Forms of practice, Forms of knowledge

Research project (2018-2021)

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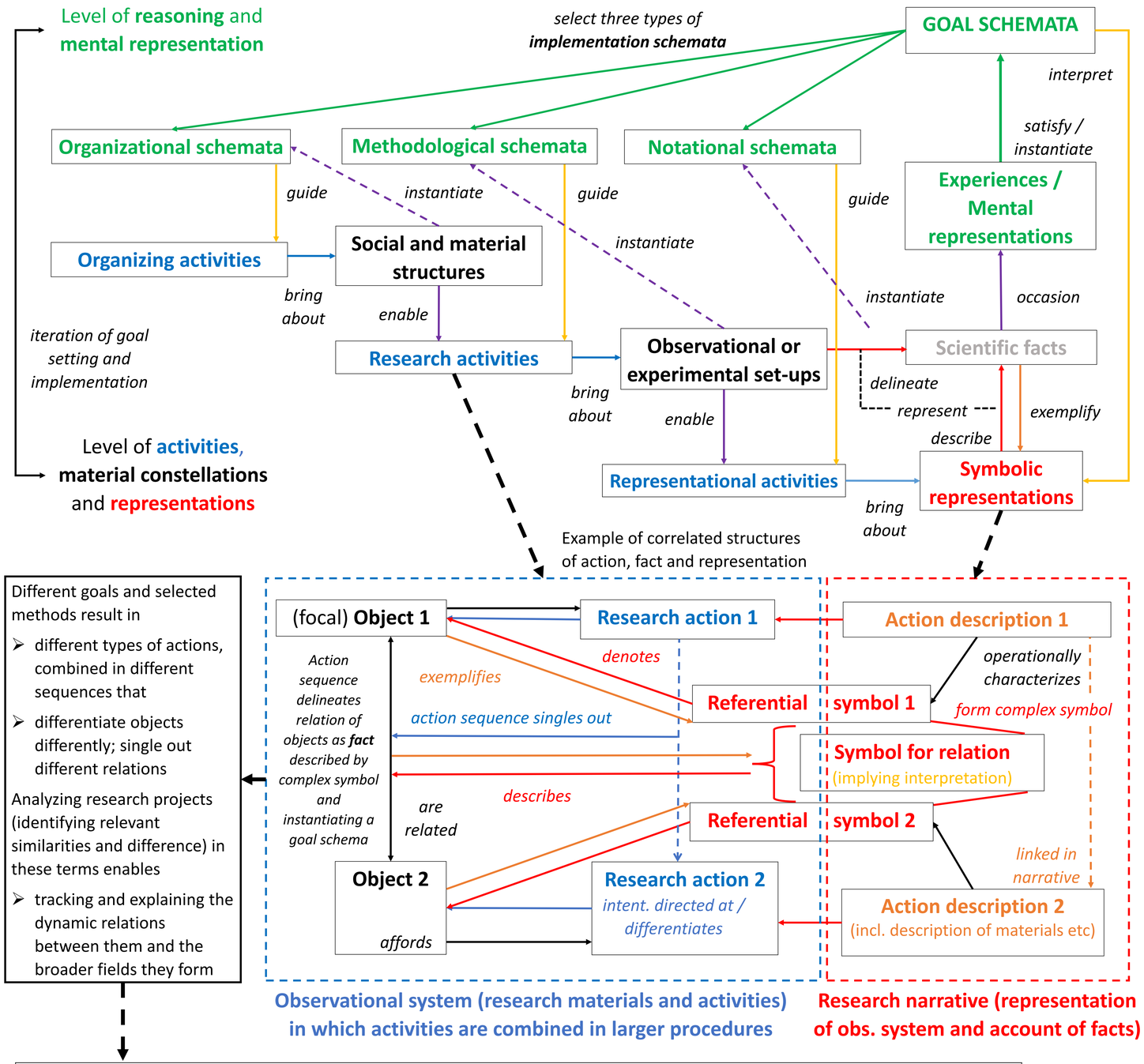

Dynamic relations between research projects/fields	
Result regarding the research landscape	Processes in which differences in the forms of practice (activities) and resulting forms of knowledge (represented facts) play out
Diversification	*Novelty, Change, Divergence*
Tension	*Ignorance, Competition, Controversy*
Productivity	*Transfer, Translation, Collaboration*
Unification	*Dominance, Integration, Universalization*

→ New models of scientific change

Introduction: Toward a theory of scientific practice and new models of scientific change

Much has been achieved since philosophers of science (along with other science studies disciplines) have turned to practice (see e.g. Soler et al. 2014). Some authors have focused on reasoning in practice and were able to throw new light on questions concerning conceptual change, explanation, and theoretical modelling. Others have investigated the role of material practices involving research materials, material models, instruments, and images. Hasok Chang has suggested to treat epistemic activities and how they are organized in systems of practice as units of analysis (Chang in ibid.). This project takes a similar vantage point, but concentrates on those features of actions that endow aspects of the material world with semiotic qualities by individuating objects and isolating relations and thereby establishing a reference relation between representing and represented aspects. This makes referents available to function as exemplars of objects and relations of that kind. The project also investigates the kinds of knowledge that inform epistemic activities. Such a model of research processes should enable a comparative view on research projects in terms of the forms their practices and the resulting knowledge take. This would facilitate the construction of models of the dynamic relations among projects and among broader fields that constitute scientific change. The project focuses on case studies from the life sciences.

Project knowledge informs scientific activities

Research typically takes the form of a project, which is planned and carried out in a social or institutional setting (e.g. university dept.) by one or more researchers, in a (set of) sites (field, lab, office, etc.) and based on some form of infrastructure and material resources (collections, instruments, etc.). Two kinds of "project knowledge" can be distinguished that guide the activities necessary to design and pursue a project: goal knowledge and implementation knowledge (referred to as "schemata", indicating their structured nature). A project is typically guided by some kind of goal. Goal schemata help to generate research questions, they specify the type of result to be achieved, i.e. what can possibly be known about a research subject (e.g. a mechanistic explanation or a taxonomy). That seems to hold true also for exploratory projects; even unprecedented events happen in contexts of planned activity and result in an iterative readjustment of goals. Failure to achieve a goal results in change of goals or adjustment of activities.

Implementation knowledge consists of a) methodological schemata, which suggest possible approaches to achieving the kinds of results specified by a goal schema; b) organizational schemata which characterize possible strategies for establishing, choosing, or navigating material infrastructure, social rules, and institutions that enable the methodological approach; c) notational schemata which characterize the media, symbol systems, and formats of notations that can be used to express knowledge as specified by the goal schema and to represent methods. Project knowledge is often transferred from one context to another (Meunier, in press).

Activities result in social, material and symbolic constellations that represent scientific facts

Organizational activities guided by implementation knowledge bring about infrastructural and social configurations that enable research activities in the narrow sense. The latter result in specific observational, experimental, or modelling set-ups that involve samples of the materials of interest (or adequate substitutes), instruments for manipulation or measurement, and other materials and devices. These set-ups embody interventions or recordings and possibly generate several inscriptions that together delineate a fact (say, a causal interaction or a similarity relation between objects), or an interrelated set of facts (a mechanism, a taxonomy), and enable the representation of research activities (incl. materials and methods), as well as accounts of facts in the form of text, diagrams, tables, etc. Scientific facts as delineated in material constellations and described in notational systems occasion an experience and mental representation of the fact that satisfies the goal schema, i.e. the fact, as represented, is seen as an instance of the type of result anticipated. This and the exemplification of terms used in the description by the objects and relations that constitute the fact opens the possibility to perceive the fact thus delineated as a tokens of a type of phenomena.

The structure of research activities, facts and representations are correlated

Research activities are structured. They comprise sequences of actions that are typically intentionally directed at objects (broadly construed) – even if an object is not known beforehand, an action is often performed under the assumption that there is an object that affords the action. This already indicates that it is often the action itself that differentiates an object within a previously undifferentiated material realm (e.g. as that which is changed by an intervention). Even when objects have been previously differentiated, an action selects objects from a set of possible targets. Actions linked in a sequence may be directed at the same object at different times or at different objects. In any case, the actions establish a connection between their targets. Accordingly, depending on the types of actions and the way they are combined, a relation between objects might be singled out. If it instantiates a relation as specified in a goal schema, it is perceived as a fact – activities thus structure experiences that can satisfy the schema.

Objects differentiated by actions directed at them become available for the application of referential symbols (which are part of sets of labels that delimit each other in their extension). The objects now function as symbols themselves – they exemplify the labels that denote them (Goodman 1976). Relations between objects singled out by sequential actions can be expressed by appropriate symbols, which often provide an interpretation of the relation implied in the goal schema. The complex symbol formed by referential symbols and symbols expressing the isolated relation describes a fact. The objects related in a particular way exemplify the fact as described by the complex symbol, making it available for other researchers to acquire the goal schema by example. Research reports typically consist in a narrative that combines descriptions of activities (including the research materials etc.) and an account of the facts delineated by these activities. Action descriptions can function as implicit operational definitions of the objects denoted in the accounts of facts. Action descriptions also enable other researchers to derive methodological schemata.

If activities are part of larger research procedures, a series of activities can apply to the same object, for instance subjecting it to a series of treatments. Analogous to the topic in a larger unit of discourse comprising several sentences, the focus of a procedure can remain on one object or shift to another object, e.g. when a part of an object becomes the new focus of investigation.

Outlook: The dynamic relations between research projects and fields and new models of scientific change

Based on the above model, it should be possible to analyze how *different* research projects 1) are informed by different goals, methods, organizational strategies, and notational conventions; 2) accordingly, become embodied by different types and patterns of activities, resulting in different objects being differentiated and relations being isolated; 3) result in differently structured complex symbols representing facts and methods. This analytic apparatus should enable the articulation of similarities and differences between research projects regarding the ways forms of practices shape forms of knowledge (and thus of different perspectives).

This, of course, needs to be combined with a comparative identification of the domains of phenomena that are the subject matter of research. For instance, domains of research might be perceived as shared among groups pursuing different goals, e.g. due to a shared commitment to preceding research and the way it differentiated objects available for further study. Such an analysis will provide accounts of various relations between such projects or between research fields centered on or combining various project types. Identifying types of relations (diversification, tension, productivity, unification) should result in models of scientific change that enable mapping the dynamics that characterize the development of science beyond simple linear models (see table to the left).

References

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