GP 3: Dirty Physics

This session consists of two speakers and a commentary by Richard Staley.

Time: Tuesday 14:00–15:30 Location: ELP 3: HS 2.33

GP 3.1 Tue 14:00 ELP 3: HS 2.33

Cleaning a Dark Matter Detector: Contamination and the Limits of High Energy Physics, 1980-2020 — •Jaco de Swart — Massachusetts Institute of Technology, Cambridge, MA, United States of America

In dark matter detection experiments, Xenon tanks are being used to find traces of dark matter particles that are hypothesised to crisscross the universe. For such detection to succeed, the Xenon in the tanks has to be clean. But what is clean? In this context, it means that no background mimics the signs of dark matter particles. In practice, such cleanliness is difficult to achieve – as soaps may be radioactive, steel may spread electronegativity, and humans are altogether dangerously filthy. In this talk, I discuss the idiosyncratic cleaning practices of the XENONnT experiment, and I place them in the context of the history of dark matter research. What does ensuring a detector's cleanliness entail? And how does one know whether the detector is, in fact, adequately clean? I particularly address how the XENONnT experiment, while cleaning their detector, also had to ensure that it did not interfere with environmental cleanliness.

GP 3.2 Tue 14:30 ELP 3: HS 2.33

'Dirty' spillovers: (geo)physical spillovers between the oil industry and early nuclear projects — •Michiel Bron — Maastricht University, Maastricht, The Netherlands

The development of nuclear physics and the geophysical understanding of uranium deposits during the Twentieth Century has pulled together many environmental actors from both the physical sciences and the oil industry. More than other subfields of the history of science, historians of scientific instrumentation have paid close attention to the commercial and industrial dimensions of scientific knowledge-making. A few industries have figured repeatedly in histories of instrumentation: e.g., telecommunications; agriculture and food production; armaments and defence. One industry in particular, however, has played an outsize, but often under-appreciated, role in the development of scientific instruments during the Twentieth Century: the oil industry. This article shows how specific scientific instruments - crucial to both the development of nuclear (geo)physics, and the commercial applications of uranium enrichment and exploration - were applied, scaled up, and developed during the Manhattan Project in close collaboration with the oil sector based on the (geo)scientific knowledge fostered within the petrochemical industry. The same knowledge and technologies that would later set up new collaborations during the environmental and scarcity debates of the long 1970s between oil companies as Exxon and well-known physicists like Hans Bethe.

Discussion GP 3.3 Tue 15:00 ELP 3: HS 2.33

Commentary to Panel — •Richard Staley — University of Cambridge, United Kingdom

Modern physics is built on dreams of purity. Historians have meticulously analysed the attempts of physicists to obtain orderly theories and uncluttered experimental data. But if conceptual order and messiness have received a lot of interest in the history of physics, material dirt and cleanliness remained in the background. In this panel, we explore different ways in which physicists have realized, affected, and impinged upon realities of pollution, contamination, waste, and otherwise. We explore institutional, intellectual, and material aspects in the history of twentieth century physics and geophysics as they relate to questions of dirt and cleanliness. How were polluting industries entangled in the development of physics theories? What kinds of cleaning practices have laboratories depended on? And how have physics experiments dealt with contamination and waste? Our cases range from the entanglement of the oil industry in the development of nuclear physics and environmental debates in the 1970s, to the construction of extremely clean experiments to detect hypothetical particles starting in the 1990s. With three panelists and one commentator, the panel aims to further explore how physics relates to its earthly surroundings.