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To the Examining Committee:

I have read the synopsis of Vitaly Pronskikh's dissertation, "Epistemological and Social- Ontological Problems of Contemporary Physics Experiments," and I strongly recommend approval of the dissertation. Vitaly correctly notes that the nature of experiment and its presentation has changed dramatically from the time of Galileo's classic experiments to contemporary experiments in high-energy physics. The increasing complexity and size of these modern experiments has led to changes in both the epistemological and social aspects of experiment.

One issue that Vitaly deals with extensively is that of theory-ladenness. This is the idea that an experiment is so laden with the theory of the phenomenon under investigation that no real test of that theory is possible. This issue affects both the experimental design and the analysis of the data and the worry is that it will affect the results. Thus, the CMS and ATLAS experiments at the Large Hadron Collider were explicitly designed to search for the Higgs boson. The fact that these experiments produce more data than can be recorded poses serious problems for both data acquisition and analysis. In the case of the Higgs boson, the properties of the Higgs were sufficiently well known that one could design a trigger system, both hardware and software, to select events of interest. One of the purposes of the LHC, however, is to search for physics beyond the Standard Model. That physics is unknown and this is a difficulty for both data acquisition and data analysis. How does one select the events of interest?

The presence of Monte Carlo simulations and calculations has been an essential component of high-energy physics experiments since the 1960s. This again raise the issue of theory-ladenness. These simulations depend crucially on both the theory of the phenomena and the theory of the experimental apparatus. Vitaly's own work as a computer scientists makes him ideally suited to discuss this issue.

The large size of experimental groups, the CMS paper on the discovery of the Higgs boson has 2897 authors, has changed the social structure of experimental groups, a problem that Vitaly has dealt with. Questions such as who is to be an author on a paper and who decides what the result of an experiment creates quite different issues for a paper by a large experimental group than does a single-author paper or one by a small group. Vitaly adopts the tripartite division of labor suggested by Peter Galison: experimentalists, theorists, and instrumentalist. Each of these groups has different areas of expertise and this has interesting consequyences for the production of an experimental result. This requires new levels of collaboration and cooperation.

The synopsis also demonstrates that Vitaly is aware of virtually all of the important recent work on the philosophy of experiment. He has also discussed the differences between the social constructivists, such as Andrew Pickering, and the empiricists such as myself. I note, in passing, that the synopsis indicates that Vitaly does not always agree with me. I also believe that the case studies Vitaly has chosen, the Gargamelle experiment on weak-neutral currents and the discovery of the "charmed" quark are well suited to illustrate the issues Vitaly has selected.

I might add that Vitaly's recent article, "E-36: The First Proto-Megascience Experiment at NAL," a very high-quality paper, deals with several of the questions in the dissertation. I have also had several conversations with Vitaly and I have always found his comments valuable.

Very truly yours,

Allan Franklin
Professor of Physics
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This document has been subscribed and affirmed, ~~or sworn before~~ me in the County of Boulder, State of Colorado, this 19th day of April, 2017
My Commission Expires 10/11/2017

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