Introduction: 'Moved' Natural Objects – 'Spaces in Between'

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The growth in knowledge of natural history in the 18th and 19th centuries cannot be imagined without reference to objects or specimens and their circulation. In all corners of the globe natural objects were collected and transported to knowledge centres, moved between locations and added to collections. Closely related to these activities is the establishment of scientific spaces, such as the natural history cabinet (*Naturalienkabinett*), the museum and the botanical garden. These are spaces where the specimens ultimately find a permanent setting as scientific and culturally determined objects[1].

It was Bruno Latour who articulated the simple but important question[2], how knowledge concerning distant entities is produced: apart from museums this question guides us to the different cultural activities of acquiring, gaining, preserving, documenting, understanding, promoting and mediating of objects. This increased attention derives from a change of paradigm within the history of science itself. It leads from ideas to practice, and this has brought questions of 'tacit knowledge'[3] into the centre of attention.

Until the point when the collected objects reach a museum location, they undergo a variety of cultural transformations. And they cross physically the vast space between the field and the museum or other institutions such as botanical gardens. The ultimate inclusion of the objects in a museum display is preceded by many different activities that will be investigated here separately from the career of the

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[1] Krzysztof Pomian, Der Ursprung des Museums. Vom Sammeln (Berlin: Wagenbach, 1998); Robert E. Kohler, All Creatures. Naturalists, Collectors, and Biodiversity, 1850-1950 (Princeton, N.Y.: Princeton University Press, 2006); Anke te Heesen and Emma Spary (Eds.), Sammeln als Wissen. Das Sammeln und seine wissenschaftsgeschichtliche Bedeutung (Göttingen: Wallstein, 2001); Nicholas Jardine, James A. Secord, Emma Spary (eds.): Cultures of Natural History (Cambridge: Cambridge University Press, 1996).

[2] Bruno Latour, Pandora's Hope. Essays on the Reality of Science Studies (Cambridge /Mass.: Havard Press, 1999) 306.

[3] Knowledge to Science as Practice, in Andrew Pickering (Eds.), Science as practice and culture (Chicago: The University of Chicago Press, 1992) 1-26.

objects in the museum. These activities are the principal focus of this volume. In order to be able to look away from the museum and offer a better analysis of these operations, I have given them a space of their own that I call 'space in between'. This research strategy will facilitate a new approach to constellations that in the past were not seen as belonging together.

'Space in between' can address the route between the field and the museum, between administration and pharmacy, between different spaces of knowledge (for example between botanical gardens) and other spatial entities (such as ships). I shall explain more fully below how the concept was established. Whatever the case, a variety of different skills and actors are involved in the acquisition and circulation of objects. These include not only the natural scientists, or the different preparation techniques and forms of packing, but also words in the form of instructions, and the documentation and letters that accompany the journey. The different scientific, cultural or public interpretations of meaning can also constitute a metaphorical space that needs to be examined case by case.

In comparison with the flourishing history of collection and the history of museums[4], the question of the movement and transformation of specimens seems to have lagged behind to a considerable extent. Of course, one might argue that the circulation of the objects themselves has been a well-researched field in the context of the investigation of networks[5]. And the growing research into transfer[6] is going in the same direction. In addition there are very many concepts that focus on the mobility of objects. For what purpose do we need the term 'moved natural objects' that I am proposing here, if there are already a range of analytical approaches that are pursuing the same goal? A consideration of the research landscape will help justify my choice of term and distinguish our concept from those that already exist.

The sociologist of knowledge Bruno Latour postulated the immutability of objects when he introduced the term 'immutable mobiles'. Like many other historians of science he does not believe that scientific knowledge is the product of individual

[4] Esp. Andrew Pickering, From Science to For example: Simon Knell, "National Museums and the national imagination", in Knell (Eds. et al.), National Museums: new Studies from around the World (London: Routledge 2010) and Simon J Knell (Eds.), Museums and the future of collecting (Aldershot: Ashgate, 2004); Paula Findlen, Possessing Nature. Museums, Collecting, and Scientific Culture in Early Modern Italy (Berkely: University of California Press, 1994); Andreas Grote, Macrocosmos in Microcosmo. Die Welt in der Stube. Zur Geschichte des Sammelns 1450-1800 (Berliner Schriften zur Museumskunde 10, Opladen: Leske und Budrich, 1994).

[5] See especially: Michel Espagne, Le Transferts culturels franco-allemands (Paris: PUF, 1996).

[6] For example: Martin Stuber, Stefan Hächler and Luc Lienhard, Hallers Netz. Ein europäischer Gelehrtenbriefwechsel zur Zeit der Aufklärung(Basel: Schwabe Verlag, 2005).

minds. Instead, it is the outcome of many activities, distributed across a broad terrain, but conducted through quite specific exchanges or collaboration between both human and non-human actors. 'Mutable mobiles' include instruments, equipment, writing instruments, images, representations such maps and the objects of study themselves, which are brought along on expeditions. All are 'transformations through which an entity becomes materialized into a sign, an archive, a document, a piece of paper, a trace [.....] They are always mobile, that is, they allow new translations and articulations while keeping some types of relations intact'[7]. The characteristic of objects is their mobility, but their immutability will be questioned here. As will be demonstrated in our case studies, immutability is not always guaranteed. For this reason we do not adhere to Latour's stimulating but greatly disputed concept.

In a totally different context, namely in the question of mechanisms of the multi-disciplinary institutionalization of ecology, Susan Leigh Star and James E. Grisam created the notion of a 'boundary object'. This concept was published in an article that has become canonical. Such objects are capable of unifying divergent discourses: 'Boundary objects are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. They may be abstract or concrete in more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key in developing and maintaining coherence across intersecting social worlds'[8]. Whilst Latour places connectivity and the availability of the phenomenon for further research at the centre of interest, what is decisive for Star is the role of the object as an 'interface between different communities of practice'[9]. In our studies, however, we are not concerned with the direct exchange of knowledge between different social communities of knowledge but ultimately with the question of whether the material and documentary aspects of a transfer have any epistemic relevance. Is it possible to determine any relationships between the conditions of the transfer, the techniques of transport and the transformations? Do the processes involved in the mobilization of natural objects, or

[7] Latour, Ibid. 306.

[8] Susan Leigh Star und James R. Grisemer (1989) "Institutional Ecology, Translation and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39", Social Studies of Science, 1989, 19, Nr. 4: 387-420, here 393.

[9] Ibid, "Institutional Ecology" 393.

indeed the containers, have any influence on knowledge itself? Or, conversely, what social and cultural settings condition or result in the mobility of objects?

The concepts of Latour and Star mentioned above are directed at the functionality and potential of objects. Both aspects are significant but are not our centre of attention. In her essay 'Scientific Objects and their Visualization' Anke te Heesen expresses, in this connection, an idea that is considered as fundamental in our studies, 'that motion, not stasis, is the hallmark of these paradigmatic objects'[10]. Irrespective of which of these models is followed or not followed, for us it is important to place the dynamic factor in which objects and knowledge are embedded at the centre of our studies. That is why I call the object 'moved'. And for this reason we have allotted this factor its own space, the 'space in between', where the objects, by virtue of a variety of operations, acquire through mobility their scientific, cultural or economic significance. Together they create a space of one's own. If, in our studies, we follow the path of a natural object as a transformation or translation into a scientific or cultural or economic object, then different practices and local knowledge transitions are at work.

The 'movement' I included in my title is both real and ambiguous: it may be diverse in nature. It can change the nature of objects themselves, position them as cultural or economic things, and alter the material nature of the objects. What factors are involved in these activities in the process of translation, or of transition, is our principal question. Totally different phenomena are identified as 'spaces in between': the spectrum begins with the container, the letter, the package, the plant receptacle in which the specimens were transported. It then passes to knowledge spaces, the botanical garden, the ship - as connected instances and actors - and extends to a variety of different forms of recording, instructions and regulations, which are used to initiate the handling of objects, to escort them or even to replace them. How these epistemic relations are generated, how they connect together and ultimately how they create knowledge will be explained with the help of case studies.

In this volume, therefore, authors focus on developments in the history of science that lead to material culture. The move to 'material culture' has been the trend in a range of scientific fields for many years. Since Peter Galison's 'Image and

[10] Anke te Heesen (2007) "On Scientific Objects and Their Visualization", in: Objects in Transition. An Exhibition at the Max Planck Institute for History of Science, (Berlin: Rainer Kaufmann Ausstellungsproduktion, 2007) 34-37, here 37.

Logic'[11], however, the history of science has also rediscovered 'material culture' as a hobby-horse. Galison determines this in the case of physics through practices that precede the pictures. The material culture of the process of scientific production is manifest, he claims, in the mutual relationship of different entities: 'the engine grease meets up with experimental results and theoretical constructions'[12]. Tools, actors and methods join together in one place and work together as 'mediators between the production of phenomenon and the production of evidence'[13].

Following Galison's approach, in this volume we also direct our attention to the material and medial nature of objects and to the cooperation of different actors, naturalists, objects, spaces of knowledge and documentations. And to repeat, our view leads us away from the familiar spaces of knowledge, away from collections and museums. Apart from these, we shall now consciously address other spaces that are not concerned either with the place of origin of natural objects nor the museum as the final destination for specimen. 'Spaces in between' are found precisely between these two poles or cornerstones. In the following contributions we are mainly concerned with the independent space unit in which elementary processes of knowledge production take place and within which, at the same time, natural objects are transformed into scientific objects. And we are not only concerned with a space, in the sense of a transfer space in which description and labelling are carried out, or a waiting space, such as a harbour, which—in the case of plants—may serve as an acclimatization station, or an anti-room, a corridor or even a storeroom in the repository of a museum. We are concerned, rather, with agendas that are played out in the 'space in between' in relation with connected activities which constitute a space of their own.

With the 'in between' we are orienting ourselves in terms of a sociological concept of space, which understands this as an 'array of bodies set in motion'[14]. The space in question arises from positional relationships. A material–physical substratum is indeed involved in this, but it is simultaneously also determined by collective interaction and action structures, as well as normative regulations, and also signs, symbols and representations. In the 'inter', according to the German philosopher

[11] Peter Galison, Image and Logic: A Material Culture of Microphysics (Chicago: University of Chicago Press, 1997).

[12] Ibid. Introduction, XVII.

[13] Galison, Ibid. 4.

[14] Martina Löw, Raumsoziologie (Frankfurt am Main: Suhrkamp Verlag, 2001)132.

Martin Heidegger, what has been separated becomes close. It gathers and remains joined together[15]. The concept of space is flexible and situationally determined. And it is made up of the particular constellation of space-determining parameters, which constitute the character of the process[16] that we place at the centre of our interest.

The term 'in between' has had a particular history in ethnology and anthropology, but also in political science: it functions as a concept for a global time that is determined by migration and hybridism[17]. The concept of 'in between' constitutes the centre of historical epistemology, and for this I am indebted to a note in a volume that appeared recently under the title *Parasiten und Sirenen* (Parasites and Sirens). In this Bernhard J. Dotzler and Henning Schmidgen refer to a lecture by Hans-Jörg Rheinberger, in which he explains historical epistemology: 'if I were to reduce [historical epistemology] to a common denominator, I would say: historical epistemology - instead of looking, on the one hand, at sapient subjects and their capabilities and, on the other hand, at knowable objects - is now directing its attention to the 'in between'. It looks at the historical-technical, cultural, and so on, - conditions under which and within which the process of knowledge acquisition takes place. It is therefore the investigation of the means and media of knowledge production'[18].

The concentration on the means and media on the path of knowledge is not new. It has also experienced a particular manifestation in the pioneering work of Bruno Latour and Steve Woolgar in *Laboratory Life* (1979)[19]. With the mapping of laboratory architecture (its life between the machines, its forms of recording, proceeding to the so-called 'inscription devices' and the recording media of individuals), knowledge traced by historians of science follows its path as far as publication. The fact that this consists of a series of transformations is central to this approach, as McLuhan, incidentally, had already noted in his classic study: 'a gap is an interface, an area of ferment and change'[20].

[15] Martin Heidegger, Unterwegs zur Sprache (Stuttgart: Klett-Cotta 2007, 14th edition) 24.

[16] Norbert Elias, Was ist Soziologie (7. Auflage, München: Weinheim, 1993, 124).

[17] Claudia Berger and Tobias Döring (Eds.), Figuren der/des Dritten. Erkundungen kultur eller Zwischenräume (Internationalen Forschungen zur Allgemeinen und Vergleichenden Literaturwissenschaft, Amsterdam-Atlanta: Editions Rodopi, 1994).

[18] Hans-Jörg Rheinberger, "Was ist historische Epistemologie?", Colloquium des Max-Planck-Instituts für Wissenschaftsgeschichte, Berlin, Quoted in: Bernhard J. Dotzler und Henning Schmidgen, Einleitung zu einer Epistemologie der Zwischenräume, in Parasiten und Sirenen (Bielefeld: transcript Verlag, 2008)7-18, here 8 und 9.

[19] Bruno Latour and Steve Woolgar, Laboratory Life: The Social Construction of Scientific Facts (Beverly Hills: Sage Publications 1979).

[20] Marshall McLuhan, Culture Is Our Business (Toronto: McGraw-Hill Book Co., 1970) 70.

In their article 'Seeds of Knowledge' Annalisa Managlia, Umberto Mossetti and Ariane Dröscher investigate the epistemological and technological implications of the exchange of seeds, by analysing letters and botanical gardens as 'spaces in between' and as actors that facilitate the interplay between various locations such as Egypt, Bologna, Turin and Uppsala. The objects passed on in the form of seeds cannot be understood as 'immutable mobiles', and this is shown most emphatically in the study: for the seeds that are cultivated in the garden modify knowledge, produce varieties of plants and in this way expand the findings and the taxonomy. Mobile seeds do not only function as tools to solve open questions; it is rather the case that they themselves pose questions.

In my own essay I am also concerned with examining the global transfer of plants to botanical gardens. Taking ships, notions of paradise, islands and containers, I see all of these as instances of transfer and systemically linked 'spaces in between'. Their common features I ascertain in the cognitive defence against a surrounding but different nature to which they are exposed. This paradigm of permeability that determines the ship, gardens and Islands may be seen, with regard to the construction of the containers for live plants, as an obstacle to an innovative solution that was only to be found later with the Wardian case.

Marcelo Fabián Figueroa's study is also concerned with plants, which admittedly were brought from the colonies to Madrid either alive or already prepared into medical products such as balsam. Instructions and catalogues of questions initiated and guided these operations along scientifically intended paths. They are part of a process of regulation that determines not only the transports themselves, but also the administrative reform and the centralization of the government. The transport of scientific evidence was related to a complex administrative body that transformed unknown unstable products into scientifically and also commercially useful objects, which we may describe as 'entangled'.

Kurt Schmutzer, in his study, concentrates on 'Collections in the Making', which he characterizes as a 'Metamorphosis between field and museum'. The journey to Brazil of the Austrian natural history researcher Johann Natterer, which lasted 18 years and acquired thousands of specimen (for example 12293 birds), included numerous different practices: hunting and annotating, preservation in alcohol and dry form, transportation and shipping. The collector tried to maintain control of the collected specimen on the way because it was managed by traders and diplomats. Therefore the dispatches accompanied by different types of documentation (reports,

letters, sketches, notes, labels and inventories) were not to be opened during transportation so as to preserve the identity of the specimen. The high point of a series of interventions that culturally determined the natural objects consisted of the ultimate provision of glass eyes, which were acquired in Venice.

A completely different approach to our topic is to be found in Bernhard Fritscher's study of the *Heidelberger Mineralien-Comptoir* - the first leading European mineral shop. He asks through what uses the new space of dealing with minerals was established. Its result was located between the scientific, economic and public/popular spheres and their implications. He shows how the increase in mineral dealing was determined by the Biedermeir culture, with its notion of paedagogy and its profound interest in teaching and education. But this new space of dealing would not, in itself, be successful if it were not generated by public handbooks in mineralogy and promotion in journals and catalogues that made the minerals accessible. In this respect he identifies the transformation of minerals as a new economization of objects/nature that does not relate to economic or practical application but rather to a significant role within a cultural practice of collecting.

In general terms the studies support the idea that the concept of 'spaces in between' is extremely useful as an analytical category. It helps to put together essential features of the process of growth of knowledge in natural history and facilitates an understanding of how it could be so successful during the 18th and 19th centuries. If the dynamic of knowledge production in natural history is to be linked not only to ideas and theories but also to such ephemeral phenomena as packaging, transport and transformations, then these entities are also embedded in a further field of material culture and practices. Interwoven with actors and different forms of documentation they are part of a complex 'entangled'[21] history of the 'Coming into Being of Scientific Objects'[22]: and its knowledge, and this probably takes place - as is shown in our examples - outside familiar institutions such as the museum.

[21] Nicholas Thomas, Entangled Objects: Exchange, Material Culture and Colonialism in the Pacific (Harvard: Harvard University Press, 1997).

[22] Lorraine Daston (2000) "The Coming into Being of Scientific Objects", in Lorrain Daston (Eds.), Biographies of Scientific Objects (Chicago and London: The University of Chicago Press 2000) 1-14.