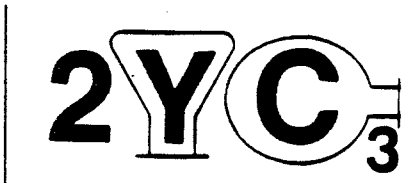
CHEMISTRY: A MOUNTAIN TOP EXPERIENCE



TWO YEAR COLLEGE CHEMISTRY CONFERENCE

DIVISION OF CHEMICAL EDUCATION

AMERICAN CHEMICAL SOCIETY

April 3 and 4, 1987

Arapahoe Community College

Littleton, Colorado

1987 EXECUTIVE COMMITTEE

CHAIRMAN

Edith Bartley
Tarrant Co.
Junior College
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Ft. Worth, TX
76119

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Home (817)
498-2177

IMMEDIATE PAST CHAIR

Onofrio Gaglione
New York City
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300 Jay Street
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11201

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CHAIR-ELECT

Ralph Burns
St. Louis Comm.
College-Meramec
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TREASURER/ COLLEGE SPONSOR

John Clevenger
Truckee Meadows
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MEMBERSHIP CHAIR

Mike Knoll
Vincennes
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Vincennes, IN
47591-9986

INDUSTRIAL SPONSORS CHAIR

Elliott Greenberg
Prairie State
College
P. O. Box 487
Chicago Heights, IL
60466

PAST CHAIRS

Jay Bardole
Marian Baker
Tamar Susskind
Douglas Bond
Katherine Weissmann
Paul Santiago
John Mitchell

95th 2YC3

ARAPAHOE COMMUNITY COLLEGE
5900 South Santa Fe Drive
LITTLETON, COLORADO 80120

APRIL 3-4, 1987

PROGRAM THEME - MAKING CHEMISTRY A MOUNTAIN TOP EXPERIENCE

PROGRAM CHAIR - Martin VanDyke, Front Range Community College, Westminster, CO 80030, (303) 466-8811

LOCAL ARRANGEMENTS - Al Grohe, Arapahoe Community College, Littleton, CO 80120 (303) 797-5839

LOCAL INDUSTRIAL SPONSOR CHAIR - Al Grohe, Arapahoe Community College, Littleton, CO 80120, (303) 797-5839

FRIDAY, APRIL 3, 1987

9:00 - 5:00	REGISTRATION
9:00 - 5.00	EXHIBITS
9:00 - 11:00	COFFEE
10:00	COMMITTEE ON CHEMISTRY IN THE TWO-YEAR COLLEGE This meeting is open to all interested persons.
12:00	LUNCH (on your own - college cafeteria, neighboring cafes)
1:00	WELCOME, INTRODUCTORY REMARKS
1:15	"DESCRIPTIVE" CHEMISTRY IN THE FIRST YEAR COLLEGE CHEMISTRY COURSE. Stanley Kirschner, Wayne State University, Detroit, MI Chair, Division of Chemical Education.
2:00	UNDERGRADUATE PROGRAMS AT THE NATIONAL SCIENCE FOUNDATION. Robert Watson, NSF, Washington D.C.
3:00	COFFEE BREAK
3:30	WERE I TO TEACH AGAIN. Fred C. Trusell, Consulting Analytical Chemist, Littleton, CO
3:50	HELP FOR HEALTH PROFESSIONS CHEMISTRY INSTRUCTORS. Anna M. Wilson, Purdue University, Lafayette, IN
4:10	(no title submitted) William T. Mooney, El Camino College, via Torrance, CA
5:30	WINE AND CHEESE
6:30	BANQUET
	BANQUET SPEAKER: Benjamin J. Luberoff, Editor. Chem Tech. Summit, NJ

SATURDAY, APRIL 4, 1987

8:00 - 12:00	REGISTRATION
8:00 - 4:00	EXHIBITS
8:30	SAFETY IN THE INSTRUCTIONAL LABORATORY. Herb Gibson, OSHA, Denver, CO
9:30	COFFEE BREAK
9:50	THE SAFE STORAGE OF CHEMICALS. Warren Kingsley, J.T. Baker Co., Phillipsburg, NJ
10:30	DISPOSAL OF HAZARDOUS WASTES. Jay A. Young, Chemical Health and Safety Consultant, Silver Spring, MD
12:00	LUNCH (on your own)
1:15	INTEGRATING COMPUTER-ASSISTED VIDEO DISC INSTRUCTION INTO AN INTRODUCTORY CHEMISTRY LATORATORY PROGRAM. Loretta L. Jones, University of Illinois, Urbana, IL
1:45	HELPING STUDENTS IN THE INTRODUCTORY CHEMISTRY COURSE WHO HAVE LIMITED LIFE EXPERIENCE RELATED TO CHEMISTRY. W.L. Bell, Red Rocks Community College, Golden, CO
2:00	AN INTELLECTUAL ASSESSMENT MODEL OF POSTSECONDARY CHEMISTRY STUDENTS. Russell D. Barrows, Front Range Community College, Westminster, CO
2:20	WHAT DO WE EXPECT OUR STUDENTS TO KNOW BEFORE TAKING CHEMISTRY? Tony Mitchell, Black Hawk College, Moline, IL
2:40	WRITING ASSIGNMENTS IN GENERAL CHEMISTRY. Naola VanOrden, Sacramento City College, Sacramento, CA

AGENDA

Committee on Chemistry in the Two-Year Colleges

Friday, April 3, 1987

General Meeting, Arapahoe Community College

I. Introductions

II. Approval of the minutes from the Dayton meeting
Executive meeting minutes, page 1
Open meeting minutes, page 3

III. Reports

A. Chair--Edith Bartley, page 5

B. Dayton meeting--Dick Jones

C. Denver meeting--Al Grohe, Martin Van Dyke

D. Rockville meeting--Margot Schumm, Alan Heyn

E. Membership--Mike Knoll, page 9

F. Treasurer--John Clevenger, page 10

G. College Sponsors--John Clevenger, page 13

H. Industrial Sponsors--Elliott Greenberg, page 17

I. Meeting sites--Edith Bartley, page 4

J. Programs and workshops--Dick Gaglione

K. ACS Two-Year Colleges Program--Jim Bradford, pages 25 through 64

IV. Old business

V. New business

VI. Information items, pages 65 through 90

2YCs Executive Committee Meeting
Princess Room, Ramada Inn
Dayton, Ohio
Thursday, November 13, 1986

Members present: Dick Gaglione, Edith Bartley, Kathy Weissman, Elliot Greenberg, Ralph Burns, Jay Bardole

Dick Gaglione opend the meeting at 7:30 PM. He gave special recognition to those persons whose term on the Executive Committee expire at the end of 1986. They include Ethelreda Laughlin as Secretary-Editor, and Curtis Dhonau and William Griffin as past Chairmen. Their leadership they have given has been a valuable asset to our organization.

Correction to Executive Committee minutes included:
page 1
Under Palatine meeting the last sentence should read "223 attended the conference. There was a balance of $528 after all expenses were paid."
page 2
In the first full paragraph the words "executive committee" should be replaced with "Committee on Chemistry in the Two Year College". In the last line of that paragraph the word "executive" should be omitted
Page 3
Under Policies and Procedures the deadline for nominees for Chair Elect should be October 17, 1986.
Page 4
Reappointment of members. Letters have been sent to Ethelreda Laughlin, whose term as Secretary and to Curtis Dhonau and William Griffin whose term as Past Chairs will expire, asking them it they wish to be appointed to a position on COCTYC. Also Jody Crook transferred her COCTYC membership from the Southern region to the Western Region.

Dick said that there was a statement in the 2YCs newsletter and the Division of Chemical Education newsletter calling for nominations for the position of Industrial Sponsor Chair.

A period of time was made available for comment on the credentials of nominees for 1988 Chair Elect. There were no written comments. Those present found the application to be in order. Concern was voiced that there was only one nominee for 1988 Chair Elect. It is the responsibility of COCTYC members to make nominations.

The committee discussed method and policy of filling an uncompleted executive committee term. It was decided that expiration date of terms should remain in tact and when a person is elected to fill an unexpired term, they have the right to two full three year terms of their own if they wish. It is understood that one person cannot hold two executive committee terms at the same time.

It was pointed out that we need to involve COCTYC members at regional meetings. This could involve hosting formal sessions or informal coffee sessions, presiding over paper sessions, or acting as recorders. Both the Program and Local Arrangements Chairs can ask people to do specific tasks at meetings.

Dick reported the results of the Division of Chemical Education Election. They are:

Jerry Bell	Chair Elect
John Moore	Secretary
Ron Perkins	Members at Large
Doris Kolb	Councilor
William Colemen	Alternate Councilor

Dick distributed a tentative membership roster for 1987. He asked that any corrections be sent to him. The last page of this membership included committees that don't function very well. Ralph Burns, Edith Bartley and Dick Gaglione were appointed a subcommittee on subcommittees.

The budget was discussed and agreed upon as included in this set of minutes.

There was extended discussion on future meeting sites. The discussion is summarized below.

98th Conference
Wendell Massey will be Local Arrangements Chair and will co-chair the program, but would like us to find someone to help on the program.

99th Conference
An exact date is needed yet.

100th Conference
At Toronto. Communication for this meeting is really slow and we need to get some plans finalized.

101st Conference
Purdue Biennial OK

102nd Conference
Pittsburg. Probabbly need a Program Chair.

103rd Conference
Kansas City. Need Program Chair.

104th Conference
Will be at North Lake Community College, Irving, Texas

105th Conference
It was decided that this will be a Western meeting and sould be in southern California. We will tell to Ruth Sherman and Wanda Sterner.

106th Conference
This will be at Jefferson Communtity College in Louisville Kentucky. Patricia McCoy-Brown will be Local Arrangement Chair.

108th Conference
Boston area.

107th Conference
Bill Wasserman has suggested a meeting at Vancover B. C. It was decided if we can make this a joint meeting with CS we would try this as a site. If not we will have to look for a different site.

It was decided that the Chemistry Day promoted by ACS for November 1987 should be emphesized and encouraged by DCHED also.

COMMITTEE ON CHEMISTRY IN THE TWO YEAR COLLEGE
Sinclair Community College
Dayton, Ohio
Friday, November 14, a986
9:30 AM

Dick Gaglione opened the meeting with a description of 2YCs and its relationship to COCTYC. The members present introduced themselves.

Minutes were circulated as a part of the agenda book. On page 3 as a part of meeting sites, the North Lake Community College, Irving site is in Texas. Dick announced that the publication resulting from the invitational meeting was complete and would be mailed to all community colleges in the near future. He also reported that the 2YCs symposium held at the Anaheim National ACS meeting was well done, but poorly attended. The Greenville meeting was very good with the theme "Industrial Chemistry". It included a tour of a Digital plant.

Membership report:

1986	404 renewals	1987	250 renewals
	237 new members		24 new members

John Clevenger gave a Treasures report with a balance of $14979.09. He also reported 102 college sponsors in 1986 and 35 already signed for 1987. Someone asked why a college should be a member. There were several replies, including receiving the newsletter, and a tangible way to support 2YCs.

Elliott Greenberg reported 22 paid Industrial members and encouraged each of us to sell industrial memberships to companies that call on us. He also announced that 2YCs mugs and briefcases were for sale in the display area.

Dick reported for Jim Bradford. The Guidelines that are being developed by the SCCED Task Force are ready for a pilot study to be conducted in February in 6 to 10 colleges. This will be done without cost to the colleges. These colleges will be asked to voluntarily upgrade their programs according to the guidelines. There will be an opportunity for discussion of the guidelines at the Littleton Colorado 2YCs.

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It was decided that the Chemistry Day promoted by ACS for November 1987 should be emphasized and encouraged by 2YC3 also.

The meeting was closed by recognizing those who are retiring from the committee. These include Ethelreda Laughlin, Secretary and Past Chair, Curtis Dhonau and William Griffin both Past Chairs.

ANNUAL REPORT -- 1986

Committee on Chemistry in the Two Year College
Division of Chemical Education
American Chemical Society

The Committee on Chemistry in the Two Year College, during the period from January 1 to December 31, 1986, has continued to support the improvement of chemical education by:

providing 4 regional Two Year College Chemistry Conferences (2YC3);

participating in the Division's 9th Biennial Conference and its 2YC3 25th Anniversary Symposium at the ACS National Meeting;

continuing to support the efforts of the ACS' Office of Chemistry in the Two Year College in publishing the Distillate;

participating in the Society Committee on Education's Task Force on Two Year College Chemistry;

increasing its individual membership;

publishing four editions of the 2YC3 Newsletter;

continuing to implement its new Policies and Procedures for the election of committee officers;

planning for conferences, elections, appointments and other activities for 1987.

TWO YEAR COLLEGE CHEMISTRY CONFERENCES

On April 11 and 12, 1986, the 90th 2YC3 meeting was held at Westchester Community College in Valhalla, New York in conjunction with the ACS National meeting in New York City. Pat Flath, of Paul Smith's College, was the program chair for this conference, which included 16 papers, 12 industrial exhibits, a trading post and a banquet. The event was attended by 85 chemistry educators and featured a post-banquet presentation on Industrial Research by Dr. Ivar Giaver, Nobel Laureate from the General Electric Company and Rensselaer Polytechnic Institute.

The 91st conference was held at Harper College in Palatine, Illinois, on April 25-26, 1986 and was attended by 223 people representing 22 states and 3 Canadian provinces. The program chair for this meeting was William T. Mooney, Jr., who provided attendees with 19 papers, a workshop, a banquet and a special 2YC3 25th Anniversary recognition ceremony. This program featured a keynote address by Ronald Gillespie, McMaster University and a post-banquet presentation by Mary Good, President-elect, American Chemical Society.

The 93rd and 94th 2YC3 meetings were held during the Fall of 1986 at Greenville, SC and Dayton, OH respectively. The 93rd took place at Greenville Technical College on October 17th and 18th and provided the 50 attendees with 10 papers, a tour of the Digital Equipment Company, industrial exhibits and a report of the ACS Task Force on Two Year College Chemistry. Leo Kling III of Tricounties Technical College in Pendleton, SC was the program chair for this meeting which had as its theme: Industrial Chemistry.

On November 14th and 15th the 94th 2YC3 convened at Sinclair Community College and offerred the 80 attendees 11 papers, 2 symposia, exhibits and a banquet address by John Tavlik of Fisher Scientific Company. Richard Jones of Sinclair was the program chair of the conference which had as its theme: Chemistry - The Central Science.

NINTH BIENNIAL CONFERENCE - DIVISION OF CHEMICAL EDUCATION

The Committee also participated in the Division's Biennial Conference held at Montana State University on July 27-31, 1986. Ed Heath of Southwest Texas Junior College chaired a 2YC3 program of seven papers, which were integrated into the overall conference program. It was estimated that approximately 90-100 Two Year College Chemistry educators joined the Four Year College and High School teachers in attendance in making this a most memorable professional experience. The Committee also provided an exhibit booth, directed by Leo Kling of Tricounties Technical College, which supplied information about the activities of 2YC3.

25th ANNIVERSARY SYMPOSIUM - ACS NATIONAL

A special symposium commemorating the 25th anniversary of 2YC3 was held at the ACS National Meeting in Annaheim, CA on September 8th. The program, "2YC3 Past, Present and Future", featured papers by William Mooney, John Mitchell, Onofrio Gaglione, John Clevenger and Ken Chapman.

OFFICE OF CHEMISTRY IN THE TWO YEAR COLLEGE

The Committee has continued to support the publication of the Distillate by providing $2,000 per year. The ACS staff person, Dr. James Bradford, in the Office of Chemistry in the Two Year College, has not only worked closely with the Committee in the preparation of items for this publication, he has also attended our regional meetings, preparing agenda books and actively participating in Committee meetings and programs.

S O C E D TASK FORCE ON TWO YEAR COLLEGE CHEMISTRY

In 1986, the Society Committee on Education's Task Force on Two Year College Chemistry added two members from our Committee, Dick Gaglione and John Mitchell, to join the group in preparing the guidelines for two year college chemistry education and in completing the report of the 1985 Invitational Conference on Critical Issues in Two Year College Chemistry.

2YC3 NEWSLETTER

Four editions of the Newsletter were published in 1986 each with a circulation of approximately 2,500. The Newsletters contain information concerning future regional conference sites, executive committee members of 2YC3, programs and local arrangements for regional meetings, membership application for 2YC3, call for nominations and election results, DIVCHED news and membership and local 2YC3 groups.

MEMBERSHIP, COLLEGE AND INDUSTRIAL SPONSORS

Throughout 1986, the Committee has attempted to increase the number of members, college sponsors and industrial sponsors via our 25th Anniversary Membership Drive. While we have been successful in increasing our individual membership from 530 in 1985 to 694 in 1986, we have also experienced a slight decline in the number of college and industrial sponsors. In 1986 our records show 102 college sponsors and 34 industrial sponsors. This represents a decline of 13 college sponsors and 5 industrial sponsors from the 1985 figures.

It should also be noted that the individual membership figures resulted from 404 renewals and 290 new members. The success of the membership drive is reenforced further by the fact that of the 290 new members, 160 joined at one of the four regional 2YC3 meetings held in 1986. The remaining 130 new members came from other sources such as the 2YC3 Newsletter and the Distillate.

NEW POLICIES AND PROCEDURES

In accordance with our new Policies and Procedures, Ralph Burns of St. Louis Community College at Meramec was elected Chair-elect for 1987 and Michael Knoll of Vincennes Junior College was re-elected to serve another term as Membership Chair.

It should also be noted that at the conclusion of 1986, Ethelreda Laughlin, Curtis Dhonau and William Griffin retired from the Executive Committee. All three are past chairs of the committee and have distinguished themselves in their service to two year college chemistry education for many years.

The committee has also held an election for 1988 Chair-elect and will announce the results at its first Spring meeting in Littleton, CO on April 3, 1987. In addition inquiries regarding the upcoming vacancy for the office of Industrial Sponsor Chair, have been received and an election will be held in 1987.

1987 ROSTER OF COMMITTEE MEMBERS

Recommendations for reappointments and new appointments to the committee were made to the Division Chairman and an updated roster of all regional committee members and officers was completed and sent to the Division office.

IN APPRECIATION

The 1986 Chair of 2YC3 would like to express his appreciation to the Division of Chemical Education, the ACS Office for Two Year Colleges and the members of 2YC3 for their support and assistance in what has proven to be a most memorable and rewarding professional experience.

Respectfully submitted,

Onofrio (Dick) Gaglione
Chairman (1986)
Committee on Chemistry in the Two Year College

MEMBERSHIP REPORT

March 15, 1987

Renewed Memberships	=	372
New Memberships	=	102
Total Memberships	=	474

Note: 50 new members joined during the Greenville (24) and Dayton (26) meetings.

COMMITTEE ON CHEMISTRY IN THE TWO YEAR COLLEGE

ANNUAL BUDGET

January 1, 1987 - December 31, 1987

INCOME

College Sponsors	2750.00	(based on 110 sponsors)
Industrial Sponsors	2500.00	(based on 25 sponsors)
Individual Memberships	3900.00	(based on 650 members)
DivChed	2000.00	
Interest	1100.00	
Meeting and Misc.	0.00	
TOTAL	12250.00	

EXPENSES

Chair Travel	2000.00
Chair Travel New Orleans	500.00
Past Chair Travel	850.00
Chair Elect Travel	850.00
Ind. Spon. Chair Travel	850.00
Treasurer Travel	850.00
Membership Chair Travel	850.00
2YC3 Rep. on Task Force Travel	500.00
Newsletter	1000.00
Meetings	1000.00
Postage,printing, phone etc.	1500.00
Outreach	1000.00
Contingency	500.00
TOTAL	12250.00

January 21, 1987
FINANCIAL REPORT FOR COCTYC
From: 1/1/86 To: 12/31/86

Credits		
Balance forward		$ 10720.27
College Sponsors		2525.00
Industrial Sponsors		3275.00
Individual Membership		3653.00
DIVCHED		2000.00
Interest		1385.01
C.D.'s	686.13	
Checking	698.88	
Meetings & Misc.		926.35
Reno	10.00	
Valhalla	50.00	
Bozeman booth	866.35	
		$ 24484.63
Debits		
Travel		$ 6919.87
Chair	2226.32	
Chair-Elect	850.00	
Past Chair	605.83	
Secretary	702.36	
Membership	335.36	
Treasurer	850.00	
Industrial Spon.	850.00	
Taskforce Mem.	500.00	
Office Supplies		49.90
Postage		107.14
Printing		347.61
Phone		75.84
Distillate		2000.00
Invitational Conf.		1200.00
Meetings & Misc.		1066.71
Valhalla	144.16	
Bozeman booth	922.55	
		$ 11767.07
Balance		$ 12717.56

COLLEGE SPONSORS

We had 102 college sponsors for 1986. Renewal notices have been sent out for 1987. So far, 89 colleges have sent renewals for 1987.

John V. Clevenger

John V. Clevenger
Treasurer/College Sponsors

March 5, 1987
FINANCIAL REPORT FOR COCTYC
From: 1/1/87 To: 3/5/87

Credits		
Balance forward		$ 12717.56
College Sponsors		275.00
Interest		304.48
C.D.'s	179.60	
Checking	124.88	
Meetings & Misc.		93.50
Bozeman booth	93.50	
		$ 13390.54
Debits		
Postage		34.12
Phone		80.71
		$ 114.83
Balance		$ 13275.71

COLLEGE SPONSORS

We have 100 College Sponsors for 1987. A list follows this report.

John V. Clevenger

John V. Clevenger
Treasurer/College Sponsors

COLLEGE SPONSORS
1987

Mr W H Team
Amarillo College
P O Box 447
Amarillo TX 79178

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Arnold MD 21012

Mr Jack Surendranath
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Dr Ken Tasa
Brazosport College
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Lake Johnson TX 77566

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Mr William Komanecky/Sci Dept
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Sr Mary Erwin Huelskamp
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Dr Pete Y Rodriguez
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Prof Robert Glynn
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TASK FORCE ON ACS INVOLVEMENT IN CHEMISTRY IN THE TWO-YEAR COLLEGES

Office of Two-Year College Chemistry
American Chemical Society
1155 Sixteenth Street, N.W.
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GUIDELINES FOR CHEMISTRY AND CHEMICAL TECHNOLOGY PROGRAMS IN TWO-YEAR COLLEGES

EXPERIMENTAL VERSION

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INTRODUCTION

The *Guidelines for Chemistry and Chemical Technology Programs in the Two-Year Colleges*, developed by the American Chemical Society (ACS), provide a comprehensive model for two-year colleges that grant associate degrees and for non-baccalaureate chemical technology programs offered at other institutions. These *Guidelines* provide:

- a mechanism for institutions to evaluate the quality of their chemistry and/or chemical technology programs[1] and related services.
- a guide for institutional self-studies and program reviews.
- a set of standards for program review and evaluation through the College Chemistry Consultant's Service.[2]
- a resource for regional accrediting groups when revising self-study guidelines and conducting visitations for periodic assessment of programs.[3]

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[1] Throughout this document the term "chemistry program(s)" will be used to refer to all parts of chemistry and/or chemical technology programs.

[2] See Section IX for information on how to apply for a consultant.

[3] The Conference on Critical Issues in Two-Year College Chemistry has recommended that the Commission on Postsecondary Accreditation, the American Association of Community and Junior Colleges, and the American Chemical Society cooperate to form a task force to study ways in which the regional accrediting associations and the scientific disciplinary organizations can work together to improve the quality of two-year college science education through the regional accrediting process. Copies of the Report of the Conference are available from the Office of Two-Year College Chemistry, American Chemical Society, 1155 Sixteenth St. N.W., Washington, D. C. 20036.

Types of Institutions

The *Guidelines* are designed to accommodate all those post-secondary institutions generally referred to as two-year, associate-degree granting colleges. They attempt to take into account the great diversity of these institutions and their programs, the great heterogeneity of the student body, the diverse curriculum and other unique characteristics of these institutions. The *Guidelines* describe optimum standards for a comprehensive community college chemistry program and a modern laboratory-oriented chemical technology program. Institutions that are not comprehensive and those that

have low enrollments may find it difficult to achieve some of these standards. In such cases, the *Guidelines* may help give a direction to future program development.

Use of Guidelines: Self-Study and Consultants

When using these *Guidelines* for self-study, institutions should carefully consider their rationale for deviation from a standard and provide explanation in the self-study document. External consultants can evaluate these self-study reports to determine if the *Guidelines* are being followed as closely as feasible. The consultants can often help colleges develop creative solutions to problem areas and devise approaches that provide greater compliance with the *Guidelines*.

Scope and Aims of Guidelines

The *Guidelines* are meant to help faculties provide chemistry students with the best possible education in the fundamental areas of modern chemistry and its relation to other disciplines and to society. To achieve this goal general curricular goals rather than specific curricular content are defined. Implementing the *Guidelines* can insure that the chemistry course offerings and programs of an institution:

- are consistent with the mission of the institution.
- meet the needs of the diverse backgrounds and abilities of entering students.
- utilize and enhance the strengths of the institution and the community.
- articulate with the chemistry programs at those four-year colleges to which most students transfer.
- are comparable to programs of recognized quality.
- meet local industries' needs for technical personnel.
- augment the continuing education and other local community chemistry education needs.

Areas of Concern

The *Guidelines* are concerned with: chemistry transfer courses and programs for science and engineering majors, chemical technology courses and programs, and other chemistry courses not included above, such as those for allied health occupations and non-science majors. (Section IV reflects this organization.) The *Guidelines*

are also concerned with the quality of: the chemistry faculty and its supporting staff, students and counseling services, articulation with other institutions and local industries and facilities.

Institutions adhering to these *Guidelines*, especially the appropriate articulation standards, should find that science and engineering majors can transfer to most four-year institutions without difficulty; that students completing chemical technology programs can find employment more easily and that the quality of the chemistry education of all students has been improved.

Sections that follow describe a comprehensive model. The self-study forms that are to be used with these *Guidelines* relate to each of the standards. The standards are to be considered as characteristics of the model; they are marked with the (S#) type of notation and printed in bold type.

Chemical Technology Programs

Chemical technology programs may be organized in a number of ways within the institutional structure. They may be a part of an independent unit usually referred to as a chemistry department or may be part of a larger unit including other technologies and sciences. In rare instances, they may exist outside the aforementioned structures as an independent program. Whatever the institution's organizational placement of chemical technology programs, there are minimal standards to be met and they are dealt with in the appropriate topical sections of these *Guidelines*. Those institutions that are concerned only with chemical technology programs, and not with chemistry courses for other students, will find the chemical technology curriculum standards, (S28) through (S38), of particular interest. Additionally, many of the standards in sections III (Financial Support), V (Faculty and Supporting Staff), VI (Students and Counseling), VII (Articulation), and VIII (Facilities) are applicable to chemical technology programs.

I

PROGRAM SURVEY AND REVIEW

(S1) Chemistry education in the two-year college has a broader mission than the preparation of students for careers as chemists, biochemists, chemical engineers or chemical technicians. There is a strong institutional commitment to the:

- **preparation of students for upper division work in chemistry, biochemistry, and chemical engineering;**

- **improvement of the chemical literacy of students preparing for other scientific and technical professions and occupations;**
- **increase in the scientific and technological literacy of non-science students;**
- **preparation of students for employment as chemical technicians or in chemically related technologies.**

The structure and scope of an institution's program in chemistry are governed by its educational objectives and resources in relation to the needs of all those it serves. The institution must recognize that chemistry is important in many disciplines and technologies, and in the intellectual lives of students seeking a liberal education, regardless of their major. The institution's financial commitment to its chemistry program must be sufficient to provide up-to-date instrumentation and supplies and adequate technical and other support services to the faculty. Moreover, institutional policies must allow for an efficient, continuous operation of the program.

(S2). The institution has established procedures for periodic evaluation of the effectiveness, level of achievement, and degree of compatibility of its programs with its objectives. When available, discipline oriented guidelines are used as a part of these program reviews.

These *Guidelines*, when used for self-study, seek evidence of the continuing ability of the entire chemistry program to serve its students optimally, recognizing their different needs, interests, and career goals.

II

ORGANIZATIONAL STRUCTURE

(S3) The chemistry programs are administered by the chemistry faculty organized as an independent unit. The faculty has participatory responsibilities in such matters such as budget development, chemistry faculty selection, evaluation and promotion; course development; assignment of teaching responsibilities; grading standards; and professional development. The faculty has control of their budget once it is established. At those institutions where chemistry faculty are not organized as an independent unit but are a part of a larger unit, they have sufficient involvement to function autonomously as set forth above.

III

FINANCIAL SUPPORT

(S4) The institution has made a financial commitment, for the continued operation, stability, and quality of chemistry programs consistent with its educational goals. Specifically, budgetary allocations provide for:

- qualified full-time faculty, competitively compensated, of sufficient size and breadth to staff effectively the chemistry courses necessary to serve the educational needs of the students.
- qualified part-time faculty, competitively compensated, as needed to provide specific expertise or to accommodate term-to-term fluctations in enrollments. They are not to serve as replacements for full-time faculty on anything other than a short-term emergency basis.
- trained laboratory technical support staff of sufficient size to provide necessary preparation, demonstration, and stockroom services.
- secretarial and clerical help, including student assistants, to aid and lessen the non-instructional work load of the faculty.
- media production and assistance as well as library bibliographic assistance necessary to facilitate a high quality, up-to-date program of instruction.
- instructional support services and learning aids compatible with the needs of the instructional program and conveniently accessible to the chemistry faculty and students, such as: tutorial services, computer facilities, library resources (including scientific journals and reference materials), audio-visual resources, programmed learning materials, and chemical model sets.
- expendable supplies and capital equipment acquisitions required for modern, high quality laboratory and lecture instruction.
- management and disposal of chemical laboratory wastes.[4]
- timely equipment maintenance and repair, or replacement.
- opportunitites for professional growth and development of the faculty, including travel to professional meetings, workshops, seminars, and courses.

- **sabbatical leaves for permanent faculty.**
- **insurance to cover the faculty for liability while carrying out their professional duties and to replace stolen/damaged equipment and supplies.**

The college board and administration recognize that laboratory-based science programs, like vocational-technical occupational programs are more expensive to operate than most other curricula in the two-year colleges. Funding is at least comparable to the occupational-/technology programs.

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[4] See *Less is Better* available from the American Chemical Society, 1155 Sixteenth Street N.W., Washington, D.C. 20036.

(S5) If unable to provide financial support as outlined in (S4) from regular funding sources, the institution actively seeks industrial and /or foundation support and strives to convince the state authorities of the need for differential funding for science laboratory-based programs.

IV

THE CURRICULUM

A. Program Development

(S6) The curriculum includes the necessary chemistry courses to accommodate the varied student and program needs. Each chemistry course is justified in terms of one or more functions of the two-year colleges, namely: transfer, occupational training, general education, remediation, counseling and guidance, and community service.

In program development, the institution recognizes that, as a result of open-door admissions policies, there is great diversity in the educational background, learning readiness, academic ability, and educational goals, of students. It accepts the fact that all students are not prepared to begin chemistry at the same level, and that all programs requiring chemistry do not cover identical topics. The use of these *Guidelines* in evaluating a program considers the size and diversity of the students' educational backgrounds in establishing the structure of the chemistry curriculum and in the presentation of the subject matter. In this curriculum section, chemistry curricular areas are outlined for the following three groups of students: (1) science and engineering majors, (2) chemi-

cal technology majors, and (3) other majors. The latter group includes, among others: students in allied health occupations, students in engineering technologies; and liberal arts students who seek a general education science experience. Additionally, the number of underprepared and remedial students make it necessary for many institutions to include preparatory or developmental chemistry courses to prepare these students for the college level courses.

Typically, comprehensive two-year colleges include one sequence of chemistry courses for chemistry, biochemistry, and chemical engineering majors. This sequence also satisfies the needs of other science majors (e.g., physics, biology, and geology), other disciplines of engineering, pre-professional health science majors (e.g., pre-medicine, pre-dentistry, pre-veterinary medicine, and pre-pharmacy) and some natural resource majors (e.g., pre-forestry and agriculture). This sequence typically involves two years of chemistry; one year of general chemistry followed by one year of organic chemistry. However, there may be considerable variation in the second year program. Not all majors are required to complete the full two-year sequence: some leave after the first semester; a larger group leaves at the end of the first year; and others leave after a third semester.

In addition to the above sequence, many comprehensive two-year institutions provide additional introductory courses tailored to the needs of other groups of students including a two-year occupational program in chemical technology where there is a concentration of employment opportunities for chemical technicians.

(S7) When there is significant variation from the curriculum mode described in these *Guidelines* (due to regional influences of the transfer colleges, demography, philosophy or a unique curriculum organization), the chemistry program meets the goals of this model but in a different manner.

The Society encourages diversity as well as quality in chemistry programs. Each institution should define its mission and develop chemistry programs that best achieve its mission. Change and experimentation preserve the vitality of chemistry education and provide timely career options for students. Experimental programs, in both content and teaching methodology are strongly endorsed. Despite variations, all good programs maximize the amount of chemistry that students learn, help students develop positive attitudes toward science, and help students recognize the contributions as well as the limitations of science and technology.

(S8) Chemistry courses include the relationship between chemistry and the other disciplines and the mutual impact of chemistry on technology and society.

The obligation to provide for the educational needs of students

in a variety of curricular areas is a challenge to the chemistry education profession. The profession can make a significant contribution both to the careers and to the intellectual development of all students and to their ability to function as citizens and community leaders in an increasingly scientifically and technologically-based society.

(S9) Through local advisory committees, the college provides ongoing investigations of the need for new occupational programs in which chemistry, biochemistry, chemical engineering and/or chemical technology are combined with other disciplines and technologies, e.g., biotechnology technician and scientific laboratory technician programs. When these needs are demonstrated, suitable programs are developed.

B. Scheduling of Courses

(S10) A schedule of chemistry courses satisfying these *Guidelines* is publicized widely and provided annually permitting students to schedule courses in proper sequence. The schedule provides reasonable flexibility for a student's orderly and normal progress into the transfer institution or the chosen occupational career.

In this regard, the Conference on Critical Issues in Two-Year College Chemistry[5] stressed the need for colleges to offer all courses for science and engineering students at least once each academic year.

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[5] See footnote 3.

(S11) The college is flexible in scheduling its chemical technology courses. These courses are organized and scheduled to meet the needs of all its students, whether they are enrolled full-time, part-time, or for continuing education.

(S12) The schedule of chemistry courses that service the various occupational programs is coordinated with the schedule of the other required courses for these programs.

C. Prerequisites for Courses

(S13) The prequisites for each chemistry course have been carefully

considered by the faculty and are continuously validated in terms of student success in the course. The prerequisities are clearly stated and publicized in the college catalogs, in the schedule of classes and in all published curriculum brochures and program sheets.

Wide dissemination of the prerequisities for enrolling in each chemistry course minimizes registration problems, promotes student planning and ensures good public relations.

(S14) All those involved in admitting students to chemistry classes, (administrators, counselors, faculty, etc.), understand the need for the stated prerequisites and adhere to them when approving student enrollment in chemistry courses.

Adherence to the established prerequisites for chemistry courses are necessary for the maintenance of quality programs. The Conference on Critical Issues in Two-Year College Chemistry* strongly recommended that colleges adhere to stated prerequisites for enrollment in a course. Failure to do so leads to increased student failure, increased drop rates; and a lowering of the quality of instruction. Additionally, qualified students with the necessary prerequisities may be deprived of enrolling in a class that becomes closed due to inadequate enforcement of the prerequisites.

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* See footnote 3.

(S15) Students deficient in the prerequisites for a given chemistry course are required to complete appropriate preparatory course(s) (in chemistry, mathematics, and/or developmental skills) designed to improve their success in the desired course or program.

(S16) An effective assessment is made of each student's preparation and readiness for the course by testing, transcript evaluation, and counseling.

D. The Spectrum of Introductory Chemistry Courses

(S17) Considering the college goals, the various programs, the characteristics of the student body, the enrollment in the chemistry program and in the college, an optimum spectrum of introductory chemistry courses is offered.

Generally, introductory chemistry courses are completed during a full-time student's first year. It provides the first introduction to the study of chemistry for students who did not study it in high

school. Among other topics, introductory courses deal with matter: its properties, structure, composition, changes in composition, as well as changes in energy accompanying chemical and physical changes. These courses are general in nature and typically include material from one or more of the several subdisciplines of chemistry (e.g., inorganic, organic, analytical, physical, and biochemistry). The knowledge and skills of chemistry needed by students in certain occupationally oriented programs is so specialized, and the time allowed for acquiring it is so limited that introductory courses for these programs include highly selective topics. Introductory chemistry courses, differentiated either by the student's major or the level of preparation include:

- o chemistry for the science and engineering professions
- o chemistry for chemistry-based technology occupations
- o chemistry for the non-science and/or non-technology students
- o chemistry for allied health and other biology related occupations
- o chemistry for engineering technologies and related occupations
- o chemistry for underprepared students
- o chemistry for other occupational or special interest groups

Due to differing needs, interests, and backgrounds of student groups for whom they are intended the aforementioned courses vary in content, orientation and level of chemical, physical, and mathematical sophistication. Some of these courses stress laboratory work and related knowledge and skills (especially mathematics), more than introductory courses in the other sciences. For either pragmatic or philosophical reasons, a given introductory course may serve the needs of two or more of the student groups listed above (e.g., both preparatory and general education students or both allied health occupational and general education students.) However, with such combinations, care must be taken to ensure that the needs of any group are not compromised.

The general chemistry course is the foundation course of the program. Once designed it greatly influences the characteristics of the second year and preparatory courses as well as the other introductory chemistry course offerings. The general chemistry and preparatory courses are discussed briefly in the next two sections, prior to considering the chemistry transfer program, whereas introductory chemistry courses devoted to chemical technology programs and other majors are discussed in later sections.

E. General Chemistry for Science and Engineering Majors

(S18) The minimum prerequisites for the first term of the general chemistry course for science and engineering majors sequence are the equivalent of one year of high school chemistry and three years of high school mathematics including two years of algebra. For students deficient in these prerequisites, the college offers and requires the successful completion of a preparatory chemistry course as well as the necessary mathematics courses.

(S19) Although the general chemistry course sequence is organized around traditional chemistry topics, it includes related major developments in such disciplines as biology, geology, physics, mathematics, and engineering.

F. Preparatory Chemistry Courses

(S20) The curriculum includes a preparatory course for students who either have not previously studied chemistry or have inadequate preparation in the subject. It is designed to improve their chemical knowledge and skills before enrolling in one of the other introductory chemistry courses. The preparatory course includes a limited introduction to the basic terminology and principles of chemistry including, among others: modern concepts of atomic structure, bonding, oxidation numbers, formulas, equations, stoichiometry, and chemical reactions. It emphasizes chemical calculations and includes one laboratory session per week.

A preparatory course is helpful and, in many colleges essential, to maintaining high standards in the general chemistry course. When combined with an effective student assessment and chemistry placement program, the preparatory course helps ensure that students entering the general chemistry sequence are well-prepared. One laboratory session a week is recommended for such a preparatory course. The caution in (S17) regarding combining functions into a single course is particularly significant with respect to the preparatory course.

G. Chemistry Transfer Programs

(S21) Science, mathematics, and engineering courses offered for chemistry and other science and engineering majors are carefully articulated with the institutions to which most students transfer.

Normally, transfer programs for chemistry, biochemistry, chemical engineering, biology, and health science professionals include one year of general chemistry followed by one year of organic chemistry. However, some two-year colleges offer analytical chemistry or biochemistry in the second-year instead of the full year of organic to satisfy the requirements of the local transfer institutions. Certain transfer students do not require the full two-year sequence; consequently, enrollment may be considerably smaller in the second-year courses than in the first-year sequence.

Ongoing articulation programs with several transfer institutions are necessary. This is particularly true where chemistry programs at senior institutions in a given geographical region are not uniform and when the four-year institutions change their chemistry curriculum. Transfer institutions that are unfamiliar with the two-year college program, may not consider the two-year college experience to be equivalent to that of the first two years of their institution and may not accept certain courses for transfer. A good articulation program is apt to prevent such problems.

Students wishing to acquire American Chemical Society certification as a chemistry major at the completion of the bachelor's degree should be aware of the approved program as outlined on page 5 of the publication *Undergraduate Professional Education in Chemistry: Guidelines and Evaluation Procedures, ACS Committee on Professional Training (CPT), 1983.*[7] At the time of preparation of these *Guidelines* the CPT, is developing a similar set of guidelines for a major in biochemistry. Chemical engineering programs are approved by the Accreditation Board for Engineering and Technology, which includes representatives of the American Institute of Chemical Engineers.

[7] Available from the Committee on Professional Training, American Chemical Society, 1155 Sixteenth Street N.W., Washington D.C. 20036.

For a two-year college chemistry transfer program to match the first two-years of an ACS certified transfer program in chemistry, it offers structured courses consisting of a minimum of 180 hours of lecture classroom work and a minimum of 240 hours of laboratory work. These hours are normally spread over a minimum of four semesters or six quarters, starting with the first term of general chemistry for science majors course. Each course is for four or five credit hours and includes a minimum of three lecture hours and at least three or four laboratory hours per week. Many two-year colleges exceed these minima primarily because their transfer institutions do so and/or because they have found it necessary or desirable to do so.

Some general chemistry courses in four-year institutions contain sufficient analytical or inorganic chemistry to satisfy some of the CPT certification requirements in these areas. Two-year colleges that offer equivalent courses through careful articulation

with their transfer institutions, should find that their students receive similar consideration by the transfer institution.

In addition to the chemistry and mathematics prerequisites described earlier, CPT recommends high school physics as a prequisite and concurrent enrollment in calculus as a corequisite for admission into the general chemistry course. The physics and calculus recommendation, while desirable, may not be feasible for certain two-year colleges because the transfer institutions do not require them for many transfer students requiring general chemistry. However, the CPT requirement that the general chemistry (for chemistry and other science majors) sequence be a prerequisite for the second year organic course is valid at two-year colleges.

(S22) Chemistry courses for science and engineering majors incorporate a historical perspective as well as references to current developments in chemistry. Attention is given to chemical safety, the systematic use of the chemical literature, and computer applications in chemistry.

Emphasis on pure theory can neglect the practical, aesthetic, and humanistic aspects of chemistry. Consideration of current developments in chemistry include biochemistry, polymer chemistry, and applied chemistry, among other topics.

(S23) Lecture experiments and demonstrations are used when appropriate in the science and engineering major chemistry courses in presenting descriptive material and in generating lasting interest in chemical phenomena. Up-to-date learning aids and media resources, such as computer aided instruction, audio-visual presentations, and programmed instructional materials are used to enhance students' interest and learning.

(S24) Laboratory work in chemistry courses for science and engineering majors is designed to give students hands-on experience in working with chemical phenomena and instrumentation. It is also designed to develop the competence and self-confidence required to:

- **o gain a fuller, more practical understanding of and appreciation for chemical concepts.**
- **o plan and execute experiments through the use of the chemical literature.**
- **o anticipate, recognize, and respond properly to hazards inherent in many chemical procedures.**
- **o keep neat, complete experimental records.**
- **o synthesize and characterize inorganic and organic compounds.**

- o perform accurate quantitative measurements.
- o analyze data statistically, assess the reliability of experimental results, and discuss the sources of systematic and random error in experiments.
- o interpret experimental results and draw reasonable conclusions.
- o communicate effectively through oral and written reports.

(S25) Laboratory work gives students hands-on experience and an opportunity to acquire competence and self-confidence in the use and understanding of modern laboratory instruments at a level equivalent to that of students in the major transfer institutions. These instruments are reasonably recent models and there is adequate provision for their maintenance and prompt repair.

Typically, most of the following instruments are included:

- o analytical balances
- o pH meters
- o recording spectrophotometers (infrared, ultraviolet, and visible)
- o gas and liquid chromatographs

and may include:

- o nuclear magnetic resonance spectrometers
- o atomic absorption spectrophotometers and flame emission photometers
- o automatic temperature control devices
- o computerized data acquisition.

(S26) The second-year program, especially organic chemistry, includes training and experience in the use of information from the enormous and rapidly expanding chemical literature.

Because of the increasing volume and complexity of chemical literature, students are no longer able to acquire sills in information retrieval without some formal instruction. These skills (e.g., using *Chemical Abstracts* and other compilations) may be taught through coordinated instruction, by integrating them into courses, and by library exercises and/or research papers as well as on-line interactive computer file experiences. Students need to understand the organization and use of the printed information sources in order

to use the computer databases to best advantage.

(S27) The department is using or is actively investigating the use of self-instruction techniques, such as audio, video, and computer courses, both as supplements to traditional classroom instruction and for single topic short courses.

Increasingly, self-instruction programs are available to help students reach a portion of their educational goals without the help of the teacher. Materials are available on such topics as catalysis, chemical engineering, industrial chemistry, polymers, surfaces, and the use of chemical literature. Special topic, self-instructional courses might be offered in cooperation with ACS local sections or local industry. They could be especially useful to those employed in the chemical industry who are not enrolled in two-year colleges.

H. Chemical Technology Programs

(S28) The chemical technology program includes specific training that provides students with entry level skills for employment as chemical technicians. Additionally, there is a continuing education program for currently employed chemical technicians including both those who are graduates of a chemical technology program and those who have entered the field without such an education.

Professional chemists often rely on chemical technicians to make measurements, perform analyses, and carry out experiments. Therefore, the technician program must provide the student with the knowledge and skills required to function in this capacity.

(S29) The core curriculum for the chemical technology program includes, as a minimum, the following fundamental areas of study:

- **basic chemistry (general, fundamentals, principles) including inorganic chemistry**
- **analytical chemistry (quantitative analysis)**
- **organic chemistry**
- **chemical instrumentation**

The non-chemistry courses in the core program include, minimally:

- **an academic year sequence of college courses in each of the following: mathematics up to algebra/trigonometry, English composition, humanities/social sciences, and physics or biol-**

ogy.

- a course in computers/computing.

The program for chemical technology majors can be organized in a number of ways reflecting the institution's missions, the available facilities, and the interests and capabilities of the faculty and students. The Society recognizes and encourages approaches that cover the core material in different ways. Some chemical technology programs use a traditional (lecture, recitation, laboratory) approach while others use an integrated lecture-recitation-laboratory format.[8] Regardless of the approach used, laboratory work must develop proficiency in laboratory techniques in addition to demonstrating basic principles of chemistry.

[8] One two-year program, *Modern Chemical Technology*, using the integrated approach has been developed. For information concerning this curriculum, the availability of the textual materials, and the experiences of colleges that are using thses materials contact the Education Division, American Chemical Society, 1115 Sixteenth Street N.W., Washington, D.C. 20036.

(S30) A student in an associate degree chemical technician program has the following minimum experience in chemistry:

- 170 to 180 contact hours of classroom work. Up to 30 of these hours may consist of supervised tutorials, active participation in seminars or supervised self-study programs.
- 450 to 500 contact hours of laboratory work, principally as part of a structured course. However, up to 100 hours may be from cooperative industrial experience. If more than 100 hours of cooperative experience is to be substituted, students must prepare detailed project reports for evaluation by the faculty.

(S31) Not less than one-half nor more than two-thirds of the two-year chemical technology program is devoted to the core curriculum in chemistry, which is spread approximately equally over the areas of basic chemistry (including inorganic, analytical, and organic) and chemical instrumentation.

(S32) Wherever appropriate, attention is given to examples of biochemistry, polymer chemistry, applied chemistry, chemical safety, and the systematic use of the chemical literature. Computers and computer applications are integrated into lecture and/or laboratory portions of the core curriculum.

(S33) Laboratory experience in the chemical technology core curriculum reflects the career orientation of the program in that it helps students develop a wide range of laboratory skills, gives them hands-on knowledge of chemistry using the latest state of the art instrumentation and equipment, and fosters competence and self-confidence enabling them to:

- o use chemical literature to plan and execute experiments;
- o anticipate, recognize, and respond properly to hazards encountered in chemical manipulations including being aware of hazardous substances and how to handle and dispose of them and abiding by all safety regulations pertaining to the laboratory area.
- o keep neat, complete well-organized experimental records.
- o synthesize and characterize inorganic and organic compounds.
- o perform accurate quantitative measurements and related calculations.
- o understand and use up-to-date instruments, particularly NMR, IR, UV, VIS and AA spectrometers, gas and high pressure liquid chromatographs, electrochemical instruments, and laboratory computers including computerized data stations as well as analytical balances and pH meters
- o communicate effectively through oral and written reports.

(S34) The laboratory experiments in the chemical technology program are realistic, stressing practical applications of standard techniques used in modern technology.

(S35) Students completing the chemical technology program are able to retrieve specific information from the chemical literature, and can demonstrate that they understand the organization and use of both printed information sources and computer databases.

Because of the increasing volume and complexity of chemical literature, students are no longer able to acquire skills in information retrieval without some formal instruction. These skills may be taught through coordinated instruction, by integrating them into courses, and by library exercises and on-line interactive computer file experiences. Students need to understand the organization and use of the printed information sources in order to use the computer databases to best advantage.

(S36) The institution is encouraged to participate, where possible, with local industries in a cooperative education program,[9] and

provide an opportunity for students to work in industrial positions prior to completing a chemical technology program. Such academic-industrial interface programs are designed to provide students with:

- an appreciation of technology
- exposure to team research, interdisciplinary research, societal problems, and points of view complementary to those of academia
- an exposure to both pure and applied chemistry
- opportunity to use sophisticated instruments in a practical setting.
- early professional experience, contacts and information for career planning
- practice in preparing oral and written reports and in meeting deadlines.

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[9] For further information regarding co-op programs, write the Academic-Industrial Education Program, American Chemical Society, 1155 Sixteenth Street, N.W., Washington, D.C. 20036, or telephone (202) 872-4517.

(S37) The institution cooperates with local chemical industries in a variety of ways including the establishment of a Chemical Technology Program Advisory Committee. The Advisory Committee advises the college on the needs of the local region for chemical technology education and the faculty on the chemistry course content for chemical technology students with respect to the latest state of the art equipment and laboratory techniques and methods; assists in planning field trips, providing persons for a speakers bureau, facilitating interuse of faculty and industrial chemists, arranging job interviews for future graduates of the program, and developing strategies for recruiting students.

(S38) All core courses in the chemical technology program are scheduled and offered on a regular basis, insuring that students can take them in proper sequence.[10]

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[10] Refer to (S11) for additional comments on scheduling of chemical technology courses.

I. Chemistry Courses for Other Programs

(S39) **Considering the number of students involved and the demands of the occupational curricula and faculty, the college provides as many separate courses as possible for each of the following student groups:**

- **non-science/non-technology students (e.g., the arts, liberal arts, business, etc.)**
- **students majoring in one of the allied-health professions/occupations.**
- **students majoring in engineering technology and related occupations.**
- **students majoring in other occupations and special interest groups (e.g., fire science, police science, auto mechanics, etc.).**

Institutional policies and pragmatic considerations, which vary widely, make an impact on these courses. Some colleges, may combine two or more groups in the same course. This however, should not compromise the needs of students in any group. In other cases, the program is so completely determined with respect to the amount of time devoted to chemistry, the topical coverage required, and the scheduling of classes that combining groups is precluded.

1. Chemistry for Non-Science/Non-Technology Students

(S40) **If a chemistry course for non-science students is offered, it is transferable and satisfies the general education science requirement for graduation of both the local and transfer institution. The mathematical requirement is minimal; usually elementary algebra is the only prerequisite. The goal of the course is to acquaint students with the fundamentals of chemistry and its relationship to science, technology and society. It emphasizes what chemistry is about rather than facts, laws and theories.**

Topics covered in these courses, which are usually interdisciplinary in nature, may range from environmental chemistry to the history of chemistry. Typically, such courses carry four or five semester hours credit, consisting of three or four hours of lecture and one laboratory session per week.[11]

[11] The 1984 Report of the Task Force for the Study of Chemistry Education in the United States, *Tomorrow*, recommends that the ACS establish guidelines regarding the appropriate balance among the fundamental principles of chemistry, applications of chemistry, and the place and role of the chemical sciences in contemporary society for college-level chemistry courses for non-science majors. Coll-

eges are encouraged to report on their experiences in balancing these factors. Copies of the report are available from the Education Division, American Chemical Society, 1155 Sixteenth Street, N.W., Washington, D.C. 20036.

(S41) The general education chemistry course includes a laboratory consisting of at least one two- or three-hour laboratory session per week. The laboratory work gives the students a brief but first-hand introduction to the properties of chemicals and to what chemists do. It uses the methods of science to relate chemistry to the students' everyday lives. By giving students hands-on experience, the laboratory work helps them develop the ability to:

- **o follow directions and use laboratory apparatus to perform quantitative measurements;**
- **o interpret experimental results;**
- **o draw reasonable conclusions from observations;**
- **o communicate effectively through oral and/or written reports;**
- **o learn laboratory safety by practicing proper safety procedures and learning how to deal with hazards inherent in experiments.**

The *Tomorrow* report emphasizes that, whether they are taught to nonscientists, science majors, or chemistry majors, foundation courses in chemistry at the college level must include a substantial component of significant laboratory work.

2. Chemistry for the Allied Health Professions/Occupations

(S42) For allied health transfer students (e.g., nursing, physical therapy, home economics, etc.) and other biology related majors (e.g., agriculture, natural resources, etc.) that do not require general chemistry, the institution offers a course sequence comparable to that required at the institutions to which most of their students transfer.

Increasingly, this is a one-year sequence that includes carefully selected topics from general and inorganic chemistry followed by topics in organic chemistry and biochemistry. Applications to living systems are emphasized. Generally, the first term requires algebra and the prerequisite for the second term is satisfactory completion of the first term. Typically, both terms have four semester credit hours, with three to four hours of lecture and two to three hours of laboratory per week, for a total of eight semester hours credit. When no organic chemistry is included in the first semester, the preparatory course or the first semester of the scien-

ce majors sequence may serve as the prerequisite for the second semester. If organic chemistry is included in the first semester, this is generally not feasible.

(S43) Laboratory work includes everything mentioned for the non-science majors course in (S41) as well as the following:

- keeping neat, complete experimental records;
- synthesizing and characterizing inorganic and organic compounds;
- learning special techniques that are used in the allied health fields (e.g., pipetting, titrating, and colorimetric determinations);
- using such instruments as pH meters and visible wavelength spectrophotometers, gas chromatographs, and laboratory computers.

(S44) If the institution has two-year allied health programs, there is a minimum of a one-term chemistry course to service these programs. The content of this course is developed in cooperation with the faculty and advisory committees for these occupational programs. Prerequisites for this course are consistent with those of the programs serviced.

Generally, these courses are four or five semester-credit hours and include a two- or three-hour laboratory per week. They are less demanding both in prerequisites and the chemistry covered than the course for the baccalaureate program and include topics in general chemistry, inorganic chemistry, organic chemistry and biochemistry, stressing applications to living systems. Laboratory work is similar to that for the non-science major course (S41) and may include certain laboratory techniques of the two-semester sequence for allied-health programs (S43) but few of the instrumental techniques.

3. Chemistry for Engineering Technology and Related Occupations

(S45) For institutions with engineering technology programs that require a background in chemistry there is an appropriate chemistry course offered. The content of this course is developed in cooperation with the faculty and advisory committees for these programs, with prerequisites consistent with those of the programs serviced.

Courses for engineering technology students are generally concerned with selected topics in chemistry and their applications to materials science and engineering related activities. Some colleges provide either a one term or a one-year course that concentrates on such topics as metals, semiconductors, corrosion, polymers, electro-

chemistry, and so on.

Laboratory work in these courses includes techniques, instruments and related calculations specific to the applications of chemistry in the technologies. Students are expected to perform accurate measurements; keep neat, experimental records, and communicate effectively through oral and written reports. The course requires that students become familiar enough with the library to retrieve information, especially that which relates to their specific technology.

4. Chemistry for other occupations and special interest groups

(S46) In institutions where occupational programs other than those discussed above (e.g., police science, fire science, auto mechanics) or where other departments, local industries, or community special interest groups have indicated a need for a special chemistry course or program, the college has responded by satisfying the need. Such courses are assigned to the chemistry faculty who develop them in cooperation with the occupational faculty or representatives of the industries or special interest groups concerned. These courses are either a part of the regular chemistry curriculum or are included as the chemistry component in the continuing education, community services, or contract education program of the college.

V

FACULTY AND SUPPORTING STAFF

(S47) The minimum academic preparation required of a chemistry faculty member is a master's degree in a discipline of chemistry (including biochemistry and chemical engineering). In addition, faculty in a chemical technology program are required to have industrial experience and are familiar with applications of chemical technology. In the selection of chemistry and chemical technology faculty emphasis is placed on both a competence in chemistry and an ability to communicate an understanding of chemistry to others.

Further academic training and research is highly desirable, particularly if it stresses depth as well as breadth of knowledge in chemistry.

(S48) There is evidence that all chemistry faculty members keep abreast of current developments in chemistry, chemistry education and the applications of chemical technology in our society.

(S49) The institution has an active program to assure equal opportunity in professional and technical employment for women, minorities, and the handicapped. If equal opportunities do not appear to exist, the institution has an active plan for correcting the situation.

(S50) Full-time faculty size is adequate to teach the full range of chemistry courses on a regular basis to meet the needs of students as outlined in the curriculum section of these *Guidelines.*

Faculty size is determined by the number of different courses offered, the number of sections taught, and the number of students enrolled in the courses. Optimum programs require at least two full-time faculty members or the equivalent in qualified full-time personnel. Full-time faculty are sometimes given other duties along with their teaching assignments and teaching load credit is granted for these duties. Consequently, they are not full-time chemistry faculty members. In such situations, the equivalent of two full-time faculty requires a total of two full-time teaching loads distributed among full-time faculty who possess a minimum of a master's degree in chemistry.

(S51) The number of credit hours taught by part-time faculty does not exceed 25 percent of the total chemistry offerings.

Part-time faculty are defined as part-time employees of the college.

(S52) Full-time faculty from other disciplines are not assigned to teach chemistry courses unless they meet the minimum requirement of a master's degree or its equivalent in chemistry, and for chemical technology programs, also have some industrial experience.

(S53) Policies regarding salaries, teaching loads, overloads, promotions, tenure and/or continuing contracts, leave policies (sabbatical or other), and hiring practices are sound enough to maintain good faculty morale and to attract and retain chemistry faculty of quality.

(S54) Teaching loads are such that after fulfilling all classroom and laboratory teaching responsibilities, meeting required office hours, and satisfying committee assignments faculty have adequate time and energy for:

- o continuing course and program development;
- o study to stay abreast of new developments in their educational field;
- o participation in professional activities;
- o instructional research to improve teaching effectiveness.

(S55) For purposes of faculty load determination, each laboratory contact hour counts the same as a lecture contact hour in the classroom.

Supervision of a student laboratory, including the preparation for the experimental work and the grading of the laboratory reports, demands time and energy of a faculty member that is equivalent to that required for the preparation and presentation of a lecture. For purposes of establishing teaching load guidelines, the definition of a contact hour is 50 minutes of time in which a faculty member is required to be present in a classroom or 50 minutes of laboratory teaching or supervising students.

(S56) No faculty member is responsible for more than 25 students in a laboratory at one time.

This standard is based on prudent safety considerations and practice as recommended in the ACS publication, *Safety in Academic Chemistry Laboratories*.[12]

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[12] Copies may be obtained from the American Chemical Society, 1155 Sixteenth Street N.W., Washington, D.C. 20036.

(S57) The normal teaching load in chemistry is 15 contact hours per week or less and/or 450 student contact hours per week or less.

A student contact hour is given by the number of students multiplied by the number of contact hours. Greater loads can be justified only in terms of factors such as smaller class sizes or fewer numbers of preparations. In such instances, the work load is compared to the standard load, which is based on two courses and students from two or more laboratory sections combined into a lecture section with an average of 30 students per contact hour or less. Teaching loads that exceed this standard risk lowering the quality of the chemistry program. For this reason, teaching loads

and contact hours are given considerable weight by Consultants when they evaluate a chemistry program and make recommendations for improvement.

(S58) Secretarial, stockroom, and technical staff is available to relieve faculty members of the routine chores that detract from academic responsibilities.

Experience has shown that in order to relieve faculty of routine laboratory preparation chores at least one full-time laboratory technician for every four full-time equivalents of chemistry faculty teaching loads in chemistry is needed. Any less technician assistance in preparing laboratory solutions and setting up equipment produces undesirable compromises in the laboratory program and in the use of lecture experiments and demonstrations. Colleges with fewer than four full-time chemistry faculty can best serve the chemistry program by hiring full-time laboratory technicians for multiple discipline assignments, using the same four to one ratio. Experience has shown that part-time and student help cannot adequately substitute for full-time laboratory technicians. They often increase the burden on the faculty.[13]

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[13] Copies of the job description for a typical chemistry laboratory technician position are available from the Office of Two-Year Colleges, American Chemical Society, 1155 Sixteenth Street, N.W., Washington, D.C. 20036.

VI

STUDENTS AND COUNSELING

(S59) The primary role of the academic advisor, whether a full-time counselor or a faculty advisor, is to assist students in developing educational goals that are consistent with the students' abilities and interests.

Because of the multiplicity of programs and the differing requirements for chemistry in the various programs, the counseling and guidance function is particularly important in two-year colleges. The situation is complicated further by the extreme variations among the students in terms of the knowledge and skills necessary for success in chemistry.

Furthermore, the Society encourages two-year colleges to provide information to chemistry students regarding transfer programs, allowing them to combine a basic chemistry education with studies

in other disciplines. For example, a major in chemistry with supporting work in biology is recognized as a wise program for students planning carers in medicine, dentistry, or pharmacy. In addition, many careers in the chemical industry, government, and other areas are open to graduates who have a good background in chemistry combined with: computer science, law, economics, environmental science, and library science as well as history, literature, and philosophy.

Colleges are encouraged to utilize discipline specific counselors/advisors so as to promote familiarity with chemistry and chemistry related programs and to facilitate articulation with both the four-year colleges and industry.

(S60) The counselors/advisors are familiar with the career opportunitites for students in both occupational programs and transfer programs. They also are familiar with the academic preparation necessary for entry into the various chemistry courses. They encourage students with strong interests and abilities in chemistry to continue with a baccalaureate degree in a chemistry related major.

(S61) The counselor/advisors advise transfer students in their selection of chemistry and related courses insuring that they will coordinate and articulate successfully with those of the senior institutions to which they plan to transfer. Students anticipating transfer to a four-year institution are counseled/advised to complete all terms of sequential courses (e.g., the general chemistry sequence and the organic chemistry sequence, as well as other science and mathematics sequences prior to transfer.

The counselors/advisors have established clear lines of communication with the chemistry and other science departments of the schools to which the students normally transfer as well as with the broader college articulation offices.

(S62) The chemistry faculty and science administrators work closely with counselors to make sure that the information all three groups possess is up-to-date and accurate.

(S63) Students in chemical technology programs are encouraged by their counselor/advisors to elect courses in communications, business administration, economics, marketing, engineering, electronics, and microbiology as a means of broadening their career options.

Many career opportunities for chemical technicians are in industry or in various independent or government laboratories. Knowledge in the subject areas listed herein is valuable.

(S64) Colleges with chemical technology programs have one or more members of the chemical technology faculty responsible, with appropriate teaching load credit, for:

- monitoring the employment needs of industry;
- assisting in the planning and/or actively engaging in the recruiting of students;
- coordinating the job placement of chemical technology graduates;
- conducting detailed follow-up studies of former students of the chemical technology program.

(S65) Colleges with chemical technology programs have the faculty participate in activities that serve to develop their understanding of the chemical industry. The faculty in turn encourage their students to participate in such activities.

These activities include ACS meetings at the national, regional, and local levels; advisory committee meetings; technician affiliate group meetings; student affiliate chapter meetings; and others.

VII

ARTICULATION WITH SECONDARY SCHOOLS, TRANSFER INSTITUTIONS AND INDUSTRY

The quality and success of chemistry programs in two-year colleges is dependent upon articulation with secondary schools, transfer institutions, and industry in the local area. The reader is also reminded of the several earlier standards (S21, S37) concerned with articulation.

(S66) The college works with appropriate faculty and administration of its "feeder" high schools and with other potential sources of students, to keep them aware of the curriculum requirements and career potentials for the graduates of its transfer and occupational chemistry programs.

(S67) The chemistry faculty, administrators, and counselor/advisors are informed of curriculum revision and changes in transfer requirements at the major transfer institutions. This information is used when necessary to revise the chemistry courses/sequences and counseling/advising.

(S68) The college conducts regular and detailed follow up studies of its transfer students as well as those in the occupational programs and communicates this information, in a timely manner, to the faculty, administrators and counselor/advisors. These follow-up studies include both academic and/or employment data and former student opinions.

(S69) The college has sharing agreements with neighboring four-year and two-year institutions and industries effectively expanding the chemistry offerings, library, laboratory facilities, and expensive instrumentation available.

Programs at two-year colleges are strengthened and enriched by the utilization of resources from other nearby agencies. Second-year and specialized occupational courses, especially, may be extended and enriched in this manner. Likewise, availability of research facilities for use by faculty members and independent study students may be increased.

If two or more institutions in the same geographical area are unable to offer a complete two-year college chemistry program individually, they might combine resources and facilities to provide full, strong two-year chemistry programs. Furthermore, such an arrangement could provide the specialized chemistry needs for occupational programs and the general education needs in science for the non-science students.

(S70) The college assists local elementary and secondary schools in the enrichment of their chemistry programs.

(S71) The college sponsors programs that help promote a favorable image of chemistry among the general public.

VIII

FACILITIES

A. Lecture Rooms and Office Space

(S72) The chemistry classrooms and offices are located near the instructional laboratories and preparation facilities.

(S73) The chemistry classrooms meet modern standards of lighting, ventilation, and comfort.

(S74) Classrooms have adequate provision, including the availability of a hood (either permanent or portable), for demonstrating chemical phenomena, and for using all types of audio-visual aids. Equipment for mounting and displaying charts is available. Easy access for laboratory carts for carrying demonstration materials is provided.

(S75) Faculty offices are readily available to students and are located so as to encourage faculty-student contact.

(S76) Faculty offices and classrooms, are accessible to the handicapped.

B. Student Instructional Laboratories

(S77) The laboratories are well-lighted and ventilated and are equipped with such services as gas, water, and electric power.

(S78) Neither the laboratory program nor the student and staff's well-being are compromised by the lack of adequate fume hoods and hood space that are well maintained and in proper working order.

(S79) There is a minimum of 28 square feet of laboratory space per student for the introductory courses and 42 square feet per student for second year courses.

(S80) The laboratories are fully equipped with well maintained and properly-functioning safety features such as eye wash, safety shower, fire blanket and fire extinguishers. Safety instructions are posted in the laboratory and safety goggles are worn by everyone in the laboratory and preparation areas.

The college faculty and administration should refer to the publications mentioned in footnotes 4 and 12 for additional information on safety in the academic laboratories and in the ordering, handling and disposal of chemical waste materials.

(S81) The laboratory facilities comply with the regulations of the federal Occupational Safety and Health Administration (OSHA), as

well as those of state and local agencies.

(S82) Laboratories are located to provide convenient routes to stockrooms and preparation areas.

(S83) Laboratory facilities have provisions for the safe instruction of the physically handicapped.

(S84) For safe supervision of students, laboratories have no more than 25 stations. Where more stations exist, no more than 25 students are assigned to a laboratory instructor. See (S56).

C. Instructional Support Facilities

(S85) Service areas, such as the rooms for storage and preparation and auxiliary instructional areas for faculty and student special projects, are conveniently located and large enough to provide for the needs of the students and the faculty for instrument, equipment and computer utilization, as well as storage, preparation, and study.

Other such areas include balance rooms, instrument rooms, computer rooms, study areas (with access to library resources), special storage and receiving areas.

D. Library

(S86) The chemistry library collection is within or near the science building. It consists of holdings commensurate with the size and nature of the chemistry offerings and the research activity of the students and staff.

(S87) The library collection includes a minimum of 10 current chemistry and related science periodicals plus a range of other reference materials suitable for the course offerings of the department. The collection includes back runs of 5 years or more for each of these periodicals.

(S88) For institutions with a central, main library, a departmental or science reading room is strongly recommended. Such a room would have the important reference materials and current periodicals close at hand when needed by staff and students, especially those engaged in advanced courses, research and independent study.

IX

COLLEGE CHEMISTRY CONSULTANT'S SERVICE*

A. Consultation and Outreach Program

B. How to Obtain Self-Study Material

C. How to Obtain Consultant Services

* This section will be added after the completion of the pilot program of visitations.

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ACADEMIC MARKETPLACE
COMMUNITY COLLEGE EXPOSITION
80 South Early Street
Alexandria, VA 22304
(703) 823-6966

M-E-M-O-R-A-N-D-U-M

To: AACJC Exhibitor

From: Debbie Trocchi, Exhibit Manager

Re: AACJC Convention April 22-25, 1987, at Loews Anatole Hotel, Dallas, TX

We have received your application for exhibit space at the AACJC Academic Marketplace. Enclosed is confirmation on your space assignment.

As stated in the Show Prospectus, each exhibit will be 8 ft. deep and 10 ft. wide. All decorating/drayage services will be contracted by The Aaron Group. If there are questions regarding their services, contact:

Mr. Mark Garvey
The Aaron Group
84 South Early Street
Alexandria, VA 22304
(703) 823-9691

Starting in late January, you will be mailed a service manual which contains all of the necessary forms for shipping freight, ordering booths, services, and equipment. Housing forms will also be sent at that time.

Should any questions arise before that time, please do not hesitate to give me a call. The Association appreciates your interest in the two-year college market and looks forward to working with you in April.

TFTYC presenting the guidelines and Critical Issues Report to college presidents and deans as well as to the AACJC/ACCT Futures Commission.

DT:ah

Bill Mooney
Jim Bradford
Edith Bartley

61

ASSOCIATION OF COMMUNITY COLLEGE TRUSTEES

ADVISOR

VOL. XVIII, ISSUE 3 MARCH, 1987

Muskegon To Welcome Central Region Trustees

Courtesy The Muskegon Chronicle

The attractive campus of Muskegon Community College

Muskegon, Michigan, is the site of the 1987 ACCT Central Region Seminar to be held May 7-9. While working sessions will take place at the brand new Muskegon Harbor Hilton, local host, Muskegon Community College, is coodinating many activities the height of its Tulip Festival. Special evening events are planned away from the hotel.

The Seminar Planning Committee has chosen topics of special interest to the Central Region. Workshop subjects include: "Promotion of Community College Month,"

Use of In-House Legal Counsel Makes Sense

In-house legal counsel not only makes legal advice convenient, according to Waubonsee Community College officials, it is also a smart economic investment.

The college in Sugar Grove, Illinois, has had two consecutive full-time in-house attorneys.

Administrators, board members, personnel representatives and faculty members have found each attorney easily accessible both for minor matters which may be settled in line at the cafeteria, and for major concerns eventually leading to litigation in court.

But, because of in-house counsel, far fewer minor incidents become matters for litigation, school officials contend, and therefore, the economic advantage resulted.

Waubonsee is one of just a few community colleges in Illinois which have legal counsel on staff full-time. President John Swalec believes other community colleges might find it to their advantage as well.

"One of the main reasons for having legal counsel here on campus is prevention," he explains. "The advantage is to have an instantaneous response to any situation by someone who is familiar with the college and has an understanding of its policies and problems."

Sound legal advice at the onset of a problem just might prevent the need for legal counsel in court later, he says.

In This Issue. . .

Nominations are sought for ACCT Board of Directors, page 3.

Nine Dimensions of Community College Effectiveness, page 3.

Presidential Replacement, Kit, page 4.

Special Section—Focus On Exemplary Programs, pages 6 and 7.

Focus On Cooperation With Secondary Schools
- **Bunker Hill Community College**

Focus on Exemplary Literacy Programs
- **Oakton Community College**
- **Central Piedmont Community College**
- **Roxbury Community College**
- **El Paso Community College**
- **Kishwaukee Community College**

Focus On Partnerships With Business and Industry
- **Houston Community College System**
- **Portland Community College**

Details of ACCT Central Region Seminar, pages 8 and 9.

Spotlight on Local Board Chairmen, page 12.

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which candidate (other things being equal) would you choose to be included as one of the 15 semi-finalists?

Other candidates put themselves at an immediate disadvantage with typographical errors, poor grammar, or by leaving some criteria without a response. The lack of a response will necessarily raise questions in the reader's mind.

Remember that in most cases, the team readers have never met you and do not know of your abilities. Therefore, your application must be letter perfect. Almost perfect will not carry the day for you. What board wants to employ a president who cannot follow directions or is sloppy in production? The competition is just too keen to take a chance on an applicant who has already exposed potential flaws.

And folks, for once this isn't just *my* opinion. It is the opinion of ACCT Search Team Members as well. If you cannot or will not follow directions then don't apply for an ACCT search. You will just be wasting your time as well as ours.

I will hope that this message has found its mark, and that we will see a significant improvement in cover letters and resumés in future ACCT searches.

(Opinions expressed in this column reflect only those of the author and are not intended to represent the position of the ACCT Board of Directors or this Association).

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Community Colleges and the National Science Foundation

CAPITAL ANALYSIS

by Frank Mensel
Director of Federal Relations, ACCT
Vice President for Federal Relations, AACJC

Just as the Dallas Cowboys once claimed to be "America's team," the National Science Foundation wants to think of itself as "America's competitiveness agency." In the eyes of community colleges, NSF has a long way to go to justify any such claim.

As the largest branch of higher education, community colleges might stake that claim for themselves. But that is not the community colleges' beef with NSF. And fuel for their beef is now coming from the scientific community itself—in the form of the report, "Critical Issues in Two-Year College Chemistry," published by the Society Committee on Education of the American Chemical Society.

Basically, community colleges see competitiveness as a challenge of the real world. NSF has consistently insisted upon interpreting its mission in a way that puts it among the ivory towers farthest removed from the workplace and the economic struggle of global competition.

The U.S. is not likely to meet the global economic challenge unless responsibility is concentrated in one agency, and community colleges would be glad to see NSF become that agency—provided it earns the distinction.

ACCT-ACCJC Joint Commission testimony on competitiveness pinpointed the issue when President Lex Walters of South Carolina's Piedmont Technical College told the House Education and Labor Committee, "Our economy has been slipping in global competition because our skill base no longer exceeds that of our more advanced competitors. We simply are not keeping pace with them in technical education."

The agency that becomes "America's competitiveness agency" has to be as concerned about that skill base and the nation's supply of technicians as it is about the supply of post-graduate scientists and engineers. NSF falls glaringly short on two counts: it has stubbornly ignored the crippling needs of undergraduate science education, especially the needs of two-year colleges which now serve more than half the entering enrollment of higher education; and it has spurned responsibility for technical education.

Now comes the American Chemical Society's report, drawn from its 1985 invitational education conference. Its specific recommendations to the National Science Board, which guides NSF, include:

* * * * *

We call upon the National Science Board to recognize (a) the indispensable contribution that contemporary two-year colleges already make to undergraduate science and engineering education, and (b) their potential for greatly increasing that contribution provided they receive the guidance and support of the federal government at a level consistent with their current and potential role in educating America's next generation of scientists.

Faculty Growth and Development

We recommend that the National Science Foundation increase its level of activity in providing faculty development opportunities to college science teachers at minimum personal expense. Specifically, the NSF should

- Support an expansion of the existing Institute for Chemical Education (ICE) that will enable ICE to provide in-service development for two-year college chemistry teachers;
- Re-establish faculty development opportunities for college science teachers such as the College Science Improvement Program (COSIP), Chautauqua courses, and other programs for growth and renewal that are scheduled during times when faculty can participate; and
- establish programs to provide additional in-service education, via modern instructional delivery methods, to two-year college chemistry teachers who are unable to attend conferences and workshops

(Continued on page 5)

The Virginia Community College System —A State System That Works

by
Robert W. Harrell, Jr.
Member, State Board for Community Colleges
Richmond, Virginia

A column by William H. Meardy entitled "They Killed 'Community' " appeared in the January 1987 *Advisor*. He stated that this was his opinon and the following is mine:

The article was an emotional opinion with no data or examples to support the conclusions drawn. I will take this opportunity to differ with his position, his conclusions, trustee.

To Mr. Meardy's question, "Could this possibly happen in my state or province?" my answer is, if it would facilitate providing a better opportunity for education to these students served, then it should happen.

I am not advocating a State Board for evervone but I will defend the role of a State

matters, Gillio coordinates with the outside legal counsel. She provides documents and research the other lawyer will need. Her help maximizes the effectiveness of the other attorney and minimizes the outside cost to the college.

That's no different, Swalec adds, than a person going to his doctor and finding out he also needs a specialist for a particular problem. "We don't pay double then, we just pay the specialist for his expertise while Vickie does the background research. It actually cuts our cost since we pay the specialist portal to portal and by each phone call."

Gillio estimates about 10 percent of her time at Waubonsee is spent advising the Board of Trustees and administration on policy matters that have legal ramifications. She attends all board meetings and advises the administrative council on the legal implications of policy matters.

Another 10 to 15 percent of her time at Waubonsee is taken up by reviewing contracts and intergovernmetnal agreements. The rest of her day is allocated to issues and concerns that change daily, depending on the needs of the college.

During contract negotiations with the faculty, for instance, most of her time is spent as chief negotiator for the college.

This year, however, she researched and helped design the model and structure used for a non-traditional, collaborative problem-solving approach to bargaining which yielded an agreement in record time.

While she reports directly to the president, she meets regularly with the board and top administrators.

Swalec, who suggested in-house counsel for the college and had one other general counsel prior to Gillio's joining the college in 1985, says the typical beginning rate for such on-campus counsel is $35,000 to $40,000 plus fringe benefits.

Generally, the attorney who will want to work for a community college is "versatile and upwardly mobile, with several years of experience, looking for more experience in a wide range of areas. They have the aspiration, usually, to go on to a university.

"I fully expect to lose my counsel after a few years of experience here. The educational environment is solid and provides a range of experiences they have not yet had."

programs on college/community relations

Student Outcomes
- Graduates placed in regional business/industry
- Number of students meeting educational goals

Trustee/Governance Activities
- Board of trustees with sense of vision
- Positive relations between trustees and local communities

Evaluation of Outcomes
- Degree and quality of feedback to college from community
- Activities outside classroom designed to increase students' academic development

Organizational Climate
- Long-term planning and goal setting
- Community perceptions of college's programs/services

Pro-Active Management Strategies
- College's ability to cope with emergencies
- College personnel initiate improvements in work methods

I suggest that this set of nine dimensions is significant in a number of ways:

1) it adds to a slim collection of OE studies involving higher education ,

2) it provides an opportunity to determine if trustee behavior affects community college OE,

3) it provides an opportunity for community colleges to judge themselves on various dimensions involving both internal and external activities,

4) it provides a means for community colleges to compare/contrast themselves to other community colleges.

Some answers to the earlier questions about trustee behavior, trustee/president characteristics, and college characteristics will be presented at an ACCT-sponsored forum at the AACJC Convention in Dallas. And the answers will also be presented in a future issue of the *Advisor*. Suffice it to say, and to possibly whet your appetite, that trustee behavior plays a significant role as far as the nine dimensions are concerned.

extension of the community which it serves.

At this juncture, I want to give the strengths of a State System that a collection of individual colleges headed in different directions could not have.

The Virginia Community College System speaks to the legislature in one voice. This is not the case in some states where college fights college for appropriations, where different groups (legislators, administrators, trustees, faculty, and labor) with different sets of priorities lobby State Government, and where those with less resources suffer. It is of extreme importance to speak with one voice, for priorities are determined by the system with the input from the local boards, local faculties, Presidents, and State Board and the legislative plan is presented and lobbied in a uniform effort. There is at least one college in each legislator's district, by speaking as one voice we get all 140 legislators hearing and preaching the same message.

Does it work?

Virginia was the only state in the nation to lower tuition in 1986-87 and we have another decrease already in the 1987-88 budget recently presented by Governor Baliles. This has resulted in an increase in enrollments of 7.5% for the fall of 1986.

Our legislative plan has allowed us to move towards an 80-20 state-to-student funding ratio.

Virginia's faculty has received an average 40.5% pay increase in the last 4 years and are now above the national average and are at benchmark with like institutions nationwide. We are funded at 94% of target, an increase of 8% since we incorporated a uniform legislative plan for the System. In this biennium, we received $17,500,000 in new construction money and have received over $25,000,000 in the last 2 years.

The legislature has established an emergency maintenance reserve fund to help any college with emergency maintenance that would exceed their budget.

Virginia has established the first Higher Education Equipment Trust that is providing the System $5,500,000 in additional equipment in its first year.

There are many other important ad-

CAPITAL ANALYSIS

(Continued from page 2)

Laboratory and Instructional Equipment

We recommend that the National Science Foundation increase its level of activity in supporting the acquisition of modern instrumentation in the two-year colleges. Specifically, the NSF should

- modify the Undergraduate Research Participation Program to encourage research by students (directed by two-year college faculty) in the two-year colleges,
- modify the College Science Instrumentation Program so that two-year colleges become eligible for funds,
- provide support for a number of regionally located and well-equipped, model science laboratories in two-year colleges,
- make umbrella grants to professional associations (or state two-year college agencies) which would then make smaller disbursements to individual colleges submitting proposals for the purchase of instruments costing under $3,000, and
- establish a program to support cooperative instrument repair services that could be used by a number of institutions in a geographic area.

Curriculum Improvement

We recommend that the National Science Foundation continue its support of existing programs in the new instructional technologies, such as Project Seraphim, and expand these efforts to specifically include material for use in two-year colleges. The Foundation should also establish new programs to take full advantage of modern electro-optical technologies . . . that would enable two-year colleges to bring enhanced learning opportunities to their students.

* * * * *

NSF does not have to run training programs (leave them to grantees) to become the competitiveness agency. But it does have to recognize that Ph.D. scientists are not the only answer to American competitiveness—that technician supply and strong lower-division math and science education are equally important.

And it must realize that strong lower-division math and science programs are essential to the quality of tomorrow's technicians. If NSF adopted and implemented the American Chemical Society's recommendations, it would take a giant step toward becoming "America's competitiveness agency."

HARVARD UNIVERSITY

DEPARTMENT OF PHYSICS

JEFFERSON PHYSICAL LABORATORY
CAMBRIDGE, MASSACHUSETTS 02138

December 8, 1986

Dr. Bassam Z. Shakhashiri
Assistant Director for Science
and Engineering Education
National Science Foundation
Washington, DC 20550

Dear Bassam:

This letter is my report to you on the actions taken by the Directorate's Advisory Committee at its November 17 meeting at the Foundation. On behalf of my colleagues on the Committee, let me thank you and your staff for their cooperation and hospitality.

The three Resolutions (enclosed) are of such importance that I am communicating them to you on behalf of the Committee by means of this letter instead of through the formal minutes (which cannot be prepared before the official transcript of our formal sessions is available). Additional issues raised in reports made by our Subcommittees are set forth in the brief Summary (enclosed also).

In my view, the meeting of the Committee went very well. The schedule adopted for this meeting permitted a good deal of informal discussion; this, in turn, made it possible for us to be "off and running" from the beginning. The three Resolutions have unusually forceful tone, even after the time and effort spent on each in discussion to soften both statement and diction. It is fair to say that the Committee, despite its laudable diversity, is remarkably harmonious. But I must register here that there is a strong and widely shared undertone of dismay in the Committee about evidences of inadequate commitment within NSF to its unique statutory function -- the support of science and engineering education at all levels.

1. Comment on the Pimentel Resolution. The Preamble reflects the distress of the Committee over the Foundation's failure to deter any Congressional tampering with details of its Budget Request by recommending on its own a level of funding for Science and Engineering Education that makes sense in terms of present national concerns and that is responsive to earlier, clear signals from the Congress.

We are pleased that the Congress saw fit to raise the FY 1987 Budget for SEE to $99-million. But, we are not pleased that the NSF's Budget Request was for only $87-million, just $2-million above the FY 1986 expenditure level. This request evidently invited Congressional intervention at a level of detail that should not have been necessary. Even if one likes the result, there can be a price to pay; for example, it invites further legislative involvement in the setting of priorities, and it can create a strong temptation to lobby Congress on behalf of the Directorate's mission instead of to support the Foundation's budget request overall.

The two paragraphs comprising the Resolution proper embody the distress mentioned above, and respond directly to the informative remarks made to the Committee by NSF's Deputy Director, Dr. John Moore. Dr. Moore discussed with us certain of the 62 recommendations made by Representative Don Fuqua, retiring Chairman of the House Committee on Science and Technology, but especially the one suggesting that "the Committee on Science and Technology should hold hearings to determine whether the precollege educational responsibilities of NSF should not be transferred to the Department of Education, bearing in mind the abysmal record of NSF in this area."

The record Mr. Fuqua refers to is that of the level of support of the educational function within NSF, as illustrated by his graph of the ratio ($ for Science and Engineering Education)/($ for Research and Related Activities) over a substantial period. This record may justify his choice of adjective. Nevertheless, my colleagues on the Advisory Committee and I agree with Dr. Moore that NSF's education program must embrace all levels, kindergarten through graduate school, and that transfer of any part to the Department of Education would be "a terrible mistake."

Thus, the Pimentel Resolution addresses the need for stronger positioning by NSF in seeking funds for education programs adequate to the task before us, and supports NSF's leadership at <u>all levels</u> of education in mathematics, engineering, and the sciences. It is essential that NSF take now all steps necessary to preempt the possibility of removal of any aspect of science and engineering education from NSF.

2. Comment on the <u>Pister Resolution</u>. This Resolution goes beyond the one passed by the Advisory Committee on June 24, 1986 (stating that "the [SEE] Directorate is the logical location for NSF's proposed new initiatives in undergraduate science, mathematics, and engineering education."), to urge that the Director "establish within SEE an Office of Undergraduate Science, Mathematics, and Engineering Education."

This resolution is not simply a suggestion about a detail of administrative organization. It proceeds directly from the difference between the recommendations in the Neal Report (NSB 86-100), substantiated and refined by the reports of the three Workshops on Undergraduate Education held late last spring, and the very first step taken by the Foundation to expand programming in the undergraduate area.

It is clear from the Neal Report that increased support of undergraduate research activity enjoyed high priority. The Neal Committee recommended that additional funding for undergraduate research be brought in the first year (assumed to be FY 1988) to its equilibrium level - $8-million - and that other kinds of activities be phased in over two years - but to substantially higher support levels ($42-million in FY 1988, $92-million by FY 1989). The Workshop reports clearly embraced this philosophy.

The Foundation, commendably, is getting a head start on the recommended undergraduate programming by allocating $8- or $9-million in FY 1987 to the support of research experiences for undergraduates. But, why isn't this program, like all its predecessors, in SEE -- its logical home?

Further, where is the recognition of the great importance of parallel support for work on the curriculum or on faculty development -- the other two high priorities of the NSB Task Committee and the Workshops? We can only assume that these activities are to be initiated in FY 1988 on the schedule and at the funding levels recommended in the Neal Report.

The Pister Resolution conveys the Advisory Committee's agreement with the Neal and Workshop groups: many aspects of undergraduate education are beset with critical problems; research is not the answer that should be offered to every question; and, the Directorate for Science and Engineering Education must be the focus for encouragement, development, and support of all NSF education programs.

3. Comment on the Pollak Resolution. This Resolution was prompted by information that the Department of Education is considering withdrawing its support from some of the important science and mathematics television programming currently jointly funded with the Foundation. The Resolution calls for continued cooperation in assuring support for such key projects.

I trust it will be clear from these Resolutions, from other actions, and from my comments above, that the members of the SEE Advisory Committee take their responsibilities very seriously. We are eager to be of assistance in furthering the good work that has been begun so admirably under your strong leadership. We hope that the Foundation overall will understand the importance to the Nation of its maintaining equally strong leadership roles in research and education.

Sincerely yours,

Gerald Holton

Gerald Holton
Mallinckrodt Professor of Physics,
and Professor of History of
Science;
and Chair, Advisory Committee, SEE

cc: Members, SEE Advisory Committee

Enclosures

ADVISORY COMMITTEE FOR SCIENCE AND ENGINEERING EDUCATION

Resolution Introduced by George C. Pimentel, November 17, 1986

Preamble: The Advisory Committee is gratified that the FY 1987 budget for SEE will be $12.0M above the $87.0M available in FY 1986. This gratification is tempered, however, by the fact that this is only a modest beginning toward the much larger amount urged by the National Science Board in its 1983 Report on Precollege Education in Mathematics, Science and Technology and its 1986 Report on Undergraduate Science, Mathematics, and Engineering Education. Even more significant and disturbing, though, is the fact that most of this much-needed gain was not appropriated in response to an NSF request but, instead, had to be added by the Congress. The Agency request, $89.0M, is only 2% above the funds available to SEE in FY 1986 ($55.5M appropriated plus $31.5M carryover). Such a meager rise, embedded in a budget that requests an overall 8.5% rise for the Agency as a whole, permits the interpretation that NSF does not have an adequately strong commitment to the nation's needs for better science and engineering education.

Therefore: The Advisory Committee agrees that the NSF is the proper locus for the support of all aspects of science and engineering education because of the Foundation's unique and strong linkage to the science and engineering professional community. The Committee concurs enthusiastically with the National Science Board's analyses that point to the need for a much larger national investment in science and engineering education. These two strongly held views lead us to urge the Director to ensure the NSF's leadership and control of the level of NSF Science and Engineering Education activities. This is best done by requesting and defending to Congress, as well as to the Executive sector, continued and substantial rises in the SEE budget in FY 1988. In future years, the SEE budget must move vigorously toward the levels demanded and justified in the National Science Board Reports.

The statutory authority of NSF for the development, implementation, and assessment of a full spectrum of science, engineering, and mathematics education activities and programs, integrated across precollegiate, undergraduate, and graduate education levels must be unambiguously recognized, preserved, and enhanced.

Passed unanimously.

ADVISORY COMMITTEE FOR SCIENCE AND ENGINEERING EDUCATION
RESOLUTION INTRODUCED BY KARL S. PISTER
FOR THE SUBCOMMITTEE ON UNDERGRADUATE SCIENCE,
MATHEMATICS, AND ENGINEERING,
NOVEMBER 17, 1986

In the interest of advancing the strength of science, mathematics, and engineering in the nation, the Science and Engineering Education Advisory Committee calls to the attention of the NSF Director and the NSB, in the strongest way possible, its belief that NSF should develop within the Science and Engineering Education Directorate a comprehensive program at the undergraduate level. We also strongly support the proposal of the Assistant Director for Science and Engineering Education to establish an Office of Undergraduate Science, Mathematics, and Engineering Education for broadened program management responsibilities and to serve as a focal point for NSF's undergraduate activities.

The report of the National Science Board Task Committee is clear and unequivocal in recommending that SEE rapidly phase in a major program in undergraduate science, mathematics, and engineering; the NSB report was still further refined and substantiated by the three NSF disciplinary workshops hosted jointly by SEE and the NSF research directorates. Therefore, the time and opportunity for NSF both to be responsive and to take a leadership role is at hand.

The SEE Advisory Committee endorses the findings and recommendations of the NSB report and urges the Director to establish within SEE an Office of Undergraduate Science, Mathematics, and Engineering Education. This office should serve all segments of undergraduate education, including students not planning careers in science, mathematics or engineering, and promote the complementarity of research and teaching. The programs should embrace all institutions involved with undergraduate education including the community colleges, the four-year colleges, and the Ph.D.-granting institutions. The community colleges should play an important role in facilitating the access of underrepresented minorities to education and careers in science, mathematics, and engineering.

Passed unanimously

ADVISORY COMMITTEE FOR SCIENCE AND ENGINEERING EDUCATION
RESOLUTION INTRODUCED BY HENRY O. POLLAK
FOR THE SUBCOMMITTEE ON MATERIALS DEVELOPMENT
AND INFORMAL SCIENCE EDUCATION,
NOVEMBER 17, 1986

The Advisory Committee reiterates its strongest support for the development of key early education projects in both science and mathematics, such as the programs produced by the Children's Television Workshop. These programs, which reach over 3 million children each week, address a critical national need.

The Committee expresses deep concern regarding the proposed plan of the Department of Education to unilaterally withdraw from this major cooperative investment, which has been planned and developed jointly with NSF over a number of years.

The Committee urges SEE to continue providing funds for the science and mathematics television projects as planned. NSF should not consider providing additional funds to cover any shortfall due to the Department of Education withdrawal, thereby endangering other NSF projects, unless this is the only way to rescue these nationally important programs in the face of the Department of Education's failure to reverse its unilateral action.

A definite framework for future cooperation with the Department of Education should be developed; resolution of the present problem in a mutually satisfactory manner could serve as the vehicle for this development.

Passed with one abstention

NATIONAL SCIENCE FOUNDATION

ADVISORY COMMITTEE FOR SCIENCE AND ENGINEERING EDUCATION

MEETING OF NOVEMBER 17, 1986

Summary of Subcommittee Reports and Action Items

1. Resolution on Funding and Responsibility for Science and Engineering Education. Introduced by George Pimentel; Seconded by Leslie Koltai; Passed Unanimously. (attached)

2. Resolution on Undergraduate Science, Mathematics, and Engineering Education. Introduced by Karl S. Pister for the Subcommittee on Undergraduate Science, Mathematics, and Engineering; Seconded by Eugene H. Cota-Robles and F. Karl Willenbrock; Passed Unanimously. (attached)

3. Resolution on Jointly Funded Educational Television Projects. Introduced by Henry O. Pollak for the Subcommittee on Materials Development and Informal Science Education; Seconded by Irwin J. Hoffman and Edward C. Keller, Jr.; Passed with one abstention. (attached)

4. Report of the Subcommittee on Teacher Preparation and Enhancement by F. Joe Crosswhite, Chair.

   The Subcommittee supports efforts by the Division for Teacher Preparation and Enhancement to develop an effective mechanism for distributing and disseminating the products and projects developed with the support of this and other SEE divisions.

   The Subcommittee recommends that a "significant fraction" of DTPE funds should be committed to targeted solicitations. Among the targets identified were the following: teacher preparation projects designed to attract more members of minority groups to teaching (e.g. a model fellowship program for post-baccalaureate certification), new preservice core-courses in science for would-be elementary school teachers, and integrated physical science programs for would-be high school teachers. Teacher-education trends, as influenced by the Carnegie and Holmes Reports, should be carefully monitored.

   The current national emphasis on "lead" teachers may suggest that Teacher Enhancement programs would be most effective if directed at this well-qualified group. Nevertheless, local and regional emphases remain important.

The Subcommittee expressed support for the Science and Mathematics Networks program, and suggested that the networks thus established might be used to disseminate materials and models developed with Foundation funding. Existing networks can help stimulate the creation of new alliances--a process that might be facilitated with small add-on grants.

The past Presidential Awardees for Science and Mathematics Teaching represent a powerful potential network, though it is frustrating that some Awardees have been unable to accept invitations to speak because of lack of travel funds.

5. Report of the Subcommittee on Research, Studies, and Program Assessment by Mary Budd Rowe, Chair.

The Subcommittee is pleased with the assurance that research activities will be the centerpiece of the Office for Research, Studies, and Program Assessment.

The research activities of this Office can provide an essential service for other units within SEE.

The Office might consider soliciting or commissioning position papers relating to current educational issues. These papers could serve as the bases for informational fora.

Other initiatives might include a targeted solicitation aimed at assessing science education endeavors designed to benefit minority students or the creation of a center for the publication of research results.

6. Report of the Subcommittee on Research Career Development by Norman Craig, Chair.

Action has been taken on some of the recommendations of the Peer Review Oversight Committee, other responses are in progress, and some are being considered.

The Subcommittee and members of the parent Committee expressed interest in strengthening the emphasis on teaching in NSF-supported fellowship and special awards programs. For example, Graduate Fellows and Postdoctoral Fellows might be encouraged to acquire teaching experience and build dossiers reflecting such experience. Selectors for the Presidential Young Investigators Awards were urged to place greater weight on evidence of excellence in teaching and carefully consider applications from faculty at institutions that do not offer Ph.D. degrees.

American Association of
Community and Junior Colleges

COMMUNITY, TECHNICAL, AND JUNIOR COLLEGE

FACT BOOK

January, 1987

Prepared by the Office of Communications Services

American Association of Community and Junior Colleges

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WHAT NATIONAL LEADERS HAVE SAID ABOUT COMMUNITY COLLEGES:

"Here at the White House, just as in businesses and organizations across the country, graduates of America's community colleges can be found. There are more than 1,200 community colleges across America, making an enormous contribution to American higher education.

"In fact, nearly one half of all undergraduates are enrolled in these institutions. As our economy evolves and grows in the years ahead, the community colleges will continue to play a vital role.

"Of course, the key word when discussing these colleges is 'community.' They are truly part of their communities, offering accessible and affordable education to almost everyone. They increase the opportunity and economic mobility of our people—each and every one who takes advantage of what is available."

-Ronald Reagan, President of the United States

"Fifty years ago this country was divided between two classes: the wealthy and the poor. Today, our country is dominated by a great middle class. The biggest reason for this is education. Because of vital community colleges... millions of Americans have been given the opportunity not just to train themselves but also to become knowledgeable in the full range of human experience. Our country can be proud of this wonderful achievement. No other land in the world has made such a broad commitment to intellectual and economic opportunity."

-Thomas P. O'Neill, Former Speaker of the House

"The tremendous progress that community colleges have made in so short a time reflects upon the great good sense of President Harry S. Truman. In fact, today's concept of the community college is such a good fit that it is hard to imagine a higher education system without it."

-Paul Simon, Senator, Illinois

"I cannot think of a better tribute to President Truman than to recognize the bold steps he took to establish the community college network."

-Howard H. Baker, Former Senator, Tennessee

"In spite of the growth and strength of the community college system...the explosion of knowledge and the means of disseminating it make it essential that we strengthen this community institution to educate, re-educate, train, and retrain people several times during their lifetime, in order to prepare them to participate effectively, not only in the workplace, but also in society."

-Carl D. Perkins, Former Congressman, Kentucky

THE COMMUNITY COLLEGE PHILOSOPHY:

Five fundamental elements compose the community college philosophy. They are as follows:

1. Community colleges are <u>community based</u>. They are in partnership with the communities they serve. They are often locally controlled. They have become modern versions of the land-grant universities, providing accessible education opportunities for all citizens in service districts, as well as direct

assistance to local employers and public agencies operating in the communities. The colleges also provide strong ties to high schools in the area.

2. Community colleges are cost-effective. Annual tuition averaged $660 during 1985-86. Tuition and fees in public four-year colleges and universities, by comparison, were nearly twice as high; private four-year colleges and universities were almost eight times as high. Full-time equivalent operating costs in public community colleges are less than half of those required by public four-year colleges, and about a third of those in public universities.

3. Community colleges offer a caring environment. They offer a full range of student services designed to help students make the most of their opportunities. Services include achievement and interest testing; personal and academic counseling; placement; academic and social clubs; athletics; cultural events; and civic partnerships involving students, faculty, administrators, and residents of service districts. Responsive retention programs are also important parts of the care that community colleges take with students.

4. Community college faculty are a crucial element of the community college success story. They tend to display a high degree of satisfaction in their work, in their progress as professionals, and in the development of the students they teach. They prize their relationships with students and other faculty, they enjoy being part of the campus environment, and they feel they are appropriately recognized and rewarded.

5. Community colleges offer comprehensive programs, with liberal arts and

technical education programs working together harmoniously. The colleges create a learning environment which recognizes Spanish and Philosophy as "vocational" programs, and which views Electronics and Construction as programs that incorporate the broader disciplines of communications, critical thinking, history, and literature.

COLLEGES AND ENROLLMENTS:

According to AACJC's fall 1985 survey, there are 1,221 community, technical, and junior colleges. Programs are offered by these institutions at 1,505 campuses. There are 75 non-profit, 71 church-related, and 14 independent for-profit colleges and the remainder are operated as public institutions.

Total community college enrollment in fall 1985 ranged from just over 100 to nearly 100,000 students. Nearly half of the institutions indicated that they served rural areas of the country. The largest institutions in fall 1985 by type are listed below.

Largest Multi-Campus Colleges	Enrollment
1. Miami-Dade Community College, Florida	37,082
2. Northern Virginia Community College, Virginia	32,282
3. Oakland Community College, Michigan	26,935
4. Indiana Vocational Technical College, Indiana	26,665
5. Macomb Community College, Michigan	26,474
6. Cuyahoga Community College, Ohio	24,583
7. Tarrant County Community College District, Texas	24,135
8. St. Louis Community College, Missouri	28,833
9. College of DuPage, Illinois	22,577

Largest Multi-College Systems

1. Los Angeles Community College District, California	92,567
2. City Colleges of Chicago, Illinois	80,955
3. Maricopa County Community College District, Arizona	60,622
4. Coastline Community College District, California	50,017
5. Dallas County Community College District, Texas	46,204
6. Foothill-DeAnza Community College District, California	37,192
7. Los Rios Community College District, California	36,444
8. San Diego Community College District, California	34,299
9. North Orange County Community College District, California	29,383

ENROLLMENT:

In the fall of 1985, nearly 5,000,000 credit students attended a community, technical, or junior college. In the college year 1984-85, close to another 5,000,000 students took noncredit, self-supporting courses in the colleges.

Credit headcount enrollment in the colleges represented 41 percent of all undergraduate students in the U.S. The community college share of total undergraduate students has increased steadily for the past ten years.

Public community colleges enrolled 97.2 percent (4,597,838) of the total community college enrollment in fall 1985.

Community, technical, and junior colleges were the colleges of choice for 55 percent of all first time freshmen in fall 1984.

The history of community, technical, and junior college enrollments reflects the extraordinary development of the colleges as well as the influence they have had on the American populace. The growth in the number of colleges during the last fifty years also tells a dramatic story.

FIFTY YEARS OF COMMUNITY TECHNICAL, AND JUNIOR COLLEGE CREDIT ENROLLMENTS:

1935-36 TO 1985-86

NUMBER OF COLLEGES

Year	Public	Private	Total
1935-36	229	229	528
1945-46	315	333	648
1955-56	363	272	635
1965-66	503	268	771
1975-76	1,014	216	1,230
1985-86	1,068	154	1,222

ENROLLMENT

Year	Public	Private	Total
1935-36	90,437	38,669	129,106
1945-46	216,325	78,150	294,475
1955-56	683,129	82,422	765,551
1965-66	1,152,086	140,667	1,292,753
1975-76	3,921,542	147,737	4,069,279
1985-86	4,597,838	132,397	4,730,235

Nearly two-thirds of the credit students in the colleges in the fall of 1985 were enrolled part-time. The percentage of part-time students has increased steadily in the colleges over the last two decades, a trend which highlights the attraction of the colleges for working men and women searching for careers outside of the home. Part-time and full-time enrollment numbers for fall 1984 and fall 1985 are pointed out below.

ENROLLMENT: FALL 1984 AND FALL 1985

	Full-time	Percent	Part-time	Percent	Total	% Change
1984	1,675,309	35.2	3,084,092	64.8	4,759,401	
1985	1,636,661	34.3	3,107,764	65.7	4,730,235	-0.6

The history of noncredit enrollments in the community colleges has also been remarkable. The chart below captures some of the story.

NONCREDIT ENROLLMENT: 1974-75, 1979-80, 1984-85

Year	Enrollment
1974-75	3,259,972
1979-80	3,977,050
1984-85	4,848,065

Below are the states with the largest community, technical, and junior college credit headcount enrollments in fall 1985.

STATES WITH LARGEST COMMUNITY COLLEGE ENROLLMENTS: FALL 1985

State	Total Enrollment	% of Total
California	1,046,542	20.9
Texas	384,545	7.7
Illinois	309,463	6.2
New York	273,480	5.5
Michigan	234,357	4.7
Florida	222,240	4.4

STUDENTS IN COMMUNITY, TECHNICAL, AND JUNIOR COLLEGES:

MINORITY STUDENTS

Community colleges enroll a disproportionate share of minority students. According to government figures for 1982 (the latest year that comprehensive numbers are available), community colleges enrolled nearly one million minority students. While community colleges enrolled 38 percent of all college student overall, 48% of all minority students were enrolled at community colleges. According to the 1982 government figures,

- 44.1 percent of all Black students;
- 56.1 percent of all Hispanic students;
- 45.0 percent of all Asian students;
- 56.2 percent of all American Indian students involved in higher education attended community colleges.

The same government source indicates that over 21 percent of all community college students are minorities. The breakdown by group is presented below.

- Black: ten percent
- Hispanic: six percent
- Asian: three percent
- American Indian: one percent
- Non-resident alien: one percent
- Other: 3.9 percent

HANDICAPPED STUDENTS

Community, technical, and junior colleges provide special resources for all types of handicapped students. Except for students who are partially sighted or blind, and for those who are speech-impaired, community colleges provide a college education to the majority of handicapped students. Handicapped persons comprise close to 10 percent of total credit headcount in community colleges, compared to just over 7.5 percent of students in all of higher education. These numbers are estimates based on a limited survey of first-time freshmen (fall 1985). Since the majority of handicapped students attend college part-time, the likelihood is that the percentage of handicapped students served by community colleges is much higher than reported here. Percentages in each of seven handicap categories is presented below.

Handicap	% Handicapped in All Higher Education	% Handicapped of All C.C. Students	% of All College Handicapped Enrolled in Community Colleges
Hearing	0.9	1.1	44.6
Speech	0.3	0.3	36.5
Orthopedic	0.9	1.0	40.3
Learning	1.1	1.7	56.4
Health Related	1.2	1.4	42.5
Partially Sighted/Blind	2,1	1.9	32.9
Other	1.2	1.5	45.6
Total	7.7	8.9	42.2

AGE OF STUDENTS

The majority of community college students are older than the traditional college age of 18-21, according to Bureau of the Census reports. 64 percent of the total credit enrollment is 20 years old or older, with 30 percent in the 20- to 21-year old category, 20 percent in the 22- to 24-year old category, and 14 percent in the 25- to 34-year old category. On any given day at 10 a.m. the average age in a community college is 23 years old; at 8 p.m. it is 38 years old.

PART-TIME STUDENTS

The majority of community college students are part-time. The trend toward attending college part-time has been developing during the past two decades. Fall 1985 figures show that 65.7 percent of credit students were enrolled part-time, one percent higher than the previous year. Part-time enrollments were 66.7 percent of the total in public community colleges, while part-time enrollments comprised 30.0 percent of the total in independent community colleges.

FEMALE STUDENTS

Women represent over 53 percent of all credit enrollments in community, technical, and junior colleges, a percentage that has remained stable over the past five years.

EMPLOYED STUDENTS

Over 80 percent of all credit students (full-time and part-time) in community colleges are employed either full-time or part-time while they attend college. More than two out of three full-time students are employed while taking courses and over four out of five part-time students are employed.

INTERNATIONAL STUDENTS

Over 40,000 international students attend community colleges across the country. This figure represents more than one-third of all international students in American postsecondary education.

COMMUNITY COLLEGE FINANCES:

The operating budgets of two year colleges in the fall 1985 totalled nearly $14 billion. The percent of finances contributed by major sources are listed below.

- Federal 6 percent
- State 46 percent
- Local 16 percent
- Tuition and Fees 15 percent

TUITION CHARGES

Tuition charges in public community colleges vary dramatically from one state to another. Costs range from the lowest charges required, in California ($100), to the highest, in Vermont ($1,631).

FINANCING

The most popular finance package for community, technical, and junior college students combines personal funds, a Pell grant, and education loans. The percentage each of these sources contributes to the total package is presented below.

- Self or Family Contribution 54.3
- Education Loan 32.4
- Pell Grant 13.3

STATE APPROPRIATIONS

State appropriations per full-time equivalent enrollments (FTE) in public two-year comprehensive colleges averaged approximately $2,340 for fiscal year 1984. Technical/ occupational colleges averaged higher ($2,606). These figures are considerably lower than state appropriations for baccalaureate colleges, which averaged $2,942.

In fiscal year 1986-87, the community college share of state appropriations for higher education is modest compared to total postsecondary appropriations. A sample of the states appears below.

- California 26 percent
- Florida 31 percent
- Illinois 15 percent
- Oregon 18 percent

COLLEGE SPENDING

Nearly half (47.2 percent) of the public community colleges' revenue is spent for the support of instruction. The next largest draws on the colleges' budgets are: institutional support (13.6 percent), plant operation and maintenance (11.3 percent), mandatory transfers and other (8.5 percent), and student services (8.1 percent).

COMMUNITY, TECHNICAL, AND JUNIOR COLLEGE ACHIEVEMENTS AND CHARACTERISTICS:

THE ASSOCIATE DEGREE

During the academic year of 1984-85, over 460,000 associate degrees were conferred in the U.S.; 75 percent of the degrees were awarded by public community colleges. The rest were awarded by private community colleges (9 percent), public four-year colleges (9 percent), and private four-year colleges

(6 percent). In the last five academic years, more than 1,735,000 associate degrees have been conferred.

The number of associate degrees awarded in occupational/technical areas has increased steadily over the past decade. In 1974-75, approximately 54 percent of all associate degrees were conferred in occupational curriculums; in 1984-85, the percentage jumped to 65 percent.

STUDENT/FACULTY RATIO

The student/faculty ratio in community colleges has hovered around 20 to 1 since 1980, with a high of 20.5:1 in 1980 and a low of 18.9:1 in 1984.

FACULTY AND ADMINISTRATION CHARACTERISTICS

Faculty numbers have kept up with total enrollment in the colleges. In 1970, 109,345 faculty were employed in the colleges; in 1985, the faculty totaled close to 230,000. Over 60 percent of the faculty in fall 1985 were part-time; 58 percent were male.

Administrators in the colleges numbered 20,435 in fall 1985. Of these, 13,350 (65.3 percent) were male.

Nearly 9 percent of the chief executive officers listed in the 1986 AACJC directory are female (107 of 1,222). The positions held by these administrators include superintendent, president, provost, campus director, and vice-president.

DEVELOPMENTAL EDUCATION

Nearly every public community college in the U.S. offers developmental education opportunities for those students who are not yet ready to successfully complete college academic credit programs. In a typical community, technical, or junior college, developmental programs are offered in reading, writing, and math. Between 20 and 30 percent of all freshmen in the colleges take one of more of these courses.

Large numbers of the colleges cooperate with and frequently serve as centers for literacy training in their communities. One recent study showed that the 260 colleges that provided information provided literacy instruction for over 250,000 individuals over the past year. The typical participant in these programs was female, Caucasian, and over 21 years old, with an annual family income between $5,000 and $10,000.

CULTURAL RESOURCES

Rural community colleges frequently serve as major cultural centers for their regions and often provide the only resource for live theatre, classical music, art, and dance.

FLEXIBILITY

Community, technical, and junior colleges offer a special opportunity to students who are not sure about their focus in college. Recent studies demonstrate that the majority of students in college today have no clear idea about what they want to do, what it takes in time and effort to achieve their goals, and what rewards they can expect for their effort. Community colleges open up a universe of possible study areas, provide economical and flexible avenues to pursue interests, and release resources that aid in the identification of realistic and fulfilling outcomes.

COMMUNITY, TECHNICAL, AND JUNIOR COLLEGES CONTRIBUTIONS TO THE ECONOMY:

Nearly every community college has established formal and informal partnerships with business/industry and the public sector in their service districts. A recent study of community, technical, and junior college business/industry and public sector partnerships showed that

- 41 percent had established Business, Industry, Labor Councils on their campuses;
- 66 percent said they participated in area Private Industry Councils;
- 66 percent indicated they had appointed college business/industry coordinators to develop and maintain contact with the local business community;
- Nearly 75 percent offered customized, job-specific, and generic employee training programs for public and private organizations.

THE HIGH SCHOOL/COMMUNITY COLLEGE CONNECTION

Nearly 90 percent of the colleges have developed collaborative relationships with local high schools. Joint programs include advanced placement credit courses of qualified high school students, articulated courses, shared faculties, shared facilities, and cooperative program enrollments.

AND MORE...

Over 80 percent of the colleges reported involvement with area economic development offices.

Colleges report that for every dollar they spend on operations, four dollars are returned to the community.

In some states (Illinois and North Carolina, for example), community, technical, and junior colleges figure prominently in the state's economic development strategies.

96th CONFERENCE

5/22-23/87	- Montgomery Community College, Rockville, MD 20850
Program Chair	- Margot Schumm, Montgomery Community College, (301) 279-5129
Local Arrangements Chair	- Alan Heyn, Montgomery Community College

97th CONFERENCE

10/18-17/87	- Southeast Community College, 8800 "O" St., Lincoln, NE 68352
Program Chair	- John Kenkel, Southeast Community College, (402) 471-3333
Local Arrangements Chair	- Don Mumm, Southeast Community College