GROWTH AND DECLINE OF CERAMIC ENGINEERING EDUCATION

Earlier it was stated that a professional fraternity by its very nature requires a secure and growing academic base. Keramos Bylaws emphasize this relationship in the statement of purposes. The first purpose reads: "(a) To provide a professional fraternity open to students in the schools, departments, and divisions of Ceramic Engineering, Technology, and Science in universities and colleges of the United States and Canada."[1] It is to be noted that, with the exception of honorary members, this statement places a very distinct and limiting boundary to membership. Discussion is reserved for later.

In view of the close tie between technical ceramic education and Keramos, a survey of ceramic engineering departments and divisions seems desirable.

GROWTH STAGES

It was reported earlier that the profession of ceramic engineering, as practiced in North America, came into being at Ohio State University* in 1894 as a two-year program. In 1896 a four-year baccalaureate curriculum was added.

Early Years (1894-1920). In rapid succession engineering and/or technical ceramic departments were established at Alfred University (1900), Rutgers University (1902), the University of Illinois (1905) and Iowa State University (1906). Each of the respective states had well-established ceramic industries serving as foundations for the academic programs.

The next two ceramic programs were organized in the far west. These were at Oregon State University (1914) which soon foundered, probably because of World War I and its drain of students from America's colleges, and the University of Washington (1918). Surprisingly, Professor Ira A. Williams was the original department head of the two and earlier had been one of two original staff members at Iowa State. The departments at both Oregon State and Washington began as part of their schools of mines and both were conceived in terms of helping local industry and developing the natural resources of their respective states. Resource exploration and evaluation were considered to be the function and responsibility of the state.

Much of the impetus for developing natural resources can be attributed to the demands for materiel and materials by the federal government and its World War I allies. The remarkable production achieved through the leadership and efforts of Bernard Baruch[2] and the U. S. War Industries Board led the American people to believe that "...given a month's time, you could get about anything you needed out of the Ameri-

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* *Throughout this discussion present-day organizational names will be used. Most of the universities are land-grant and all are state supported.*

can continent."[3] It was to take more than half century for this naive concept to give way before the painful realization that natural resources have finite limits and must not be wasted.

The Twenties (1920-29). During the exuberant economic growth following World War I, new departments or divisions of ceramic engineering were established in rapid order, viz:

1921 University of Saskatchewan
1924 Georgia Institute of Technology, (authorized 1923)
1924 North Carolina State University, (authorized 1923)
1924 Pennsylvania State University
1924 University of West Virginia, (in Dept. of Chemical Engineering)
1925 University of Toronto, (in Dept. of Metallurgy)
1926 Missouri School of Mines
1926 Massachusetts Institute of Technology, (graduate students only)
1926 Louisiana State University
1928 Virginia Polytechnic Institute & State University
1928 University of Alabama, (in Dept. Chem., Metal. and Ceramics)

To most the future seemed to have no boundaries. "The sky was the limit." How wrong they were!

The Great Depression (1924-40). Financial panics were not new to the United States. Since the adoption of the constitution there had been six before the one named "The Great Depression."* The latter was unique in intensity and length. Approximately one-third of the work force became unemployed. Despite many emergency measures and government support programs, full recovery was not achieved until the federal government began heavy spending for national defense in the early 1940s.

Under those circumstances there was small wonder that students had a difficult time remaining in school despite the very low prices**. As in the business world, colleges and universities were making very few ventures into new enterprises, thus no new ceramic departments during the 1930s.

The country slid from depression into defense preparation which suddenly became total war. During the late 1930s and until war was declared following "Pearl Harbor" December 7, 1941, enrollments were increasing. A few junior faculty who held commissions in the armed forces reserves were called up for "refresher training"; otherwise expansion was again "the word." After the declaration of war against the axis powers (Germany, Italy and Japan) enrollments headed downward again.

The War Period (1941-45). At first student losses were caused by acceleration of programs and ROTC commitments. Increasing numbers of students were being drafted or were volunteering for service. By 1943 the pressures against any young man not in uniform were becoming intolera-

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* *Financial panics have been named by the year of their beginning: 1819, 1837, 1857, 1869, 1873 and 1907.*

** *Examples of "depression" prices: lunch 25-50 ¢, banquet $1.00, bread 10 ¢ /loaf, beer 5 ¢ /glass, gasoline 10-20 ¢ /gal., first quality ready-made men's suits $25, Ford V-8 $600, etc.*

ble. Finally, ceramics and ceramic engineering were declared "non-essential to the war effort." Such a blanket ruling was a fallacy. Nevertheless, so it was.[4]

In retrospect it is apparent that much of the difficulty stemmed from a lack of adequate definitions of ceramics.* For inexplicable reasons the federal agencies have always avoided the use of the term, ceramics. Many of the circumlocutions have been ridiculous. In 1943 the American Ceramic Society and its affiliates, the National Institute of Ceramic Engineers (NICE) and the Ceramic Educational Council (CEC) prepared extensive reports hoping to change federal policies but decided that it was useless to proceed. It was a case of "too little and too late."[4]

As a consequence of the situation just described, most ceramic engineering departments were essentially closed. Some war-related research was carried on. Many faculty members left the universities for other employment and few who remained were transferred to other jobs within the university. There was one exception. The University of Illinois' department was designated to continue ceramic engineering under the U. S. Navy's more enlightened V-12 trainee program. In the fall of 1942 a few ceramic engineering students with navy assignments were transferred from Alfred, Iowa State, N. C. State, Ohio State, Rutgers and Virginia Polytech. Even this program wound down as the war progressed.

Postwar Boom (1945-50). The last half of the 1940s saw a rapid increase in enrollments swamping faculty, which had to be recruited, and facilities. The causes were (1) the pent-up desires of young men seeking productive careers, (2) the conversion of war-based technology to civilian desires and needs, (3) the unprecedented needs of industry for technical personnel to man the reconverted factories and (4) the most relevant, the passage of Public Law 346, popularly known as the GI Bill of Rights. It paid the veterans' necessary school costs and helped them to support themselves while attending school.

The great influx of students began to subside around 1948 but, because of the time lag, the crest in degrees granted occurred in the years 1950 and 1951. During this period three new departments were established: at the University of Texas in 1945 and Clemson University and the University of California at Berkeley in 1948.

Had bureaucratic fumbling not intruded at this time (1950) it is probable that enrollments would have settled down to a somewhat higher level than prewar but below the maximums reached. However, that was not to be. In the spring of 1950 the U. S. Office of Education erroneously forecast

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* *Generally ceramics was considered to be pottery, tile and similar products. New products were generally designated by trade jargon. For example, the talc containing low-loss dielectrics was called "steatite" without specific reference to ceramics. The ceramic educational leaders could not agree. As late as the 1950s many ceramic engineers subscribed to obsolete definitions and insisted that clay was an essential ingredient or it was not a ceramic. Even in the late 1970s many respected standard reference works, such as dictionaries and encyclopedias, do not have acceptable definitions.*

a great over-supply of engineers. There was a small over-supply but it lasted less than three months. Nevertheless the mischief was done. As someone quipped, "students stayed away from engineering in droves." All branches were hurt, small departments especially. In the case of ceramic engineering, a field not known to the public or to high school career counselors, it proved to be a real disaster.

NEW EDUCATIONAL BOUNDARIES

In the early 1950s the American Society for Engineering Education (ASEE) released what was called the Grinter Report. Among other things, the report recommended large increases in the time devoted to science and to what was termed the engineering sciences. Because of other imposed restrictions, such as time devoted to humanistic-social studies, many of the skills, such as drafting and other how-to-do courses, were eliminated. At the same time a drive was made to reduce engineering course loads from 17-18 to 15 credit hours per term, the liberal arts' requirement. The latter was an attempt to lure more students into engineering.

At about this time (1950s) several other interrelated factors came into play. Four of these caused, eventually, considerable trouble to the ceramic departments. They were (1) administration by head-count, (2) misconceptions concerning ceramics as engineering materials, (3) material science and engineering as a curriculum area and (4) massive governmental funding of research. The blessings were mixed.

In the prewar days engineering programs were introduced to supply trained personnel for existing or potential industries of consequence to the area and to fulfill the needs of the people. Industry, if one existed, usually cooperated by providing funds, facilities and other support. The postwar rapid expansion of education tended toward administrative remoteness and the student-teacher ratio became a major criterion of performance and program value.

Federal Agencies Enter. During and following the war, particularly in the 1950s and early '60s, great strides were made in developing technical ceramics for many unrelated applications. At the same time the adaptation and application of solid-state physics and chemistry were coming into play. Coincidentally the materials problems for the nuclear and military development programs were becoming more acute. Then on October 4, 1957, the USSR launched Sputnik I - a severe jolt to the complacency of the American people. The National Aeronautics and Space Administration (NASA) was established in 1958. A new set of design parameters came into being.

Since ceramics seemed to have promise in fulfilling the needs of federal agencies, they adopted the "A-bomb philosophy" - viz., with enough money and enough people any engineering problem could be solved. By the massive application of funds, the government essentially took over academic research in the ceramic and metallurgical fields.

The time was frustrating for all engineers particularly with reference

to the space program. As the news media invariably reported the happenings, the results were either a "scientific triumph or an engineering failure."

MATERIALS SCIENCE AND ENGINEERING

Somewhere along the way the idea of materials science and engineering came into being. It probably originated with a governmental agency. In the original concept all engineering materials were to be integrated into a single technology. Hydraulic cements and structural concretes were hardly considered, as cements were considered as strictly the province of the chemist and the uses (concretes) were controlled by the civil engineers. Plastics were left with the chemical engineers for two valid reasons: (1) the industrial applications of organic chemistry have been part of chemical engineering and (2) the power and the backing of the chemical engineers precluded its transfer to another jurisdiction. This left but two major materials areas, metals and ceramics, to be merged.

There was some justification for consolidation. Both were relatively small and both were built on the same scientific base. The latter came to be known as materials science. The problems lay in the applications. Thurnauer[5] summarized the situation: "There is one consideration which seems quite obvious but is frequently overlooked. In contrast to other materials (e.g., metals and plastics) a ceramic is a material only in its finished form." He pointed out that the other materials may be formed from ingot or prefabricated shapes. "The ceramist has to work with unreacted or partially reacted particulates ... and turn them into the final product which is the ceramic." Processing is an inherent part of ceramic engineering. Thurnauer stated further "A curriculum in ceramics cannot be superseded by one in materials science per se." Nevertheless, materials engineering did become a reality, supported as it was by administrators eager to justify their largely self-imposed numbers game. In this effort they were aided and abetted by the physical metallurgists who generally were in a stronger position than the ceramists.

During the period (1960s and early 1970s) new ceramic departments were established at the University of Utah and Mississippi State University and an option within metallurgical engineering at the University of Florida. On the negative side four undergraduate programs seem to have been lost; those at the two Canadian universities (Saskatchewan and Toronto), Louisiana State University and the University of Texas.

STATUS OF CERAMIC ENGINEERING

Undergraduate Programs in Effect, 1971-72. The Engineers' Council for Professional Development (ECPD) reported accredited curricula in 1971-72:[6]

Ceramic Engineering (NICE as major representative):

California, University of (Berkeley) (1959)*

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* *Year of first accreditation.*

Clemson University (1955)
Georgia Institute of Technology (1942)
Illinois, University of (Urbana) (1936-38)
Iowa State University (1940)
Missouri, Unversity of (Rolla) (1936-38)
N. Y. State College of Ceramics (Alfred) (1936-38)
North Carolina State University (1936-38)
Ohio State University (1936-38)
Rutgers University (1949)
Virginia Polytechnic Institute (1936-38)
Washington, University of (1936-38)

Ceramic Science (NICE as major representative)
Pennsylvania State University (1936-38)

Ceramic Option in Metallurgical Engineering (NICE as major representative)
Florida, University of (1971)

In the same report, 18 curricula of materials engineering (or variations) were listed as being accredited through the American Institute of Mining and Metallurgical Engineers (AIMME) as major representative. The AIMME was the organization that was of such help to Greaves-Walker in the battle for professional recognition of ceramic engineers in 1936-38.

Ceramic Programs in Effect, 1977. Three undergraduate ceramic engineering programs that were on the ECPD accredited list of 1971-72 have been withdrawn: University of Calfornia (Berkeley), North Carolina State University and Virginia Polytechnic Institute. According to the Ceramic Educational Council (CEC)[7] the number of "Materials Programs with Ceramic Groups" remains at eighteen. Paradoxically, the ceramic work in academic institutions continues to grow. It is worth mentioning that the CEC lists 23 institutions offering MS-PhD programs and at the other pole of Academe, two Ceramic Technical Associate Programs.

REFERENCES

[1] Keramos, Professional Ceramic Engineering Fraternity Bylaws, Adopted April 24, 1960, as amended April 20, 1964.

[2] Margaret L. Coit, Mr. Baruch, Haughton Mifflin Co. (Boston, Mass.) 1957.

[3] U. S. War Industries Board. Official Report of the Chemical Industry, Chemical Div., VI, 1. as cited by M. L. Coit.

[4] Interesting details from the American Ceramic Society point of view published in the Bulletin 21 (10) 233 (1942); 22 (3) 71-72 (1943); 22 (6) 180-82 (1943); 22 (7) 231-35 (1943).

[5] Hans Thurnauer, "Reflections," Edward Orton, Jr. Memorial Lecture 1977, Am. Ceram. Soc. Bull. 56 (10) 861-66 (1977).

[6] Annual Report 1971-72, Engineers' Council for Professional Development

[7] Minutes, Ceramic Educational Council, Nov. 16-17, 1978.

GROWTH OF KERAMOS

In the section *Early History* the story of Keramos extended from the 1902 beginning of Beta Pi Kappa and that of Keramos in 1914 culminating in their consolidation in 1932 to form the present Keramos.

During the next several years (1932-38) the major efforts of the Fraternity were directed toward gaining professional recognition. These later efforts resulted in the establishment of the National Institute of Ceramic Engineers (NICE)* and the acceptance of ceramic engineering as an independent field by the major engineering societies and their associated organizations. Despite this preoccupation with recognition the Fraternity leaders, particularly A. F. Greaves-Walker°, were painfully aware of their limited numbers. Numbers were and remain important.

The desire for expansion was not new. As reported in *Early History* both the original Keramos and the reborn Beta Pi Kappa had directed a great deal of their energies toward growth. That their efforts were largely nonproductive now seems obvious. Simply, the non-Keramos departments were not large enough to sustain a chapter. At times three of the four merged chapters had difficulties.

AVAILABLE METHODS

Attention has been called to membership restrictions as expressed by the Fraternity's statement of purpose. Eligibility requirements were detailed in the appropriate articles of the 1932 Constitution and Bylaws[1] and more recently in the 1960 Articles of Incorporation and Bylaws.[2] In brief, a member must be or have been a student of ceramic engineering, science or technology with the exception of honorary members.

Chapters. The normal method of growth has been and continues to be the initiation of new members in accordance with the respective chapter rules as limited by the national bylaws.

New Chapters. The obvious method of substantial growth is the chartering of new chapters. The usual procedure has been for a group of students in a unit of ceramic engineering, technology or science to form a local professional fraternity or club, draft a constitution and bylaws, obtain institutional approval for the new organization and then submit a petition for charter. Under the 1932 Constitution the petition was submitted to the Executive Council. "On approval it then required approval by three-fourths of all active chapters and by a three-fourths vote of the active members of each."[1]

These requirements were modified in the Bylaws (under the Articles of Incorporation of 1960)[2] in that the petition is submitted to the Board of Directors (new name of the Council) for approval. Referral to the chapters is no longer required.

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* *Throughout this section only present day names of organizations will be used.*

Subchapters and Nonresident Active Members. The term subchapter* has been used by the Executive Council (1932-1960) or the Board of Trustees (1960-date) to designate a ceramic educational unit not having a chapter of Keramos but whose students satisfy the eligibility requirements for membership. The senior faculty member must provide consent and then act as official representative recommending qualified students to become nonresident active members. Usually the faculty member was a member of the fraternity.

Greaves-Walker, ever seeking to have ceramic engineering grow and prosper, was responsible for the inclusion of the nonresident active membership in the 1932 Constitution and Bylaws. He was chairman of the Constitution Committee for the merger of Beta Pi Kappa and Keramos. Provision for nonresident members was included in the 1960 Articles of Incorporation and Bylaws.

Three months after the merger Greaves-Walker, as Grand President, began to urge the Executive Council to take action. In February, 1933, Greaves-Walker did gain approval to appoint Council representatives and "subchapter" status to:

Georgia Institute of Technology, Dr. Arthur V. Henry (Hon. N. C. Chapter in 1930)

Iowa State University, Dr. Paul E. Cox (Former active N. Y. Chapter in 1931)

University of Missouri - Rolla, Prof. Charles M. Dodd° (Former active Ohio Chapter in 1927)

University of Washington, Prof. Hewitt Wilson (Hon. N. C. Chapter in 1936).

Greaves-Walker reported (1934) that the same invitation had been extended, in vain, to Rutgers University and to Pennsylvania State University.

Subsequently subchapter appointments were made at:

Virginia Polytechnic Institute in 1938, Prof. John W. Whittemore° (Hon. N. C. Chapter in 1935)

University of Alabama in 1942, Dr. Thomas N. McVay (Former active Illinois Chapter in 1936)

Clemson University in 1952, Prof. Gilbert C. Robinson° (Former active N. C. Chapter in 1938)

University of California at Berkeley in 1962, Dr. Richard M. Fulrath (Former active Illinois Chapter in 1949)

University of Utah in 1962, Dr. Ivan B. Cutler (Hon. Washington Chapter in 1961).

Prior to 1942 the prescribed procedure required the faculty representative to forward "an outline covering the candidate's personal history, a transcript of his scholastic record and a record of his extracurricular activities. If the candidate receives a four-fifths approval (of the Executive

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* *Nowhere in the 1932 Constitution and Bylaws[1] does the term appear. It was first used by A. F. Greaves-Walker in internal correspondence (Spring 1932).*

Council) ... the nomination and records are submitted to the Chapters ... (and) receive a three-fourths vote of the active membership of each Chapter to be declared elected." This was greatly simplified by the elimination of chapter approvals through a bylaw amendment passed in April, 1942, in response to a protest of Dr. T. N. McVay of the University of Alabama. Small wonder that very few nonresident active members were elected during the decade 1932-42.

The above has been related in some detail to illustrate the consequence of poor implementation of an excellent idea. Under the simplified procedures several substantial initiations were made, notably the South Carolina Subchapter by the Georgia Chapter, the Washington Subchapter by the Missouri Chapter and later the California Subchapter by the Washington Chapter. [1]

The ultimate benefit gained from the subchapter system was to provided "brooders" for potential chapters. Several chapters went through a subchapter phase; viz., Georgia, Iowa, Missouri, South Carolina, Virginia and Washington.

Honorary Membership. As originally conceived "The membership shall be composed of those on whom the Fraternity wishes to confer a distinctive honor for attainments in the field of ceramics" and "a chapter may elect as honorary members, with the approval of the Executive Council, those who have made notable contributions to ceramic science, in arts or industry, provided, however, that a chapter may not elect more than one honorary member each school year." With only minor changes in wording these statements remain valid today. The only material change in the rules has been the granting of suffrage and the privilege of holding national office which had been prohibited by the 1932 Constitution. These prohibitions have been ignored even in the first election of national officers in 1932.

The honorary membership has served several very useful purposes. It provides each chapter with "windows" to the outside world and to those who are shaping it. It gives the chapters the opportunity of making a gracious gesture recognizing the achievements of persons in their chosen field of endeavor that they alone can bestow. Also, it should be noted that it is not uncommon for a grateful recipient of this distinction to assist the chapter in achieving its program objectives.

Though 360 honorary memberships have been awarded, there should have been twice this number. The active members seem reluctant to make selections, probably because of limited acquaintances and natural reticence. To the chapters it represents many lost opportunities for meaningful action.

Alumni Associations. Alumni members have always been welcome participants in their own or in a more conveniently located chapter. Quoting from the 1932 Constitution and Bylaws, "They shall have all privileges of active members except the right to hold chapter office or vote on the election of new members." Further "they shall have equal privileges with

active members when the Fraternity is in convocation assembled."[1]

Recognizing the limited number of chapters, the 1960 bylaws provided for the establishment of Alumni Associations in "locations where there are no universities or colleges having schools, departments, or divisions of ceramics."[2] It was the belief that the associations could serve very useful purposes of fellowship to the alumni members as well as for the general well-being of the profession and the Fraternity. It has been a keen disappointment that none has been established. They could be a source of real service, pleasure and satisfaction as well as a great help to the Fraternity.

GROWTH BY CHARTERING CHAPTERS

From Merger to World War II (1932-41). For the cogent reasons previously stated no new chapters were chartered during the 1930s. During the brief period between economic recovery and America's entry into the war, two chapters were added, Virginia Chapter on March 2, 1940, and Iowa Chapter on November 15, 1941. Details are given in the respective chapter histories.

The Effects of World War II (1941-46). The activity of the chapters paralleled that of the departments. With the exception of the Illinois Chapter all became dormant during the last half of the war. (See the history of the individual chapters.)

Many incidents, some ironically amusing, could be related concerning the period. One from the New York Chapter will illustrate: "John Boros accepted the responsibility of preparing a White Paper to show draft boards the value of ceramic engineers in the war effort. Mr. Boros has been called into the armed services, however, so work on the project has been delayed temporarily."[3]

In a letter from Grand Secretary Lane Mitchell° to all chapter secretaries, dated March 18, 1943, he quoted a communication from the Ohio Chapter that typified student attitudes. "we have taken steps at O.S.U. to preserve our records along with copies of the Constitution and Bylaws in the event that all our active members be called to the service (sic). This may prove to be the case by the end of this quarter or next. ... We are leaving notes on the way we carry on our meetings, initiations, and social functions. ..."

The last national convocation "for the duration" was held on April 22, 1942. The national officers elected then carried on until 1948 with the exception of Grand Secretary Lane Mitchell who resigned in 1943 to enter the U.S. Navy. Dr. Paul G. Herold° took over that position until the 1948 election.

One pleasurable incident to report was "A Song of Keramos" written by Dr. S. R. Scholes°, Grand Treasurer (1934-62). Sung to the tune of the "Marines' Hymn" it was first performed at the New York Chapter's annual banquet on May 3, 1942.

A SONG OF KERAMOS

From the common brick and hollow tile to the finest pottery,
We bring our brains and skill to bear on our clay technology.
Glass and porcelain, and many more
Things that earth and fire can yield
Are within the realm of Keramos, and the world's our working field!
Other engineers may sweat and plan, with their slide-rules working too;
But unless our stuff is on the ground, not a thing can those guys do.
For, refractories must come before
Any metals can be made,
And ceramics, as in days of yore, leads the industries' parade!
Our profession is the oldest one that the histories record;
There was Adam, made from clay, and "fired" from the Garden of the Lord.
But the future, not the past is ours,
And research, not history
Is to spread the fame of Keramos in the world that is to be.

– S. R. Scholes.

From World War II to Date (1946-77). Since the end of World War II eight new chapters have been chartered — New Jersey and Missouri in 1947, Pennsylvania in 1948, Georgia in 1950, Washington in 1952, Texas in 1955, South Carolina in 1958 and Florida in 1976. Regrettably during the same period three have been lost, at least for all practical considerations.

Earlier it was asserted that a professional fraternity must have a secure academic base. In the case of Keramos a measure of the secure base is accreditation of the curriculum by EPCD. Conversely, withdrawal of the accredited curriculum naturally deactivates the chapter. A rough parallelism between Keramos chartering and ECPD accreditation is apparent in the following tabulation:

Chapter Name	Keramos Charter	Initial ECPD Accreditation
Illinois	1932	1936-38
New York	(Year	1936-38
North Carolina	of	1936-38
Ohio	Merger)	1936-38
Virginia	1940	1936-38
Iowa	1940	1940
New Jersey	1947	1949
Missouri	1947	1936-38
Pennsylvania	1948	1936-38
Georgia	1950	1942
Washington	1952	1936-38
Texas	1955	1948
South Carolina	1958	1955
Florida	1976	1971

Retrogression. Most of the history of Keramos has been positive — a story of success, of obstacles overcome. Nevertheless there have been reverses. Most of the losses have been in the realm of "what might have been" and are more difficult to evaluate. The deactivation of three chapters was a sad reality.

Deactivated Chapters: Chapter	Year of Deactivation	Status
Texas	1961	Degree program discontinued, Keramos charter withdrawn.
North Carolina	1971	Degree program discontinued, Chapter inactive.
Virginia	1973	Insufficient students for Chapter to function.

During the academic year 1957-58 it became apparent that the Texas Chapter was in trouble. Correspondence was unanswered, chapter officer names were not submitted, or only partial lists, and no delegates or faculty advisor attended the 1958 Convocation. This situation continued through the following academic year (1958-59). The Executive Council minutes of May 18, 1959, state that ceramic engineering was to be discontinued at Texas within the next two years and authorized then Grand President, J. I. Mueller° to investigate and to report the following year whether or not the charter should be revoked. The Council's minutes of April 23, 1960, carry the statement "Because the degree in ceramic engineering will no longer be offered at the University of Texas and because of the inactivity of the Texas Chapter, the charter will be withdrawn and the Chapter declared inactive (Article 3, Section 1 of the Bylaws.)"

The reference merely authorized the Executive Council to withdraw a charter and declare a chapter inactive if the membership falls below five active members. Membership falling below five was not the question — that had never been enforced. The likelihood there would never be an active chapter prompted the decision.

After the usual delays of the biennial officer change and record transfer, the new Grand Secretary, W. J. Smothers° wrote to the Texas Chapter in accord with the Council's decision. From Dr. E. J. Weiss' response it was learned that the ceramic engineering work was expected to be enlarged and strengthened but was to be split between the Chemical Engineering Department termed "Solid State for Engineers" and the Engineering Science Program under the heading of "Material Sciences." Hardly an integrated program. Possibly the Executive Council should have delayed its action and awaited further developments.

In the case of North Carolina the Ceramic Engineering Department became in 1954 a part of a new Minerals Engineering Department with degree programs of ceramic, geological and metallurgical engineering. Around 1960 the geology work was transferred to another school within the university. In 1971 a further reorganization was pushed through

resulting in the conversion of Materials Engineering with a single degree program. Some specialization was offered in either ceramics or metallurgy but without degree option. The course of study essentially became a program in physical ceramics and metallurgy. The Chapter ceased to function; 1970-71 was its last year. The charter has not been withdrawn.

A somewhat similar situation arose at Virginia Polytechnic Institute. Because of a small enrollment the Ceramic Engineering Department was combined with Metallurgy in 1966 to form the present Materials Engineering Department with degree options in both fields. Since 1973 there have been insufficient ceramic majors to maintain the chapter. The charter has not been recalled.

It was indicated that the national officers possibly were too hasty in withdrawing the Texas charter and should have awaited further developments. The Board of Directors certainly have not been hasty in the North Carolina and Virginia cases. Probably the Texas experience and the failure of two projected chapters (California and Utah) to develop have been contributing factors. Also, there were other considerations. At North Carolina there have been indications that a ceramic degree program might be reinstated and there appears to be an increase in ceramic activity within the State of Virginia.

Keramos and Materials Science and/or Engineering. At the Keramos Business Meeting of 1963 a question was posed, "Inasmuch as the American Ceramic Society has accepted petitions for SBACS (student branch) chapters at schools where only materials engineering is taught, what should Keramos' position be on chapters at such schools? Prof. Planje conducted a chapter survey. Six chapters were for granting charters (with qualifications); six were against "diluting" ceramics by such charters. It was suggested that, until the Bylaws were studied nothing be done on this since a Bylaw revision would be necessary to permit the change.[4] The Bylaws were studied; changes were recommended and accepted; there was no mention of materials engineering.

The Board of Directors in 1966 held an extended "discussion of the problems surrounding some of the evolving material sciences..."[5] No conclusions were reached. Only one other reference to the problem has been found in the records. At a meeting in Raleigh, N. C., December, 1970, the question of the membership eligibility of students having ceramic majors but without ceramic degree designation was raised.[6] Understandably, they were advised to submit to the Board of Directors detailed descriptions of the programs. Apparently this was not done and no action was taken. By summer, insofar as North Carolina was concerned, the question had become academic — the Chapter had become inactive.

In the preceding section, *Growth and Decline of Ceramic Engineering Education*, attention was called to the facts that in 1971-74 there were 14 ECPD accredited curricula in ceramics of which 13 had Keramos chapters. Since then (1977-78) the number of accredited curricula and active chap-

ters has shrunk to 11 each. On the other hand the number of "materials" programs stood at 18.

The three foregoing paragraphs should give Keramos, NICE and the whole profession of ceramic engineering something to think about.

SUMMARY

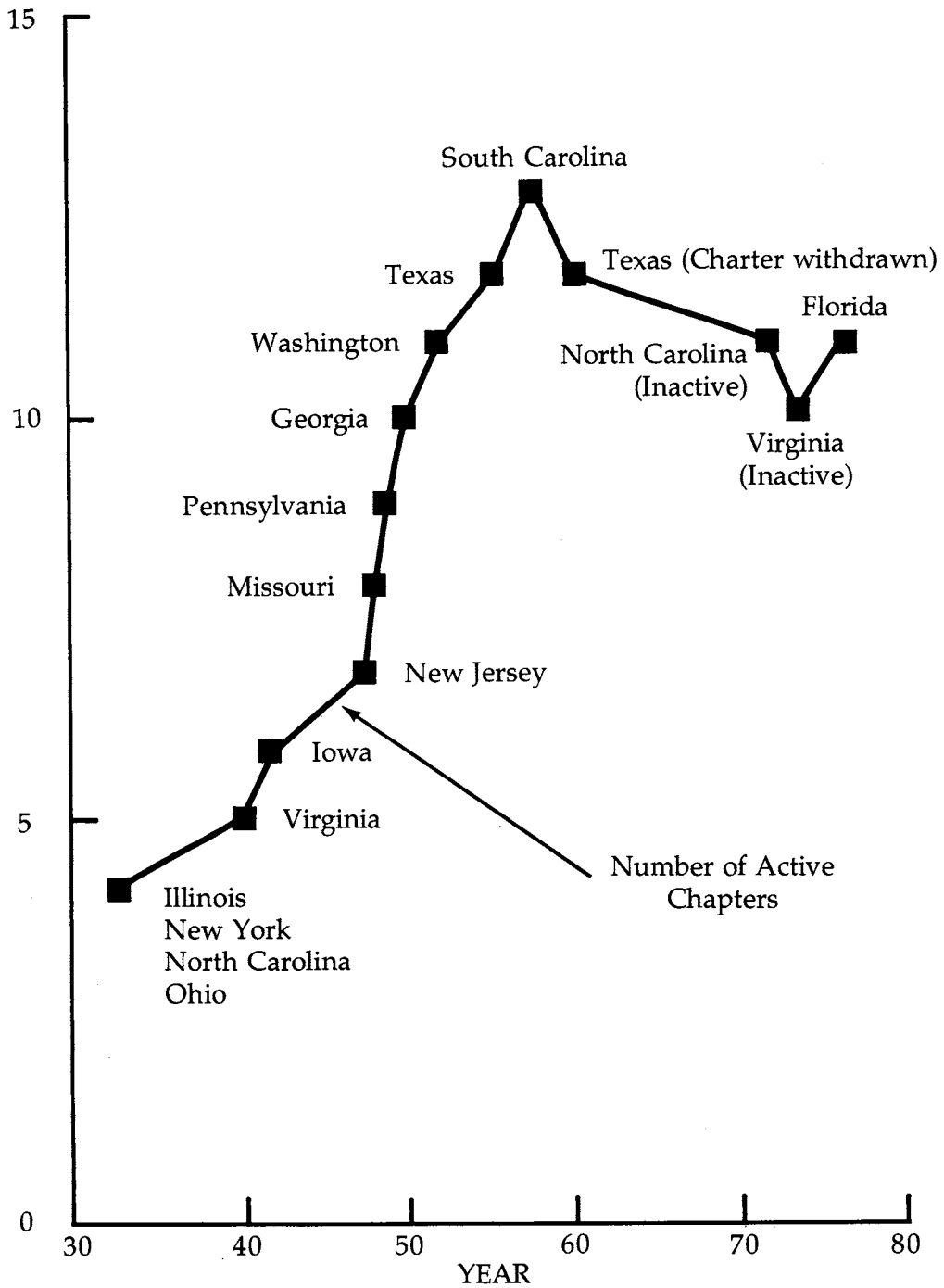
The growth of Keramos can be summarized most readily by the following three number-time plots. For the beginning, the year of merger, 1932, and the establishment of the present Keramos was selected with the end at 1977, the 75th anniversary of the founding of Keramos through its antecedent, Beta Pi Kappa.

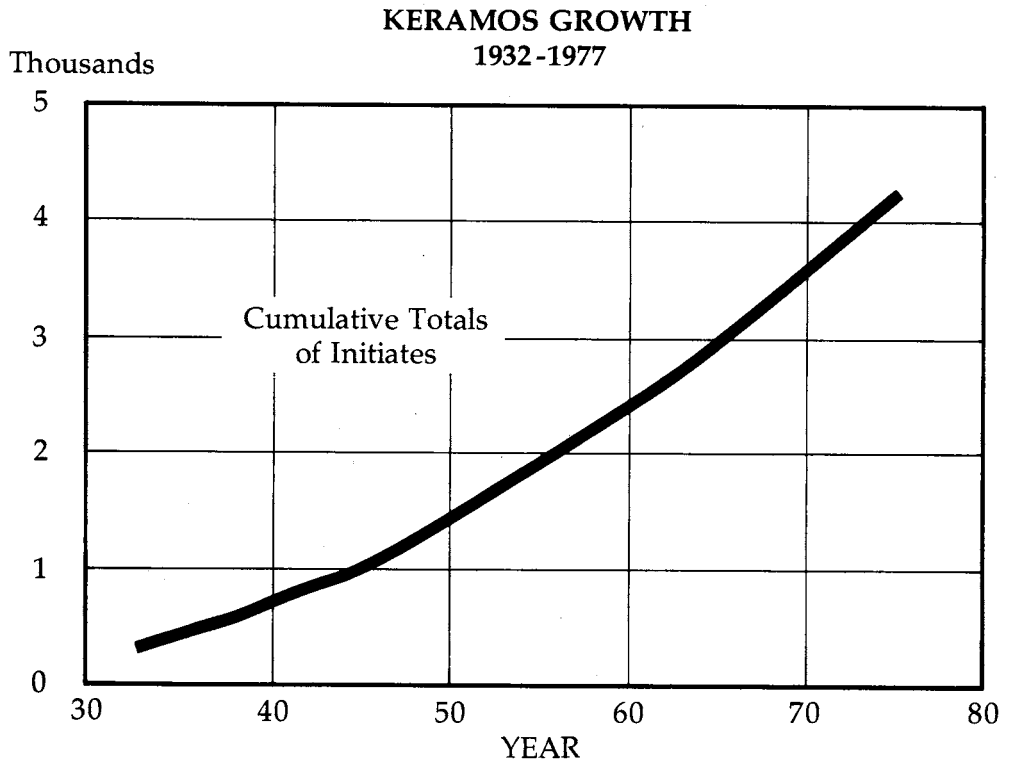
Attention is invited to the plot of active chapters beginning with the four at the time of merger, one of which has been lost, at least to the active list, rising to a peak of 13 in 1958 ending with the present eleven.

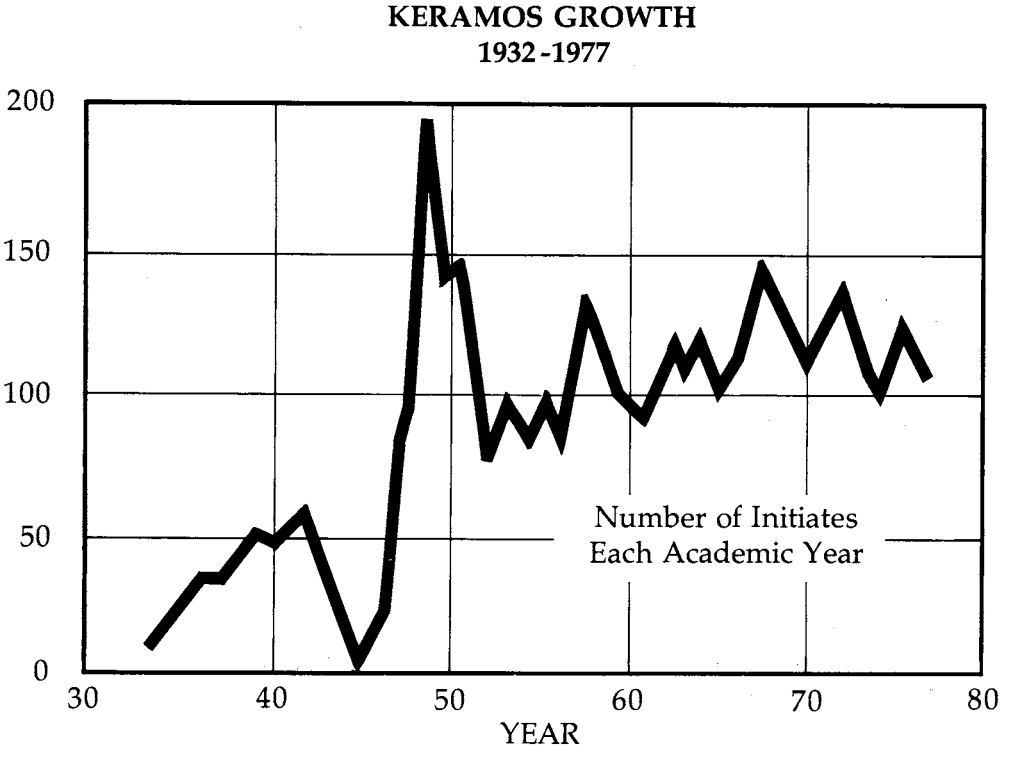
The second plot, the cumulative totals of initiates, begins with approximately 400 in 1932 and reaches almost 4,500 in 1977, a very respectable number. It is noteworthy that from 1945 to 1977 the plot generates a straight line which means a static growth rate for the past 32 years.

The third plot, the number of initiates in each academic year, reveals the ups and downs created by national events. The valley between 1942 and 1947 shows the effects of World War II followed by the 1947-51 postwar boom. The boom is followed by the devastating effects, 1952-1957, of the U. S. Department of Education erroneous prediction and the Korean War (1950-53). The remaining oscillations are not considered to be of significance. The approximate curve of means is disturbing in that during the last decade the trend seems to be downward — another reason for concern.

KERAMOS GROWTH
Active Chapters
1932-1977




KERAMOS GROWTH
1932-1977
Thousands
5
4
3
2
1
0
Cumulative Totals
of Initiates
30
40
50
60
70
80
YEAR


KERAMOS GROWTH
1932-1977
200
150
100
50
0
Number of Initiates
Each Academic Year
30
40
50
60
70
80
YEAR

REFERENCES

[1] Constitution and Bylaws of Keramos, Adopted February 10, 1932, as amended February 12, 1934, and April 21, 1942.

[2] Keramos Ceramic Engineering Fraternity Bylaws, Adopted April 24, 1960, as amended April 20, 1964.

[3] American Ceramic Society Bulletin 22 (3) 78 (1943).

[4] Minutes of the Business Meeting, Keramos Fraternity, April 28, 1963.

[5] Minutes, Keramos Board of Directors' Meeting, May 9, 1966.

[6] Minutes of North Carolina State Meeting with National President and General Secretary, December 8, 1970.