Linking theoretical content and context: a carrier-trait approach

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Longitudinal and large-scale studies of scientific knowledge, addressing evolution have challenges. Approaches vary on how they break up meaningful chunks of intellectual history and patterns of activities. Most philosophical accounts opt for crisp and clear delineation of propositions (akin to the statement view) or conceptual and modelling spaces, while historians and sociologists moved from etics to emics, gradually abandoned paradigm and épistémè, and at present modestly indulge in large-scale cross-cultural studies of science. How are we to tackle the dynamics and complexity of long-term developments, to account for change, novelty, variation, and spread? Darwin's evolutionary theory deconstructed the very structure that provided the entry point for the research: stability of species and Linné's system of classification. 'Theory' might be one of the endangered notions, and the question is pertinent: does it have a place in an account of the evolution of knowledge?
What are the suitable frameworks that connect case studies and large-scale analyses, link our abstract notions of theories, tangible artefacts of scientific activities, and changes in our cultures? Reconstruction of theoretical content is typically carried out using static and atemporal frameworks, focusing on the language of science and with little regard to novelty-aspects (like neologisms, representational inventions). As smart and definitive readings (like "Maxwell's theory is Maxwell's system of equations") are often not available, it is probably ill-advised to start the analysis of the theory from an assumed structure (expressible as a set of formulas, or a mathematical object). Tackling the problem has been on the agenda for quite some time (e.g. Vicker's theory-eliminativism), but the uptake of a theory (and knowledge-mobilization in general) is complex, wide-ranging, often graded. To give some examples: It could be a culturally relevant fact that Kant's forehead on average increased over time on depictions in his lifetime, but would this fact connect to some theory? It could be a culturally relevant fact that 18th century books on optics had more triangles among the diagrams, while 17th century authors used more circles, and would this fact not connect to technological developments and/or to the uptake of some theory?

To study theory-acceptance and the often co-occurring process of opinion-polarization the talk offers a permissivist framework, linking carriers via traits to theory. In a deliberately broad definition, carriers are scientific representations, parts thereof, or composites of them, targets of an interpretation-process. A carrier is an external (non-mental) representation, akin to some speech act, yet it can be a whole book, or just a part of a diagram or sentence. A trait is a distinctive or distinguishable feature, corresponding to some act of making distinctions between carriers. A trait can be a trait of carriers, as well as of the theory or of the evidence in some formal sense. In short, instead of assuming some type of content (a propositional structure, a conceptual space, or a mathematical object) to reconstruct the theory, and thus provide a paraphrase to stand for the theory, I look at traits that are delineable when studying the carriers of a theory.

The theory picked for analysis is Newton's optical theory, one of the most successful scientific theories ever, but one that cannot be easily reduced to equations or formulas. The question is far from trivial: what was/is it? It is hard to think of Newton's optical theory as an easily delineable entity, the union of all his optically related writings is possibly inconsistent. The theory is a dynamic conglomerate of carriers of content, including diagrams and mathematical idealizations, temporally changing, responding to new data, literature, and criticisms received. The uptake of the theory shaped our view of the world, how we think of Light, and how we draw optical diagrams (e.g. the proliferation of parallel rays inside a camera

obscura, and the decrease in the Sun's size in proportion to the chamber on camera obscure drawings in the 18th century). The reconstruction develops an artifact-human-artefact knowledge-mobilization process, building on an externalized interpretation of positions (argumentative utterances), studying commitments and carriers of epistemic content (diagrams), not assuming that frames of reading (interpretation) are fully controlled by the agents. As a point of departure I focus on some of the innovations that become conventionalized, like the 'spectral image' and neologisms, items introduced to the lexicon (spectrum, refrangibility). The perspective helps reconstruct novel traits of Newton's optical theory, and enables mapping strands of uptake. The analysis shows that presence or omission of a trait can be linked to disciplinary or genre constraints (institutionalized social and discursive contexts). From progenitor carriers different cultures of reading, representing, interpreting, and evaluating the theory emerge (a historical theory is a manifold). Trait-analysis shows that rejection often travelled with partial acceptance (late critics were partly converted to/by the theory), and that multiple readability (ambiguity) of carriers facilitated the spread of competing views.