knowledge'.
9. Faber and Proops (1998) indeed offer a detailed taxonomy of types of ignorance, which are compatible with issues discussed here. However, their work is solely focused on long-run interactions between the economy and the environment and not on general social interactions as a sociological field of study.
10. Although one reviewer of this article pointed out that the term extended knowledge does not mean anything more than 'knowledge at time t + 1' and thus a new term is not needed, I would reply that extended knowledge can as well mean 'knowledge at time t + n', which also includes potential knowledge about new ignorance, new gaps of knowledge, etc.
11. The lake was named after a village that had been relocated in 1978–9 to give way to the surface mining activities.
12. It needs to be noted that for reasons of clarity, Figure 1 is dynamically simplified. To be sure, variables like non-knowledge or ignorance are autocorrelated over time, since what people know and do not know always depends on what they knew and also did not know earlier.

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