

The History of Polymers at UMass

*As the 50th anniversary of the PSE program approaches, we take the opportunity reflect on the evolution of polymer research and education at UMass through a series of retrospectives written by PSE faculty and alumni. **Prof. Bill MacKnight**, who was there from the inception of the program and who served as department head for many years starting in 1976, authors the first in this series. Here, he revisits the origins and early history of PSE. Future installments will address subsequent time frames as well as the current day. As Alumni, you are both the creators and the embodiments of the PSE legacy. We would be be grateful to hear from you regarding your recollections, further to, receive any copies of photographs and other documentation you may have to contribute to the history of the first half century of PSE.*

The early years: pre-1966 to 1982

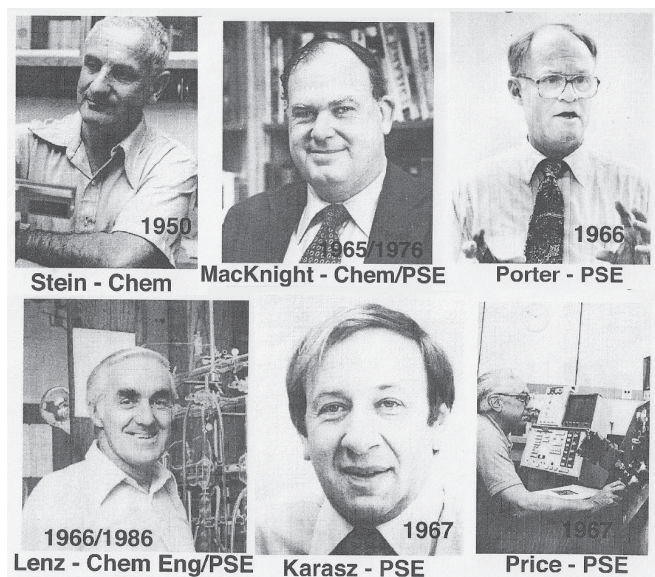
by W. J. MacKnight

Polymer research at UMASS dates from the early 50's when Richard Stein arrived as an Assistant Professor of Chemistry. Before that time, in the late 19th century, the vision for research at our land grant university was established by Charles Goessmann (1827-1910), who developed an internationally recognized program in agricultural chemistry, and served, among other roles, as the President of the ACS. In this context, the establishment of the polymer research program in the mid-20th century marks something of a realignment of the research strength of the university with a critical sector of the Commonwealth economy during the 20th century.

Beyond the establishment of a polymer research program, Richard Stein can be credited with starting the university's computer center, and further, with reestablishing and modernizing the physical chemistry curriculum at UMass. In 1961, he established the Polymer Research Institute (PRI) at UMass (only the 2nd such entity in the US at that time), which was to be vital for consolidating polymer research efforts on campus for decades.

Immediately following the 1965 appointment of William MacKnight as Assistant Professor of Chemistry, Stein and MacKnight began to design a Polymer Science and Engineering Program. The program was approved in 1966 as an interdisciplinary effort with authority to confer M.S. and Ph.D. degrees. By the beginning of the fall semester of 1966, Roger Porter was in place as Head and sole faculty member of PSE. In the same year, Robert Lenz, an organic polymer chemist, was hired in Chemical Engineering. These original four were united through their common interests in polymer research, and more formally, through their membership in the PRI. At that time, the first graduate students were admitted to the PSE program and the requirements for the Ph.D. were formalized. Critical elements of the curriculum were established at that time, notably the cumulative exam system, which remains in place to this very day.

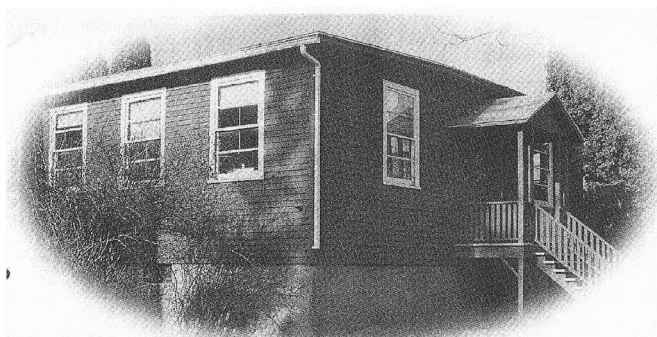
From the start, issues of funding and suitable research space were paramount. To expand the funding capacity provided by federal grants held by PRI members, a



Original members of the PSE "team".

campaign was mounted to raise money from industry, including Monsanto which was then located in nearby Springfield, MA. Industrial money was used mainly to support graduate students, and, in those early years, it was possible to provide stipends for all PSE graduate students throughout their studies through industrial fellowship dollars. May 1969 marked a critical milestone for the program, the awarding of the first Ph.D. in PSE to Tisato Kajiyama, who was admitted in the first PSE class.

At the start of the program, research space was provided by the home departments of PSE faculty, while Porter, whose appointment resided with the program rather than a department, was allocated space by the Graduate Dean. Needs for usable research space became more critical with the arrival of Jack Carmichael and Frank Karasz as PSE faculty members in 1967. After considerable negotiation, both were allocated lab space in Chemistry, though the issue of space immediately reemerged in 1968, when Fraser Price was added to the PSE Faculty. In search of a "home base" for PSE, Karasz and Carmichael identified an old, disused building named Draper Annex as possible faculty office space. Following renovations of the building, offices were provided for the PSE Faculty members (Porter, Price, Karasz and Carmichael). Employing his considerable carpentry



The Draper Annex, home of PSE circa 1969.

skills, Price outfitted a small laboratory in Draper Annex, which served as the primary location for the Polymer Laboratory courses for many years.

With a permanent, if somewhat ramshackle, home on campus, PSE began to expand rapidly. In 1969, Robert Laurence and Stanley Middleman joined the Chemical Engineering Department. Both brought their interest in polymers to UMass and to the PRI, Laurence in polymer reactor design and Middleman in rheology and fluid mechanics. In 1970, Jack Carmichael departed and was replaced in PSE by Otto Vogl, while J.C.W. Chien (also a PRI member) joined the Chemistry Department that same year. By the end of 1972, when Isaac Sanchez joined PSE, the UMass Polymer program consisted of 5 PSE faculty members and 6 affiliated faculty in Chemistry or Chemical Engineering. While Porter was the Head of PSE, Stein, as director of the PRI, continued to have important impact on the direction of the polymer program, from his appointment in Chemistry, which he maintained throughout his career.

The establishment, in 1973, of the Materials Research Laboratory (MRL) with funding from the National Science Foundation (NSF) was a transformative factor in the rise of PSE. A number of prior MRL's existed in the US, which up to that point had been funded through the defense department, but the program was being transferred to NSF control. As a result of a national competition, UMass was awarded the first and only MRL devoted to polymers, with Porter and Karasz appointed co-directors; participation was open to all faculty working on polymer materials. The MRL played an important part in putting PSE "on the map" in the materials research world. It provided crucial and sustained funding for major research instrumentation purchases and the resources to maintain them. Stimulated by the awarding of the NSF center, UMass hired Richard Farris, a civil engineer working on polymers who was appointed to the Civil Engineering Department. The MRL, later renamed the Materials Research Science and Engineering Center (MRSEC) endured at UMass for over 40 years with NSF funding.

As a result of administrative action, PSE was reconstituted as a Department in 1974, and moved from the Graduate School to the Faculty of Natural Science and Math-

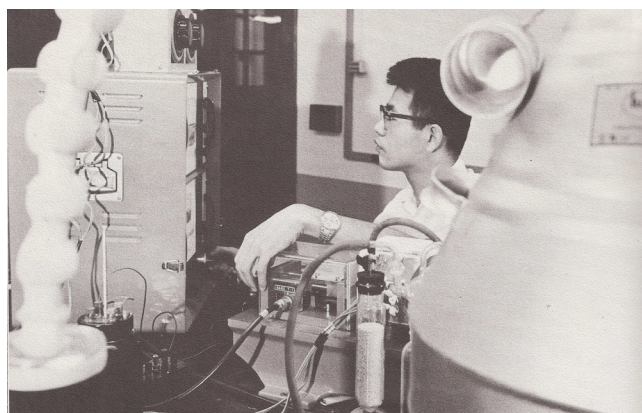
ematic (FNSM). Then as now, PSE differed from the other departments in the college in that it lacked an undergraduate major and contained an engineering component. At about this time, PSE was relocated to two floors of the new Graduate Research Center (GRC) in the Lederle Tower, a considerable upgrade in the quality of research space available to the department.

1976 saw the untimely death of Fraser Price of a fatal heart attack. When Price arrived at UMass he was already well known for his work in polymer morphology and he contributed greatly to the development of PSE during his all too short tenure. Also in 1976, Porter stepped down as the first head of PSE, and MacKnight moved from Chemistry to PSE to become the new department head.

At this time PSE was somewhat of a "Hydra-Headed Monster", with at least three administrative centers supporting polymer research, each associated with distinct funding sources: the PSE department headed by MacKnight; the MRL with Porter and Karasz as co-Directors; and the PRI directed by Stein in Chemistry. Further complicating matters somewhat, those faculty outside of PSE (Stein and Chien in Chemistry and Laurence, Middleman and Lenz in ChEmE) regularly attended PSE faculty meetings, directed PSE students and were members of the MRL and PRI. Several PSE faculty appointments came about in the late 1970s. Following the loss of Price and the departure of Sanchez in 1977, Edwin L. Thomas and Shaw Ling Hsu joined the PSE department in 1977 and 1978, respectively.

Finally, the start of the 1980's saw the establishment of another important center for polymer research at UMass, the Center for UMass Industry Research on Polymers (CUMIRP). This center, awarded in 1982, was the result of a NSF initiative to promote Industry-University collaboration. Co-chaired by Stein and Vogl and directed by Eugene Magat, a long time duPont employee, CUMIRP was initially jointly funded by NSF and many of the largest industrial firms in polymers and related fields.

In the next issue: PSE enters a new building and new century.



Then PSE Ph.D. candidate, Tisato Kajiyama, operating the "Rheovibron" in the MacKnight lab, in Goessmann.