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A Place for Materials Science: Laboratory Buildings and Interdisciplinary Research at the University of Pennsylvania

Hyungsub Choi · Brit Shields

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Abstract The Laboratory for Research on the Structure of Matter (LRSM), University of Pennsylvania, was built in 1965 as part of the Advanced Research Projects Agency's (ARPA) Interdisciplinary Laboratories (IDL) program intended to foster interdisciplinary research and training in materials science. The process that led to the construction of the four-story structure served as the focus of intense debates over the meaning and process of interdisciplinary research in universities. The location of the building, its size, internal design, and functionalities were all subject to heated negotiations among patrons, scientists, and university administrators, to find the proper place of interdisciplinary materials science on the University of Pennsylvania's campus. Building on the recent work on laboratory architecture, this paper argues that the negotiations and controversies over the LRSM building were concrete representations of the broader struggle over the appropriate place of interdisciplinary research and training within a university.

Keywords Materials science · Laboratory for Research on the Structure of Matter · University of Pennsylvania · Interdisciplinary research · Laboratory buildings · Advanced Research Projects Agency

At 4:30 p.m. on October 15, 1965, distinguished guests gathered at the Laboratory for Research on the Structure of Matter (LRSM) of the University of Pennsylvania,

H. Choi (✉)
Department of Materials Science and Engineering, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 151-744, Korea
e-mail: hchoi1@snu.ac.kr

B. Shields
Department of History and Sociology of Science, University of Pennsylvania, Suite 303 Claudia Cohen Hall, 249 South 36th Street, Philadelphia, PA 19104-6304, USA
e-mail: bshields@sas.upenn.edu

located at the corner of Walnut and South 34th Streets in Philadelphia. The occasion was to inaugurate the new four-story $4,175,000 laboratory building, funded in large part by the Advanced Research Projects Agency (ARPA) of the Department of Defense (DoD). The University of Pennsylvania was one of three universities, along with Cornell and Northwestern, which had been selected by ARPA in 1960 to establish an "interdisciplinary laboratory" (IDL) for research and training in materials science. As the university leaders remarked in the invitation card for the building's dedication ceremony, the LRSM was "an interdisciplinary center for graduate education and research in the materials sciences. Its staff embraces chemists, physicists, metallurgists, and engineers whose main interest is [in] understanding the origins of structure and properties of matter, and the control of properties through the control of structure"[1] (Fig. 1). In his dedication speech for the building, Vice President of General Electric's Research and Development Center, Arthur Bueche, praised the laboratory as "[having] every reason to be successful." The remaining question, as Bueche aptly pointed out, was "what will constitute 'success'?" His idea of the lab's success was that it would function as "a kind of 'production facility.' It will not be a mass-production factory by any means, but it will be a carefully managed organization designed to produce – simultaneously – new knowledge about materials and new people knowledgeable in the art of teaching and in the art of doing research on materials."[2] Indeed, the opening of the new state-of-the-art building that brought together faculty and students from distinct disciplines across Penn's campus was seen as a targeted effort to increase interdisciplinary research and training in the materials-related disciplines.

The history of materials science that emerged on university campuses in the 1960s with substantial support from ARPA in the form of the IDL program has been told by both historians and participants.[3] From these previous works, we know that the historical actors were critically concerned with the "materials bottleneck," which emerged as a priority among the defense technology sectors in the 1950s, particularly with the development of materials-dependent technologies such as solid-state electronics, long-range ballistic missiles, nuclear power, and space technologies. The Soviet Union's launch of Sputnik in October 1957 crystallized these widespread concerns into a policy initiative devoting funds toward the development of materials science, including the IDL program sponsored and operated by the newly-created ARPA. The goal of the IDL program was to create a number of interdisciplinary materials research laboratories at select, prestigious universities. These IDLs would increase both the output of basic research and the

[1] RSVP Card, UPF 8.55 Penn News Bureau Collection, Box 144, Folder 3, University Archives and Records Center, University of Pennsylvania (hereafter UPA).

[2] Arthur M. Bueche, "Remarks on the Occasion of the Dedication of the New Laboratory for Research on the Structure of Matter," 15 October 1965, UPA, News Bureau Collection, UPF 8.55, Box 144, Folder 3.

[3] For a participants' version of the story, see Psaras and Langford (1987). Several historians of science and technology have written on the various aspects of the national U.S. effort to develop materials science. See Lassman (1996), Leslie (1987, 1993), Bensaude-Vincent (2001), Bensaude-Vincent and Hessenbruch (2004), Mody and Choi (2013).