What is an approach in science?[1]

Robert Meunier

(https://orcid.org/0000-0002-4026-6167)

In this paper, I first introduce the question of actors' vs analysts' categories. I then provide an explication of the concept of an *approach* that captures the use of the term by scientists and will be useful for philosophers, historians, and sociologists of science to analyze research in the empirical sciences. For this purpose, I lay out some preliminaries for a successful explication, provide a definition as the core of the explication, and assess the adequacy of the suggested explication. Finally, I point out some historical, sociological, and philosophical dimensions of approaches that can be addressed by means of the analytic category introduced by means of the explication.

From actor's categories to analysts' categories

The term "approach" is an actors' term - researchers routinely speak of "approaches". They promote their approach in their writings and distinguish it from other approaches in their field. A commonly used term does not always indicate an actors' category, that is, a concept shared by those using the term. I will argue here that in the case of the term "approach" this is indeed the case, however, and that explicating the underlying concept is useful for the historical, philosophical, and sociological analysis of science.

Historians or sociologists identify actors' categories in an attempt to describe the cultural and social worlds of the communities they analyze. These categories are presumably important units in the cognitive and social practice of the actors in that community, but they are not necessarily most relevant regarding the epistemic aims of the analysts in terms of the explanations and classifications, or the general understanding of historical and social processes sought. Analysts thus use their own concepts to further characterize the functions of the units identified in the worlds of the analyzed community. This practice always bears the risk of anachronism, epistemic imperialism, and other ways of imposing the categories of the analyst's cultural and social world on the analyzed world. Yet, bringing in concepts attuned to the analyst's epistemic aims seems unavoidable and when the terms are well defined and the categories construed as generic, i.e., as applying to all societies and communities, then the practice is widely seen as acceptable – but assessments differ, of course, within and among practitioners of history, sociology, or anthropology.

Analytic categories, even if they become seen as generically applicable, are typically originally derived from the cultural and social worlds of the analysts, that is, they often were categories recognized by actors in the broader communities in which the practice of analysis emerged. For example, generic categories such as *power* as used by Western sociology emerged from conceptualization of social relations in Western societies, but is now widely seen as universally applicable. Accordingly, it can be assumed that also actors' categories of a community under analysis can in principle ascent to become analytic categories used by analysts looking at a community from outside.

A given term might be used to refer to very different situations by the actors in an analyzed community. Identifying an actors' category then requires separating the various meanings. Turning it into an analytic tool, furthermore, requires selecting one meaning, preferably such that it covers

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several specialized uses of the term. Additionally, analysts will connect the concept such derived to several other analytic categories that they use routinely, which might or might not originate from the language of the analyzed community, in order align it with the epistemic goals of their analysis.

When philosophers of science turn to a vague concept used by scientists, they often aim to *explicate* the concept. This procedure can be applied both, to concepts referring to natural objects, properties, or processes, as well as to methodological or epistemic categories, such as explanation. Typically, the aim of explication is the improvement of a conceptual system and hence it is often taken to have normative implications for the scientists, whose use of the concept is analyzed. However, also when a concept is transformed from an actors' category to and analysts' category and is meant to serve only the conceptual needs of the analyst, without necessary implying consequences for the original users of the concept, the procedure of concept formation (separate and select meanings; connect concepts to others) is similar to explication. Thus, I suggest philosophical explication here as a method for obtaining analytic categories from actors' categories. While in this case explication not necessarily has normative implications for the actors, it has normative force for other analysts who wish to follow the analyst who introduced an actors' term into the analytic language of their community – but there is also always room for fellow analysts to improve or replace the suggested explication.

Explication: Preliminaries

Before giving an explication of "approach", some preliminaries are in order (Cordes and Siegwart n.d.):

1) This is about the use of the term "approach" by scientists since the beginning of the 20th century and potentially by philosophers of science or other science studies scholars – the explication is not meant to apply to other contexts of use.

2) Explication is required and justified for the analyst, because the use of the term by scientists is not tailored to the epistemic aims and discursive habits of philosophers and other scholars of science. An explication might also be useful for scientists themselves, in order to improve their methodological discourse. But an explication for this purpose might look differently.

3) The explication suggested here is meant to serve an integrated history, philosophy, and social studies of science agenda. But these science studies disciplines might have different needs and sometimes require an explication with different emphasis.

4) The use of "approach" by researchers is vague and ambiguous. For instance, "approach" is sometimes used to refer to theoretical accounts, sometimes for methods (and here also on various levels of generality); sometimes it is used broadly to indicate the specific character of one discipline *vis a vis* another; sometimes narrowly to refer to the particular work of a researcher or group.

5) When researchers speak of approaches, they do not speak of their subject matter (natural objects or processes), but about how to study it; approach is thus a methodological concept.

6) In many cases, "approach" seems to be used synonymously with "method". However, the term "method" is used for many things on many levels, from the use of an instrument to an inductive procedure. I will argue here that while an approach is characterized by a method, the term "approach" refers to more than method.

7) Most often researchers speak of "an approach to the problem of xyz", but sometimes they use other formulations such as "an approach to the phenomenon of xyz".[2]

8) As mentioned, an explication should involve analysts' categories – some generic, such as "community", some derived from other actors' categories, such as "experimental system". An explication will also describe the place of the concept in question in the discourse of the actors whose cultural practice is analyzed. This then might require further explication of other categories used by these actors (leading to a potentially endless string of explications to reconstruct the language of the analyzed community). In this case the terms "problem" and "method" will be central, which are also actors' terms, and which are used in a vague and ambiguous manner as well. However, as the is already more philosophical literature on these categories, they can be characterized in the context of the explication of "approach" without providing a full explication of these terms.

9) Regarding previous work, it should be mentioned that Ken Waters (2004) has characterized the special case of the genetic approach pursued by the Morgan school as an "investigative strategy", which could be applied to many problems. While Waters does not provide a full explication, it will be seen that my conception is emphasizing different aspects.

With these preliminaries in place, a definition can be suggested in order to introduce the concept of an approach into the language of analysts of science working with the spectrum of history, philosophy and social studies of science.

Explication: What is an approach?

If "approach" is the explicandum, the vague term used by researchers, I suggest as explicatum the following definition:

Def: A practice constitutes an (novel) approach if it constitutes an (novel) alignment of a problem and a method.

As the explication should help to identify and distinguish approaches it makes sense to think of the definition in terms of *novel* approaches. Developing a novel approach then is a reciprocal and iterative process of interpreting a problem, such that it can be addressed by a specific method and simultaneously to assemble a method that can be used to address the problem such interpreted.

To specify further, method as understood here has two components, an abstract study design or what I call a methodological schema (Meunier 2019) and a material research system that can implement the design – in many cases this will be an experimental system (Rheinberger 1997), but it might also be a field observation setting or a computer simulation. An example of a simple methodological schema in genetics could be MUTAGENESIS AND SUBSEQUENT PHENOTYPIC SCREENING which might be seen as sub-type of the more general schema that Claude Bernard called "experiment by destruction" (Bernard 1957, p. 8). The schema could be implemented in an experimental system comprising a model organism, x-ray mutagenesis, and an apparatus for measuring, say, behavioral phenotypes.

A problem as the term is used here is shared by a community and hence often rather unspecific. A problem is not always puzzle to be solved, but often simply a research topic. But in the empirical sciences the formulation of a problem carves out a domain of phenomena. Phenomena might be recognized as part of a pre-scientific rendering of the world or in terms of previous scientific

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[2] A *Google Scholar* search for these phrases, for instance, shows a marked difference with 19.000 hits for "an approach to the problem" and only 450 for "an approach to the phenomenon".

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conceptualization. "What are the causes of behavior?" might be such a problem shared by the communities of psychologists and ethologists at a given time.

To interpret a problem means to develop a more specific and answerable question (cf. Elliott 2020). Such a question can be derived by applying an abstract goal schema to the problem, which specifies a kind of outcome, that is a kind of thing that can be known about the phenomena, such as "Which parts does it have?"; "How are the parts located relative to each other?"; "Which mechanism constitutes the phenomenon?"; "How can its instances be classified?" etc. (Meunier 2019). As a problem carves out a domain of phenomena such specification according to a goal involves choosing specific aspects of a phenomenon as relevant.

The interpretation of problems and the assembly of methods are coordinated by the fact that goal schemata and methodological schemata are often cognitively associated according to the respective socialization of researchers. They can be more or less specific, and they can be combined into more complex goals and associated ways to achieve the kind outcome specified in the goal schema.

Approaches thus understood provide material and representational access to phenomena. To approach a phenomenon means to bring oneself in a position to interact with it. This is in some sense a generalization of Rheinberger's (1997) account of epistemic objects in an experimental system. By applying an experimental or observational method to a phenomenon specified in a certain way, objects (broadly conceived) are differentiated and relations obtaining between them are singled out; thereby objects and relations are made accessible for interaction, as well as for reference of concepts or images.

It is important to note that approaches are typically an outcome of a research process, not the starting point – the alignment is the result of an iterative process, and this implies that goals which are derived from applying goal schemata to problems can change!

Finally, approaches are realized in individual research projects, which are historical episodes in which an individual or a group addresses a problem with the aim to deliver some result. So, developing an approach is often the same process as designing a research project. Addressing the process as project design, however, emphasizes its dependence on and sensitivity to the material and social dimensions of local research settings. Speaking of the development of an approach instead, puts the focus on an abstraction from the concrete implementation: Approaches are seen as universally applicable to a type of problem. Other researchers can pick up an approach and transfer it to their own project, situated in different material and social settings.

Explication: Criteria for adequacy

Classical criteria for adequacy of explications according to Carnap (1950) and others are similarity, regularity, fruitfulness, and simplicity. Prima facie, the explication of *approach* suggested here is simple enough, provided that the brief discussion of the concepts of *problem* and *method* are sufficient. I would also claim that the definition at the core of the explication captures the use of the term by researchers in most cases and could replace the term.[3] In this respect it is important to point out that the definition is scalable. It captures very coarse problem-method alignments that scientists point to when contrasting disciplines, as much as those that constitute idiosyncratic research projects. Finally, I believe that my abbreviated explications of the terms of the explicatum, that is of "problem" and "method" guarantee a regular use of the explicatum.

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[3] This is of course an empirical question and should be shown by discussing at least a few examples that can be argued to be representative.

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So let me then say just a few more words about what fruitfulness could amount to in this context:

a) As already mentioned, an explication should help to identify novel approaches and distinguish approaches in a field. This can be achieved by focusing on the specification of or shift in the understanding of problems recognized in a community, and by analyzing the research systems and the methodological schemata they instantiate.

b) Given the prominence of the practice turn in recent history, philosophy and social studies of science, the explication of approach should help to pursue this agenda. The suggested definition does so as it focuses on methodological schemata and their implementation in research systems. It also emphasizes the fact that science (esp. biology) is often organized around problems rather than overarching theories as shown for developmental biology by Alan Love (2014).

c) Finally, I would argue that an analytic category, in this case a philosophical concept of approach, should serve not only the description, classification or explanation of the practice of researchers, but also its interpretation and understanding. How this goal is achieved will become clearer when discussing the philosophical implications of the concept (see below).

The value for HPSS

I hope that the fruitfulness of the newly introduced analytic category will become clearer as I turn to its significance for questions pertaining to the historical, social, and philosophical analysis of science.

History

The suggested explication of approach facilitates the micro-historical study of a researcher or group. It structures the analysis, by highlighting the two components of the explicatum, problems and methods, and their respective characterizations in terms of goal schemata, questions, and specified aspects of phenomena on the one hand, and methodological schemata and research systems on the other hand.

In this way, analysts become sensitive to how the differential reproduction of experimental (or, more generally, research systems), or the more dramatic hybridization of such systems relate to re-formulations of a problem or new characterization of phenomena (Rheinberger 1997). The elements coming together in an approach, both conceptual and material, can be traced back by paying attention to the biographical, disciplinary trajectory of researchers or the various fields from which they might draw as outsiders. Approaches often develop in various stages over the course several sub-projects resulting in various publications. The explication then helps to track the extensions, drawbacks, and revisions in the articulation of an approach.

When concrete research projects exhibit considerable novelty in their approach, they can function as a paradigm - in the sense of exemplar - for other research endeavors. Often a new field emerges from a new account to problems recognized in previously existing fields, and fields diversify when approaches diversify. In this way an analysis of approaches connects micro-histories with macro-histories concerning the dynamics of the formation of research fields.

Sociology

Regarding the social analysis of science, the usefulness of the category of an approach can be specified as follows:

Part of the work of developing an approach is to justify and promote it in the light of other approaches. Thus, researchers not only position themselves towards the subject matter of their

research, but thereby also towards projects by other researchers or their own previous projects. By distinguishing their approach from others, researchers thus position themselves within or towards one or several communities. To address this aspect, it is helpful to turn to position theory as it has been advanced by Rom Harré and co-workers. This makes clear that positioning always involves defining a relation: for instance, the new generation vs the old generation etc. Furthermore, this account emphasizes the re-description involved in interpreting problems and how this goes hand in hand with arguing for what should be seen as relevant and thus be supported by a community or other actors such as funders. As van Langenhove and Harré write:

> Adopting a 'position' involves the use of rhetorical devices by which oneself and other speakers are presented as standing in various kinds of relations. […] In discursive processes two essential things happen: (i) people position themselves and others and (ii) people present versions of the material and social world by means of rhetorical redescriptions. (van Langenhove and Harré 1993, p. 3)

An analysis in terms of approaches can also facilitate analysis in terms of controversies, which constitutes a central method for the sociological and philosophical study of science (REF). Researchers can disagree about the most appropriate approach but also see each other as contributing in a pluralistic and complementary manner to addressing the problem by pursuing different approaches. In such situations it crucial to understand not only the differences in the respective research systems, but also in the interpretations of the problem which they are meant to address.

Philosophy

Theoretical representations have been described as perspectival, in that they denote aspects of the world to the expense of others (Giere 2006). This philosophical concept is built on a perceptual metaphor; perception, however, remains distanced. Furthermore, philosophical discussions of perspective typically emphasize theory (Massimi 2018).

The term approach itself has a metaphorical origin; as a verb it most often means "come nearer to". Thus, unlike the perceptual metaphor of perspective, the notion of an approach emphasis an agent's involvement and embodied interaction. To approach an object implies to move towards it from a given vantage point and direction and to access it in a specific and selective manner. That phenomena are understood from a theoretical point of view requires that they are approached and made accessible from a 'point of action' in the first place. An approach enables and limits, but also orients a theoretical perspective. Hence the concept of an approach an approach introduced by the explication promises to bring current discussions of perspectivism closer to scientific practice.

Conclusion

In conclusion, this paper argues that it is useful for historians, sociologists as well as philosophers of science to pick up central actors' categories and turn them into analysts' categories, i.e., into conceptual tools that can be used to trace, explain, or understand processes of knowledge production in the sciences. Furthermore, the philosophical method of explication is shown to be adequate to the task of facilitating this transformation of categories. Finally, the actors' category of a research approach is subjected to an explication in order to derive a concept useful for historical, sociological, and philosophical analysis of science. The category is central to many empirical sciences. It is shown that the explication of the concept of an approach serves the goals of analysts from the history, sociology ad philosophy of science. While the ideas presented here have been derived from the analysis of research in the biological sciences, it can be expected, that the suggested explication will be useful also in the analysis of other sciences.

References

Bernard, C. (1957). *An Introduction to the Study of Experimental Medicine*. Courier Dover Publications.

Carnap, R. (1950). *Logical Foundations of Probability*. University of Chicago Press.

Cordes, M., and G. Siegwart (n.d.). Explication. In: Internet Encyclopedia of Philosophy. Retrieved July 27, 2021, from https://iep.utm.edu/explicat/

Elliott, S. (2020). Research Problems. *The British Journal for the Philosophy of Science*, 1-28. https://doi.org/10.1093/bjps/axz052

Giere, R. N. (2006). *Scientific Perspectivism*. University of Chicago Press.

Love, A. C. (2014). The erotetic organization of developmental biology. In A. Minelli & T. Pradeu (Eds.), *Towards a Theory of Development* (pp. 33–55). Oxford University Press.

Massimi, M. (2018). Four Kinds of Perspectival Truth. *Philosophy and Phenomenological Research*, *96*(2), 342–359.

Meunier, R. (2019). Project knowledge and its resituation in the design of research projects: Seymour Benzer's behavioral genetics, 1965-1974. *Studies in History and Philosophy of Science Part A*, *77*, 39–53.

Rheinberger, H.-J. (1997). *Toward a History of Epistemic Things. Synthesizing Proteins in the Test Tube*. Stanford University Press.

Van Langenhove, L., & Harré, R. (1993). Positioning in scientific discourse. In R. Harré (Ed.), *Anglo-Ukrainian Studies in the Analysis of Scientific Discourse: Reason and Rhetoric* (pp. 1–20). Edwin Mellen Press.

Waters, C. K. (2004). What was classical genetics? Studies in History and Philosophy of Science, 35(4), 783–809.