CHAPTER THREE

Modern Times

THE MAIN BUILDING of the Department of Chemistry was occupied in 1903 and, as mentioned earlier, no further building was undertaken for many years. With the influx of graduate students after World War II, the capacity of the Main Building was taxed, indeed it was overtaxed. Conditions were worse than unsatisfactory: for example, a high pressure hydrogenation apparatus was separated from the research laboratory by only the flimsiest of walls.

In 1948-49, under the leadership of Philip Leighton, funds were found for the construction of a single-story building for organic chemistry research. This concrete slab, cement brick structure was built and furnished for about $200,000; its occupation in January, 1950, provided desperately needed relief for the organic chemists and their graduate students, for at that time Noller, Mosher, Bonner, and Eastman all had very active graduate research programs, crowded, for the most part, in the second floor of the Main Building, which also served the needs of undergraduate organic chemistry, analytical chemistry, and some biochemistry.

The frill-free, very utilitarian laboratory for organic research has admirably served the purposes for which it was designed. On the whole, few mistakes were made in the planning or construction, but one notable error crept in as regards the faculty offices, which are situated, two and two, at opposite ends of the building. Professors Noller and Eastman occupied adjacent offices at the eastern end of the building, Mosher and Bonner those on the western end. By some act of careless engineering, the thermostats which controlled the heat pumps employed to heat the offices were cross-connected, with the result that, the offices on the eastern end being cold, Professor Noller was driven to turning up ever higher the thermostat in his office. Bonner, in consequence, was in an increasingly overheated office, a condition which he tried to correct by turning his thermostat lower and lower—thereby ensuring that Noller's office became still more frigid. An extraordinarily large

number of conferences with heating engineers was required before the apparently erratic behavior of the heating system was solved.

The laboratory for organic research was built none too soon. For it was at about this time that superior designs for fractional distillation columns were beginning to emerge, and space was needed to accommodate the growing number of distillation units. Moreover infrared spectroscopy, which had hitherto been largely confined to physical chemistry, was beginning to assume its important role as a tool for qualitative identification of organic compounds. Space was needed, therefore, for spectrophotometers. Finally, high pressure catalytic hydrogenation was being increasingly used in synthetic work.

In the early 1960s two remodeling projects were undertaken in the Main Building, as mentioned earlier. At the southern end of the building, Room 20, which had housed large classes for the general chemistry courses, was found to be badly in need of improved seating and structural reinforcement. The interior walls were strengthened and the old wooden floor was torn out, being replaced by a poured cement floor. With new lighting, and minor acoustic treatment to reduce the three- or four-second echo in the room, the large lecture theater was greatly improved and has continued to be in use many hours each day for large classes.

In the summer of 1961 a sizable portion on the northern end of the building was partially gutted and strengthened to provide long overdue library space. In April 1962 this space was dedicated as the Robert Eckles Swain Library, Professor Swain's son and other members of his family attending the dedication. Older members of the Department will recall that previously the "library" had consisted of cramped-space in a small office on the second floor of the Main Building, and the improvement provided by the Swain Library was greatly enjoyed by all Library users, especially as the University Library began, at this time, to provide full-time librarian service in the new Library. The 1961 improvements, though very substantial, eventually proved to be inadequate: in the summer of 1976 work was started to permit further expansion of the Library into the adjoining laboratory, which for many years served the needs of general chemistry.

During the 1950s the University, guided by Provost F. E. Terman, undertook to expand and strengthen the faculty of the Department of Chemistry. With the approval of the faculty at that time, it was decided that, on the retirement of Professor George S. Parks, who served as Executive Head from 1951 to 1960, a new

Executive Head would be sought from outside the Department for the first time in the history of the Department. A search committee, consisting of George Parks, Carl Noller, and Eric Hutchinson, was appointed. Eventually an offer was made to, and accepted by, William S. Johnson, who at that time held the Homer Adkins Chair of Chemistry at the University of Wisconsin in Madison. The changes during the next few years were fascinating to participants and spectators alike.

Several things were clearly necessary if the faculty was to be strengthened. First, the obvious and speedy way to bring this about was to change the traditional method of building the faculty by regular, but slow, promotion within the ranks. It would be necessary to recruit faculty who had already established strong reputations. This clearly meant that appointments would have to be made at tenured levels. With this in mind, the Provost's Office had, since about 1956, blocked a number of tenure billets in order to provide flexibility in appointment that would be needed. Additional funding would also be needed for equipment, assistants, and the like. Fortunately, at this time the Proctor and Gamble Company had agreed to provide a sum of $50,000 a year for a five-year period, to be spent at the University's discretion. As a result, there was a small but useful reservoir of money accumulating from that source. Finally, conversations had been proceeding for some time between University officials and Mr. John Stauffer regarding the needs of the Department of Chemistry for additional space.

Almost coincident with the appointment of Professor Johnson as future Executive Head, to be effective in the autumn of 1960, an offer was made, at Johnson's suggestion, to Carl Djerassi, who was then on the faculty of Wayne State University, though at the time in question he was on leave from Wayne University and serving as Vice-president for Research of Syntex, S.A. Djerassi accepted the offer, so that in a very short space of time the Department had acquired not one but two faculty members who had extensive research programs. The provision of space, therefore, became an urgent and immediate problem.

Happily, at almost the same time as these developments were taking place, Mr. Stauffer and his niece, Mrs. Mitzi Briggs had determined to support the construction of a research laboratory dedicated to the memory of Mr. Stauffer's parents. In one stroke, therefore, a solution to the space problem was provided through the generosity of the members of the Stauffer family. Happily, also, it was at this period that federal funds, notably from the National Science Foundation and the National Institutes of Health,

were being provided for the construction of facilities. It is fortunate that such additional funds were available, for preliminary conversations soon revealed that it would be desirable to establish in the Department a microanalytical laboratory and a laboratory for spectroscopic analysis.

Although some of Professor Djerassi's research students arrived at Stanford and were crowded into space in the one-story organic building, it was clear that funding and planning for the new Stauffer Laboratory would have to be achieved at a smart pace if the Department were to be ready to accommodate both Djerassi and Johnson in 1960. I recall that for weeks on end I seemed to be writing and rewriting proposals for federal construction funds: once submitted, however, these proposals were acted on quickly in Washington.

One of the major strokes of good fortune, in this and in future expansion of the Department, was that Birge M. Clark (Stanford, Class of 1914) entered the picture as the architect chosen to design the Stauffer Laboratory. Clark had deep connections with, and commitments to, Stanford. His father, Arthur Bridgman Clark, joined the Stanford faculty in 1892 as Assistant Professor of Drawing. An extremely energetic man, Arthur Clark undertook a number of civic duties in Palo Alto in addition to his teaching, and he also designed a number of campus homes, most notably the David Starr Jordan house. Talent runs deep in the Clark family, architectural talent in particular: two of Arthur Clark's sons, Birge Clark and the late David Clark, became successful architects.

Birge Clark did not come without experience to the design of the Stauffer Laboratory: he had already designed some very effective research buildings for companies in the Stanford Industrial Park. But the most valuable quality that he brought to the Department of Chemistry was an extraordinary ability ***to listen to his clients*** and to take careful note of their needs. The result of his discussions with Professors Johnson and Djerassi was a building well suited to the needs of research in organic chemistry, designed to provide great internal flexibility, and with a simple but pleasing exterior. Provost Terman was himself much interested in the new construction. A firm believer in minimizing both present and future constraints on buildings, Terman successfully argued that the Stauffer Laboratory be built with a full basement even though, at the actual time, it did not appear that funds would be available to equip and furnish the basement space. (The wisdom of that rather emphatic argument was borne out very soon, because the appointment of Paul J. Flory, in 1961, raised almost immediately another space problem.

Flory's needs were met temporarily by equipping part of the basement of the Stauffer Laboratory.)

Construction of the building went ahead at an excellent pace, owing to good weather and the careful supervision of Birge Clark, so that, on his arrival in the autumn of 1960, Professor Johnson was able to house his research group in permanent quarters, while Professor Djerassi's group was able to escape from their cramped quarters in the single-story building. The new laboratory, which almost immediately became known colloquially (and prophetically) as "Stauffer-One", was dedicated on March 1, 2, and 3, 1961. The dedication was the occasion for an impressive international symposium which was addressed by the following speakers: E. Lederer, Paris; H. Brockman, Goettingen; V. Prelog, ETH Zurich; A. R. Todd, Cambridge; S. Shibata, Tokyo; D.H.R. Barton, London; M. M. Shemyakin, Moscow; R. Ryhage, Stockholm; A. J. Birch, Manchester; E.R.H. Jones, Oxford; G. Stork, Columbia; R. B. Woodward, Harvard; and R. Adams, Illinois. Rarely has a chemistry laboratory been dedicated in the presence of such a stellar aggregation of organic chemists.

The accommodation of Professor Flory's researches in the basement of Stauffer-I was, at best, a temporary and unsatisfactory solution to the space problem. The appointment of Henry Taube in 1962 made the construction of still another building inevitable. Once again Mr. John Stauffer expressed a willingness to continue his benefactions to the Department of Chemistry, and before we had really adjusted to the availability of Stauffer-I, we were deeply involved in planning for the John Stauffer Laboratory for Physical Chemistry-or Stauffer-Two, as it is more commonly known. Birge Clark was again appointed architect, and the merits of having a companion building were soon evident in that many of the design features of Stauffer-I were directly transferable to the physical chemistry building.

A new factor had to be taken into consideration, however. Even in the period of two years the needs of organic chemistry had increased. The number of graduate students had grown, but, more significantly, two new instruments had burst into great practical importance in organic analysis and identification. These two instruments were nuclear magnetic resonance and mass spectrography of organic ions and breakdown fragments. Both required rather considerable space. The construction of the John Stauffer Laboratory for Physical Chemistry provided the opportunity, which was vigorously urged on the Stanford administration, for excavating an area between the two Stauffer Laboratories to pro-

vide underground laboratories and a connecting hallway. At the same time, and with an impetus whose force is only appreciable to those who know him, Carl Djerassi was arguing the merits of placing between the two buildings a small, self-contained building which could be used for small seminars, oral examinations, interviews, coffee breaks, and the like. The Stanford Planning Office was noticeably cool to this suggestion, but since Djerassi quickly assembled from a group of industrial donors the necessary funds, it was a foregone conclusion that the octagonal gazebo would be built. The good sense behind Djerassi's plans for the gazebo was so amply borne out in succeeding years that, when the Stauffer family provided still more funds for the construction of the Chemical Engineering Laboratory, a second gazebo was built as if this were the most natural thing to do.

The John Stauffer Laboratory for Physical Chemistry was occupied in 1963 and was dedicated on November 17, 1964. The dedication was once more made the occasion for holding a symposium, but this time it was decided that the Department should invite a single speaker to present a short series of lectures. No happier choice could possibly have been made than the distinguished physicist-chemist and Nobel Laureate, Peter Debye, of Cornell, who presented a memorable set of lectures, remarkable for the beguiling ease with which he carried along his audience on the subject of light-scattering. Debye's personal charm and absence of pomposity delighted everyone. One of my most enduring memories is of Debye disporting himself dressed in a toy fireman's helmet.

Further tenured appointments were made during the 1960s. In 1962 E. E. van Tamelen, who had succeeded W. S. Johnson as the holder of the Homer Adkins Chair of Chemistry at the University of Wisconsin, joined the Stanford faculty. In 1964 H. M. McConnell, who had been on the faculty of the California Institute of Technology for the past eight years, came to Stanford to establish a program in chemical physics, and he was joined by J. D. Baldeschweiler in 1965. James P. Collman came to Stanford in 1967 from the university of North Carolina, adding further strength to inorganic chemistry. Two rather unusual appointments were made in 1969. First, Kenneth S. Pitzer left Rice University to assume, for a brief period in politically and socially turbulent times, the Presidency of Stanford. Pitzer was appointed President and Professor of Chemistry, and, to the extent that his busy life as President permitted, he took a reasonably active part in the affairs of the Department. In 1969, also, Linus Pauling, already retired after a long

career at the California Institute of Technology, was appointed Professor of Chemistry. Until 1974 Pauling carried on an active research program in medicinal chemistry, but left in that year to establish the Institute of Orthomolecular Medicine (as it was then known).

The relatively rapid growth of the Department of Chemistry in the 1960s, not only as regards the number of tenured appointments that were made but also as regards the number of research assistants and auxiliary services, undoubtedly caused persons in other departments, and possibly even some in the Department of Chemistry, to presume that Stanford was putting greatly increased support at the Department's disposal. That presumption, though natural to the outsider, was in fact fairly wide of the mark. The increase in auxiliary services was almost entirely supported from external research grant funds, which by this stage amounted to about $1 million annually. The rather dramatic increase in the number of tenured faculty was largely achieved by careful spending of the Proctor and Gamble gift funds (referred to earlier) which were employed to make additions to the faculty in anticipation of eventual retirement of more senior members. Finally, the Department acquired an endowed chair, the J. C. Jackson - C. J. Wood Chair of Chemistry, which materially assisted the Departmental budget.

In looking at the growth in the Department of Chemistry, it is necessary to reflect on the fact that the 1960s were a period of growth in virtually all areas of the University. Increased annual gift funds, and particularly the successful PACE Program, facilitated this growth, which saw Stanford's stature as a university climb at a remarkable rate. Budgets are dull affairs to those not directly involved in them, but it is worth noting that in 1955-56 the Department of Chemistry's basic operating budget from general funds was $189,000, which amounted to 9.2% of the budget of the School of Humanities and Sciences. In 1969-70 the operating budget of $677,000 was only 6.9% of the budget of Humanities and Sciences. Thus, not only was the expansion of the Department's activities not carried out at the expense of other departments, the reverse has been the case.

Construction figures for the Department of Chemistry between 1900 and 1964 reveal interesting detail:

Main Building (~60,000∅),	**1902**	**$233,664.**
Stauffer Lab. for Organic Chemistry (~20,000∅),	**1960**	**$806,152.**
Stauffer Lab. for Physical Chemistry (~20,000∅),	**1962**	**$980,319.**
Underground Connecting Lab. (~4,500∅),	**1962**	**$ 79,850.**

Although by the mid-1960s the Department had acquired good facilities for research (though they were already becoming crowded), the situation as regards facilities for undergraduate teaching had become deplorably bad. The third floor was condemned as unsafe by county authorities, who demanded that it be sealed off. The undergraduate laboratories had deteriorated to the point that they could not be rehabilitated at any reasonable (or, indeed, at any unreasonable) cost. The Main Building, which for seventy years had done its duty, was no longer suitable or adaptable for the needs of the Department.

During the 1960s the DuPont Company generously provided funds which permitted the Department of Chemistry to employ Edward Leys to work with a faculty subcommittee to consider the problems of a new building which would serve the needs of undergraduate teaching and provide some additional research space. That subcommittee performed its work diligently, but for some years it appeared unlikely that funds would become available to translate the group's concepts into physical reality. However, in the early 1970s the rapidly deteriorating condition of undergraduate facilities, coupled with a very sharp (and apparently lasting) increase in the number of undergraduate students reading chemistry (as a substantial part of premedical education) convinced the University that a new building must be given high priority. In spite of a tightening financial situation, the Board of Trustees approved the proposal for a building somewhat reduced in scale as compared with the subcommittee's estimates. Birge Clark was appointed architect, and the Seeley Mudd Foundation, together with the Syntex 'Corporation, provided generous funds, so that the University was emboldened to start construction. The splended new building taking final shape to the west of Stauffer Laboratories is expected to be ready for occupation by December 1976. It is functional and economical, and, like all Clark's buildings, quietly elegant.

The Main Building has lasted somewhat longer than the biblical three-score years and ten. Like the rest of us who are growing older, it is tiring but has not quite given up the ghost, even now. For the foreseeable future the expanded library and the basement machine shops and stockrooms will continue in use. Like an emeritus professor, the Main Building, though superannuated, will continue to be of real value and use to the Department. Although, no doubt, those who move into the Seeley Mudd Laboratory will relish the good facilities there provided, those of us who spent much of our active teaching and research life in the Main

Building will experience some measure of wistful sadness at its decline and eventual disuse.

Mention must be made here of a program which has been of great value to the Department since the late 1960s. This is the Industrial Affiliates Program. Through this program a number of corporations and companies have provided substantial, long-term support to the Department of Chemistry by committing money to our Gift Funds. Each of the corporations or companies assigns a staff member or two as representatives for liaison purposes, and a member of the Departmental faculty similarly serves as a means of maintaining close communication with one or two companies. Periodically there are symposia and workshops, lasting two or three days, on some important area of chemical research which representatives of the Affiliates attend and at which they often present papers. These symposia have served a very useful purpose in bringing important research developments to a wide audience in a very timely fashion. Graduate students, faculty, and Affiliates have all profited from these programs. In addition, some highly instructional programs have been provided to the Department by Affiliates in the form of "case studies" of the research and development process whereby new products and materials have emerged in the Affiliates' own manufacturing programs. The symposia and the "case studies" are very well attended; and they provide, in addition to the purely formal scientific side of the program, a pleasant means of maintaining a valuable, informal, continuing network of scientific and personal exchange.

It may be questioned whether the Department would have been able to register its excellent scientific record in the last several years without the support of the Industrial Affiliates Program. For, putting aside the undoubted scientific value of the program to both the Affiliates and Stanford, the financial support provided by the Affiliates has been invaluable in enabling the Department to pursue a vigorous research program during times of rapidly rising costs and diminishing government grants. The cushion of support provided by the Affiliates has permitted the Department to attract new people to the faculty and support their researches, and can be described unequivocally as adding substantially to the progress of important chemical research.

The following list gives the titles of the symposia and workshops which have been held:

INDUSTRIAL AFFILIATES SYMPOSIA AND WORKSHOPS

FIRST WORKSHOP, August 11 - 12, 1969
"X-Ray Photoelectron Spectroscopy"

FIRST SYMPOSIUM, November 6 - 8, 1969
Session I. "The Role of Metals in Promoting Chemical Reactions"
Session 11. "Newer Instrumental Methods in Molecular Structural Determinations"
Session 111. "Some Recent Developments in Organic Chemistry"

SECOND WORKSHOP, July 30 - 31, 1970
"Spin Labels in Biological Systems"

SECOND SYMPOSIUM, November 6 - 7,1970
"Chemistry in the Life, Earth, Engineering, and Material Sciences at Stanford"
April 23 - 24, 1971
"A Student's View of Industry"

THIRD WORKSHOP, July 6, 1971
"Raman Spectroscopy"

THIRD SYMPOSIUM, October 18 - 19, 1971
"Drug Abuse—1970-1984''

FOURTH SYMPOSIUM, May 4 - 5, 1972
"Does Chemistry Have a Future in Chemistry Departments—Is All Well in Chemical Engineering?"

FOURTH WORKSHOP, September, 11 - 12, 1972
"Surface Analysis: Scientific, Patent, and Legal Implications in Heterogeneous Catalysis"

FIFTH SYMPOSIUM, November 13 14, 1972
"The Effect of Regulatory Agencies on Scientific and Industrial Productivity"

SIXTH SYMPOSIUM, May 14 - 15, 1973
"Should Scientific Research be Done in Industry?"

SEVENTH SYMPOSIUM, August 6 - 7, 1973
"Vitamin C and the Common Cold"

EIGHTH SYMPOSIUM, November 12 - 14, 1973
"Synthesis: A Science for All Seasons"

NINTH SYMPOSIUM, March 7 - 8, 1974
"Energy: Crisis for All Seasons"

TENTH SYMPOSIUM, August 12 - 14, 1974
"Morphology of Polymers at the Molecular Level"

ELEVENTH SYMPOSIUM, November 14 - 15, 1974
"Recent Advances in Biomaterials"

TWELFTH SYMPOSIUM, April 21 - 22, 1975
"Applications of Lasers to Chemistry and Chemical Engineering"

THIRTEENTH SYMPOSIUM, June 18 - 20, 1975
"Synthesis: A Science for All Seasons" (Part Two)

FOURTEENTH SYMPOSIUM, November 13 - 14, 1975
"Some Recent Developments in Chemical Sciences at Stanford'

FIFTEENTH SYMPOSIUM, June 14 - 15, 1976
"Synchrotron Radiation — A Unique New Resource in Chemical Research"

A current list of Industrial Affiliates is given below.

INDUSTRIAL AFFILIATES MEMBERS
1976

ALLIED CHEMICAL CORPORATION Morristown, New Jersey	Dr. Edel Wasserman
CHEVRON RESEARCH Richmond, California	Dr. M.R. Barusch
Du PONT DE NEMOURS & Co. Wilmington, Delaware	Dr. Keith Bremer
EXXON RESEARCH Linden, New Jersey	Dr. Robert L. Garten
HALDOR TOPSØE A/S Denmark	Dr. Jens Rostrup-Nielsen
SNAM PROGETTI S.P.A. Milan, Italy	Professor Cernia
HOFFMANN LAROCHE INC. Nutley, New Jersey	Dr. L. M. Jampolsky
IBM CORPORATION San Jose, California	Dr. H. E. Hunziker
MONSANTO COMPANY St. Louis, Missouri	Dr. James F. Roth

PETROBRAS Rio de Janeiro, Brazil	Dr. A. S. Moggi
RAYCHEM Menlo Park, California	Dr. Leon Glover
SYNTEX Palo Alto, California	Dr. John Fried

DEPARTMENT OF CHEMISTRY
STANFORD UNIVERSITY
1891 - 1976

JOHN MAXSON STILLMAN	Executive Head, 1891 - 1917
ROBERT ECKLES SWAIN	Executive Head, 1917 - 1940
PHILIP ALBERT LEIGHTON	Executive Head, 1940 - 1951
GEORGE SUTTON PARKS	Executive Head, 1951 - 1960
WILLIAM SUMNER JOHNSON	Executive Head, 1960 - 1969
PAUL JOHN FLORY	Chairman, 1969 - 1972
HENRY TAUBE	Chairman, 1972 - 1974
EUGENE E. VAN	Chairman, 1974 -

(The title Executive Head was changed to Chairman, as a matter of University policy, December 5, 1968.)

EDWARD CURTIS FRANKLIN	President, ACS, 1923
CARL DJERASSI	National Medal of Science, 1973
PAUL JOHN FLORY	National Medal of Science, 1974
	Nobel Prize in Chemistry, 1974
LINUS CARL PAULING	Nobel Prize in Chemistry, 1954
	Nobel Peace Prize, 1962