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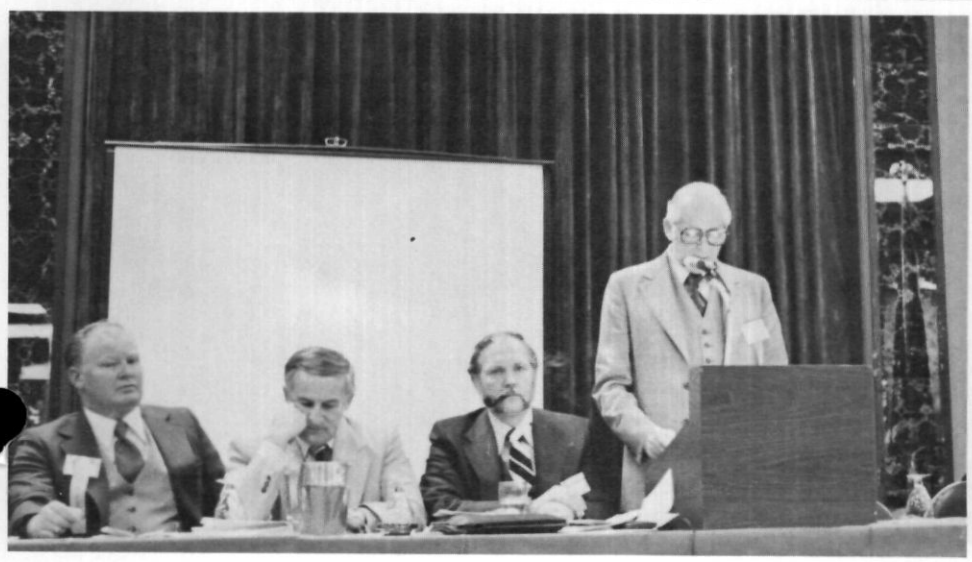
The California Surveyor

No. 59 The Voice of the Land Surveyors of California Conference 1980

CONFERENCE



'80

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Cover: Photos taken at 1979 CLSA/NALS Convention by Reece Harper (NALS). Upper: Paul Lamoreaux, immediate past president of CLSA. Center: Audience at technical session. Lower: Speakers

The California Surveyor

is the quarterly publication of The California Land Surveyors Association and is published as a service to the Land Surveying profession of California. It is mailed to all Licensed Land Surveyors and Land Surveyors in Training in the state of California as well as to all members of California Land Surveyors Association. *The California Surveyor* is an open forum for all surveyors, with an editorial policy predicated on the preamble to the constitution of the California Land Surveyors Association and its stated aims and objectives, which read:

"Recognizing that the true merit of a profession is determined by the value of its services to society, the 'California Land Surveyors Association' does hereby dedicate itself to the promotion and protection of the profession of Land Surveying as a social and economic influence vital to the welfare of society, community, and state."

"The purpose of this organization is to promote the common good and welfare of its members in their activities in the profession of Land Surveying, to promote and maintain the highest possible standards of professional ethics and practices, to promote professional uniformity, to promote public faith and dependence in the Land Surveyors and their work."

Personnel

Owner: California Land Surveyors Association
Editor: R.E. Baldwin, L.S.
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Sustaining Membership

Membership in the California Land Surveyors Association as a sustaining member is open to any individual, company or corporation who, by their interest in the Land Surveying profession, is desirous of supporting the purposes and objectives of this association. For information regarding sustaining membership, contact the Editor of *The California Surveyor.*

Editorial Material.

All articles, reports, letters and contributions are accepted and will be considered for publication regardless of the author's affiliation with the California Land Surveyors Association. Material should be sent to *The California Surveyor.*

Unless indicated, all articles in this publication are prepared by the editor.

EDITOR: **R. E. Baldwin, L.S.**
1345 California St.
Berkeley, CA 94703

DEADLINE DATES FOR THE CALIFORNIA SURVEYOR

SPRING ..... FEBRUARY 8, 1980
SUMMER ..... MAY 12, 1980

Articles, Reports, Letters, etc., received after the above mentioned date will be placed in the next edition.

Editor

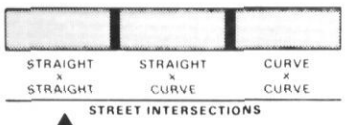
California Land
Surveyors Association
Central Office:

P.O. Box 7400
Santa Rosa, CA 95401
Telephone: 707-526-2572

SURVEY 31

The computer that speaks your language.

As an example: Here's how easy it is to compute a street intersection. (Centerline points 1, 2, 108 & 261 have already been computed and stored in memory)



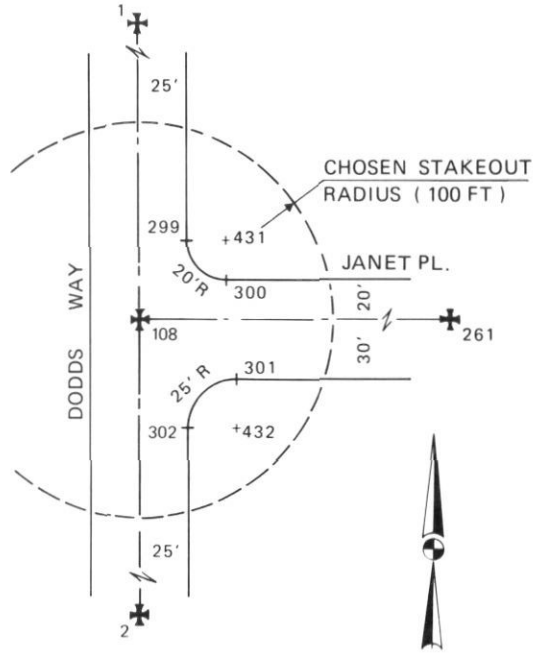
1. SELECT program.
2. ENTER requested data:

```
(P.I.)
POINT?
        108.
(1ST C/L)
TO POINT?
          1.
OFFSET?
         25.
(NEXT C/L)
TO POINT?
        261.
OFFSET?
         20.
CORNER RADIUS?
         20.
RADIUS=
      20.0000
DELTA=
      90.00000
LENGTH=
      31.4159
TANGENT=
      20.0000
CHORD=
      28.2843
(BC/PC)
POINT#?
        299.
    9332.9924
   10027.4417
(RADIUS)
POINT#?
        431.
    9333.0656
   10047.4415
(EC/PT)
POINT#?
        300.
    9313.0656
   10047.5148
```

```
BACK OFFSET?
         30.
(NEXT C/L)
TO POINT?
          2.
OFFSET?
         25.
CORNER RADIUS?
         25.
RADIUS=
      25.0000
DELTA=
      90.00000
LENGTH=
      39.2699
TANGENT=
      25.0000
CHORD=
      35.3553
(BC/PC)
POINT#?
        301.
    9263.0842
   10052.6976
(RADIUS)
POINT#?
        432.
    9238.0843
   10052.7890
(EC/PT)
POINT#?
        302.
    9237.9931
   10027.7894
BACK OFFSET?
```

then, for staking out all points within a 100' radius of #108:


```
FROM POINT?
        108.
BACKSIGHT POINT?
          1.
RADIUS?
        100.
```



. . . with the stakeout data printed on an optional page printer:

```
INSTRUMENT PT=        108.   9292.9012      10002.5882
BACKSIGHT PT=           1.  10000.0000      10000.0000
STAKEOUT RADIUS=      100.00
 TO PT:     BEARING      N AZIMUTH      TURNED<     2XTURNED<      DEFLECTED<     2XDEFLECTED<  DISTANCE     NORTHING      EASTING
   299.  NE 31.47444      31.47444     32.00194      64.00388  -   147.59406  -   295.59212     47.17    9332.9924   10027.4417
   300.  NE 65.49410      65.49410     66.02160     132.04320  -   113.57440  -   227.55280     49.24    9313.0656   10047.5148
   301.  SE 59.14445     120.45155    120.57505     241.55409  -    59.02095  -   118.04191     58.31    9263.0842   10052.6976
   302.  SE 24.39132     155.20468    155.33218     311.06435  -    24.26382  -    48.53165     60.42    9237.9931   10027.7894
   431.  NE 48.09243      48.09243     48.21593      96.43585  -   131.38007  -   263.16015     60.21    9333.0656   10047.4415
   432.  SE 42.28593     137.31007    137.43357     275.27113  -    42.16243  -    84.32487     74.33    9238.0843   10052.7890
```

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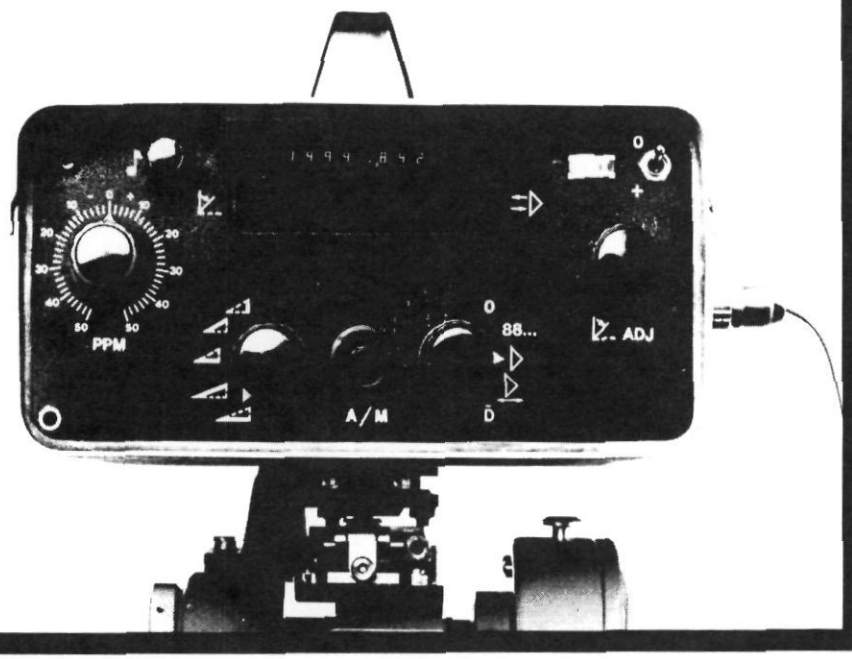

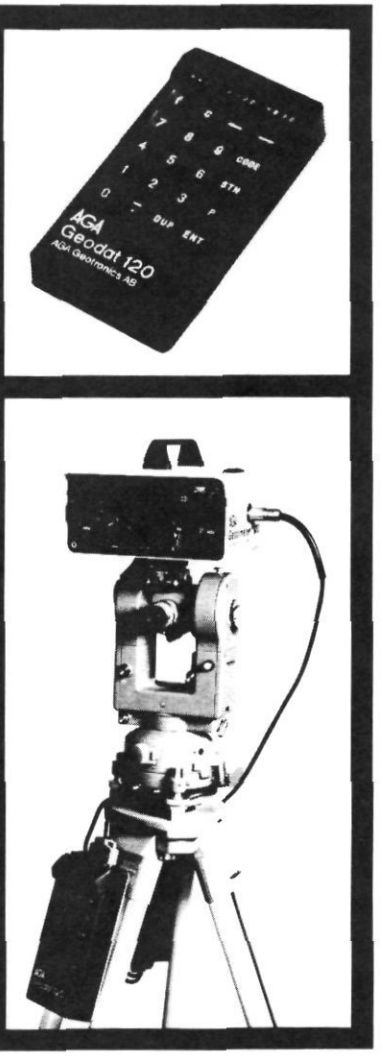

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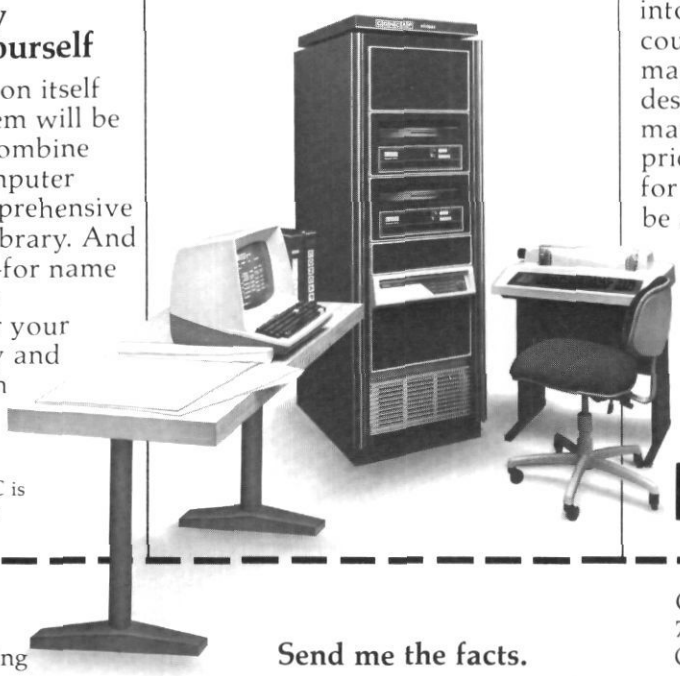

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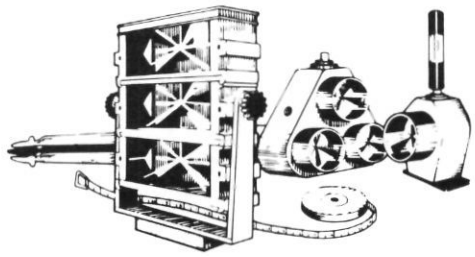

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*†K & E Autoranger with Azimuth Base or mount for Theodolite	30.00	18.00	12.00
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*Lietz TM-1A 1" or Wild T2 Theodolite (Direct reading Horizontal and Vertical to 1", Self Indexing Vertical Circle)	27.50	16.50	11.00
*Lietz TM-6 or TM-10C 10" Theodolite (Horizontal and vertical Estimation to 1", Self Indexing Vertical Circle)	20.00	12.00	8.00
*Lietz TM-20C 20" Theodolite (Horizontal and Vertical Estimation to 3", Self Indexing Vertical Circle)	17.50	10.50	7.00
*Lietz T-60D 60" Theodolite (Horizontal and Vertical Estimation to 6", Self Indexing Vertical Circle)	16.50	9.90	6.60
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*Lietz C3-A Engineers Automatic Level	4.50	2.70	1.80
*Lietz B-4 Contractors Automatic Level	3.00	1.80	1.20
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*Magnetic Locator, Schonstedt	4.00	2.40	1.60
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*Lietz #7311-35 or Wild GDF-6 Tribrach with Optical Plummet	2.00	1.20	.80
*Lietz #7311-38 Tribrach Prism Adaptor	.50	.30	.20
*Retro-Ray Single Prism Assembly (round)	1.00	.60	.40
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Editorial

This year's CLSA Conference is to be held in Fresno, home of the only nationally accredited University west of the Mississippi offering a bachelor's degree in Surveying and Photogrammetry. This is one reason Fresno was picked as the site for the Conference. I therefore urge all those attending to take the time to become acquainted with Cal State University at Fresno and its program.

As an introduction to surveying education I have devoted much of this Conference Edition to the subject. Under *Perspectives* is Gunther Greulich's vision of the educational needs for surveyors in the coming century. Whether or not you agree with his views, the problems he presents must be faced, and soon. Under *Education* is Dr. Eugene Slavoj's article on the surveying program at the City College of San Francisco. Of particular note are his comments on the political and financial problems now faced by almost all college surveying programs, and his request for assistance from the profession which *must* be answered if these programs are to survive. If you think education is expensive, try ignorance.

There is an opinion among some surveyors that a college education is a waste of time. Surveyors, unlike engineers, must be thoroughly knowledgeable with field procedures, but because the survey is always made upon the ground does not mean that this is the only area in which they need be expert.

While surveyors were content to pass on their knowledge from one to another as they had for centuries, engineers entered the 20th Century establishing universities with curricula specially suited to their field. It is no wonder that, as surveyors, we now find ourselves in a struggle with engineers over ground which was one *exclusively ours.*

We can no longer afford the luxury of riding the open range, setting corners and enjoying the great outdoors — we are part of a complex society with a number of pressing problems. The technology of our society affects our profession, and more importantly, so do its problems — ask anyone who deals with EIR's. Solving problems is no longer a matter of applying formulae to familiar circumstances, but a process of evaluating a great number of possibilities and then creating solutions which best fit the situations at hand. Tomorrow's surveyor *must* possess the disciplined yet open mind that only education can produce.

The true purpose of education is not to produce expert technicians, but to broaden the horizons of the intellect. The true test of a person's education is that they enjoy exercising their mind.

-R. E. Baldwin, L.S.-

1980 ACSM CALIFORNIA CONFERENCE

October 24 - 25
SACRAMENTO

The 1980 American Congress in Surveying and Mapping California Conference will be held October 24-25, 1980, at the Red Lion Motor Inn, Sacramento, California.

The conference theme is "Surveying from the Air and the Ground" and will focus on issues and applications of land surveying in California today.

A one-day workshop on PHOTOGRAMMETRY FOR THE SURVEYOR will be held in conjunction with the 1980 ACSM California Conference in Sacramento, California.

The workshop will be on Thursday, October 23, 1980, at the Red Lion Motor Inn (same location as the Conference). Organizers for the workshop are Francis H. Moffitt, University of California, and George P. Katibah, Chief, Geometronics Section, Cal-Trans.

Tentative subjects to be covered include:

- Basic principles on photogrammetry
- Photogrammetric products used by the surveyor
- Use of the aerial photograph as an aid in field work
- Availability and cost of aerial photography
- Ground control surveys for photogrammetry
- Photogrammetric determination of ground points for initiating ground surveys

Cost for the workshop is $100 per person for ACSM members and $125 per person for non-members ($25 of this fee can be applied toward membership). The cost includes textbook, notes, and lunch. Enrollment is limited and pre-registration will be required. For information on the workshop contact:

Shelby Guthary
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Western Mapping Center
345 Middlefield Road
Menlo Park, CA 94025

Co-chairmen: Lee W. Aggers & Lewis R. Nichols
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Education

FORTY YEARS OF SURVEYING EDUCATION AT THE CITY COLLEGE OF SAN FRANCISCO

By D.E. Slavoj, Dr. of Engineering
Coordinator of Civil Engineering
Technology, C.C.S.F.

Eugene Slavoj is a graduate of the Technical University of Prague, where he earned his Dipl. Eng. Degree, and the Technical University in Vienna where he earned his Dr. Techn. Degree in Surveying. He is a Graduate in Education, UC Berkeley, RCE & LS in Czechoslovakia. He has 22 years of industrial experience in Europe, Australia and the USA, and 20 years of teaching Surveying & Photogrammetry at the University of Melbourne, CCSF, CSU Fresno, University of Hawaii, Cogswell College, and UC Berkeley. He is a member of CLSA, ACSM, ASP.

INTRODUCTION

The City College of San Francisco, a public two-year college, was founded in 1935 to meet the needs of the people of San Francisco for education on both the university and semiprofessional levels. The present enrollment is close to 16,000 in day programs and 9000 at night. The Engineering Technology enrollment is about 550 in five curricula. The Civil Engineering Technology (CET) with three other programs has been accredited without interruption since 1957 by the Engineering Council for Professional Development (EPCD). All Engineering Technology programs are designed for completion in two years. An Associate in Science (AS) degree is awarded to those who satisfy the California general education requirements and an Award of Achievement is also awarded to students who satisfy the minimum grade average and successful completion of all subjects specified in the selected major field of study. The Engineering Faculty consists of 28 members, and two are engaged in teaching Surveying only.

BRIEF HISTORY

The CET program at CCSF was started in 1937/38, and Surveying was introduced by the late "Mike" Aggeler in 1940/41. During the forty years the program was listed in the college catalog under various titles: as "SURVEYING" in 1940-46, "DRAFTING and SURVEYING" in 1947-56, "SURVEYING & MAP DRAFTING" in 1957-66, "SURVEYING & MAPPING" in 1967, "SURVEYING ENGINEERING TECHNOLOGY" in 1970-71. In 1972 the Architectural Engineering Technology was integrated into Surveying Engineering Technology, and a new title of "CIVIL ENGINEERING TECHNOLOGY" was adopted.

The CET curriculum, with emphasis on Surveying, at CCSF is one of the oldest in the USA and has for many years had the distinction of being one of only four colleges in the nation offering Surveying Education.

PROGRAM

Graduation requirements in the CET curriculum are outlined below. The number of semester credit hours for each course is shown in brackets. Mathematics (Computers in Engineering, Basic and Advanced Technical Math) [9]; Basic Sciences (Physics, Engineering Geology) [9]; Written and Oral Communication (English and Speech for Technicians [5]; Humanities and Social Sciences (Human Relations in Industry, Political Science, American Institutions and U.S. History) [5].

In addition to basic sciences and humanities, the following technical courses are required: Measurements and Plane Surveying [3]; Plane Surveying [3]; Programming for Digital Computers [3]; Elementary Engineering Drafting [2]; Structural Design Drafting [3].

For those students choosing the surveying option, the following technical electives are available: Map Drafting [3]; Land Surveying [3]; Astronomy For Surveyors [1]; Topographic Surveying [4]; Route Surveying [3]; Photogrammetry [3]; Curves and Earthwork [2]; Fundamentals of Traffic Engineering [3].

OUTLINE OF SURVEYING COURSES

First semester:

Measurements and Plane Surveying:
Theory of and practice in linear and angular measurements. Equipment and methods used in common surveying measurements, elementary treatment of errors in measurements in surveying. (Transferable to UC, Berkeley)

Second semester:

Plane Surveying:
Control surveys, field astronomy, topographic mapping, stadia and plane table surveys, construction surveys, state coordinates, land surveys, photogrammetry, and field adjustment of transit and level instruments. (Transferable to UC, Berkeley)

Map Drafting:
Subdivision and topographic computations, drafting techniques on mylar, scribecoat and cloth, computation and mapping of routes and right-of-way, plotting of profiles and cross-sections and computation of areas.

Photogrammetry:
Principles of terrestrial and aerial photogrammetry, flight planning, ground control, single and double-image (stereo) photogrammetry and photogrammetric mapping by Ballplex and Kelsh Plotters.

Third semester:

Land Surveying:
A study of original surveys, resurveys, subdivision surveys, land survey descriptions and legal aspects of the practice of land surveying as covered by the federal Manual of Surveying Instructions, The California Subdivision Map Act, The Land Surveyors Act and Local Ordinances.

Astronomy for Surveyors:
Astronomical procedures for determining latitude, time, longitude, and bearing as observed with the transit and theodolite.

Topographic Surveying:
Field and office work applying the various methods of topographic surveying, planning, computations and mapping. Application of control surveys and the California State Coordinate System. Electronic distance measurements, hydrographic surveys, basics of least squares adjustment.

Fourth semester:

Route Surveying:
Reconnaissance, preliminary, and

location surveys, computation of earth quantities and distribution.

Curves and Earthwork:

Presentation of route surveying problems dealing with simple, compound, transition and vertical curves, and computation of quantities and distribution of earthwork problems.

Practical project type courses are carried out in the campus area independently by student parties under the supervision of the instructor. Copies of each student's work serve as samples of their technical performance for job interview purposes. For complete information contact CCSF.

EVALUATION

The latest evaluation and subsequent accreditation was approved by ECPD in 1979 for a five year period. The accreditation of the Land Surveying Curricula by the California Board of Registration for Professional Engineers was approved in 1977 and the graduates of CET surveying option from CCSF will receive two years credit of the required experience in land surveying to qualify for the second division of the L.S. examination.

ENROLLMENT

In the beginning Surveying course there are an average of 100 students per year. About 10-15% select CET Surveying option as their major field of study. At the present time there are about 65 majors in the CET program. About one half of CET majors are continuing their education toward the B.S. degree in Surveying and Photogrammetry by transfer to California State University (at Fresno, which gives the CET graduates from CCSF a transfer credit of 62 units. This articulation agreement is unique, because no other engineering program on a 2-year college level in California can match it. The number of graduates who completed the Surveying program and earned the Certificate of Achievement from 1947 to 1970 totaled 85, and from 1971 to 1979 included another 65 students. In the 40-year period, about 5000 students took Surveying and about 1200 took the second semester surveying course Engn 1B. About 250 noncertified majors transfered to 4-year colleges or went to work. Approximately 25% of the students complete all of the surveying subjects and attain sufficient skills but do not graduate because they already possess some other academic degrees, and a number come from industry as part time students to "brush up" for the L.S. examination.

Since the introduction of LSIT examination, about 95% of CET majors take this examination before graduating from CCSF. This achievement aids greatly in their initial placement in surveying jobs.

FACILITIES

Beside the general college facilities, the CET branch has its own lecture and laboratory room for 25 students, faculty office, and equipment storage facilities. CCSF also has many major items of surveying equipment including Theodolites and modern transits, engineer's transits, levels, Alidades, E.D.M.'s, equipment for celestial observations, and photogrammetric instruments including Ballplex and Kelsh plotters.

The CET faculty office has for the use of faculty and students an up-to-date set of books and magazines covering all branches of surveying and photogrammetry.

EMPLOYMENT

About one-third of the 150 CET certified graduates from CCSF work for the PG&E Company, about one-fourth with Caltrans, and the rest with various public and private organizations. We've had 10 females in the CET program, four graduated, two are at CSUF and four are currently enrolled. Approximately 50% of the graduates are of Oriental background. There has been only one black graduate to date.

PRESENT SITUATION AND PROBLEMS

The passage of Proposition 13 disrupted the conventional financing of college education in California. The existing situation doesn't allow any short or long term planning. This and politics as practiced by some school boards affect many California Colleges to such an extent that some "expensive" and "low enrollment" programs may be eliminated. Unfortunately this can be applied to some important engineering programs (viz. Monterey Peninsula College). For two years in succession

there has been no money for replacement or new equipment. Another problem is the replacement of retiring faculty with people with the desired academic qualifications and industrial experience at the current salaries. The starting salary for an engineering instructor with a MS degree at CCSF is about $16,000.00; EBMUD in September 1979 invited applications for a position of a Chainman, with the only requirement for education being the completion of 12th grade and no experience, at the salary range $16,008. to $18,648. No wonder under such conditions there is a shortage of Engineering educators. Along with the salary range is another problem – the lack of qualified people to fulfill the affirmative action demands.

The present situation, the future of Engineering education in general and the Surveying education in particular at the Community College level don't look good, unless the responsible people from the public and private sectors of the surveying profession on local and state levels immediately take the following action: Representatives of the Surveying profession should participate in local college board meetings in person or write to board members, urging them to preserve the surveying programs in the national interest regardless of the cost. They should remind them that the Engineering schools train people for productive jobs serving the public and creating immediate taxpayers. The temporary income of the college from the state contribution per student enrollment is illusory in the case of grduates who are not trained for productive jobs, and many of them end up as welfare recipients. In the long run the cost of education of such students to the taxpayer is many times more than the training of an Engineering technician.

The representatives of professional societies should be in touch with Engineering faculties and monitor the administrative policies and political trends in particular Community Colleges. They should participate on college advisory boards. For CCSF, I would like to suggest that the presidents of ACSM, ASP, CLSA and other kindred organizations should serve on the CET Advisory Board.

The local surveyors should seek the opportunity and participate in a strong public relations activity (at the local High School) to motivate young people towards surveying careers, by giving lectures, showing films, distributing brochures and other aids describing functions performed by surveyors.

The Surveyors engaged in private and public practice should secure employment of surveying graduates and give them preference in hiring by requiring surveying education as a condition of employment on surveying jobs.

The representatives of the Surveying profession should convince the college administrators and members of school boards, that training of Engineering Technicians can be satisfactorily achieved only in small classes in contrast with "liberal arts" classes. Many politicians own land and they should be reminded that only properly trained surveyors are able to locate properly the boundary lines of their properties. The Surveyors should strive to improve the image and status of the Surveying profession by acquiring the maximum of academic training and practical experience. This can be achieved only by upgrading the level of American Surveying Education to the level existing in other advanced countries of the world. A very good example is neighboring Canada.

To prevent the further deterioration and eventual elimination of Surveying education at the Community College level, the Surveying organizations and individual Surveyors and Engineers should contact their political representatives in Sacramento to alert them about the dangerous trend of some local college boards trying to save money by cutting out the Engineering programs. Actions of this nature will have detrimental effects on the quality of surveying service to the American public. The public should be reminded at every opportunity that the embarassing calamity at "Three Mile Island" was caused by an unskilled high school graduate and **not** by a college trained technician.

The current emphasis on land development and on the environment calls for many new and responsible services from the Surveying profession, and the people engaged in the business of Engineering Education on local, state, and national level have an obligation to maintain and update the Surveying curriculum at the Community College level. The Surveying program at CCSF developed during the forty years of its existence should be considered as a national asset and in no circumstances should its elimination be permited because of temporary financial difficulties.

To help the survival of this program at CCSF the employers of surveying personnel should encourage their employees to enroll part-time in surveying courses offered at CCSF in order to increase and enhance their qualifications and skills. In many instances night and Saturday morning classes can be arranged.

▲

"FRESNO 1980"
MARCH 27 - 29, 1980
HACIENDA INN, FRESNO, CALIFORNIA

REGISTRATION FORM

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SPOUSES NAME (If attending) _____

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PLEASE TYPE OR PRINT C.L.S.A. MEMBER ☐ YES ☐ NO

ITEM		PRICE PER PERSON Pre-Reg. (prior to 3/15)	*Late Reg. After 3/15	Number Desired	AMOUNT
REGISTRATION	MEMBER	40.00	50.00		
	NON-MEMBER	50.00	60.00		
	**STUDENT	15.00	20.00		
	SPOUSE	5.00	5.00		
FRIDAY LUNCH		7.50	8.50		
FRIDAY LADIES ACTIVITIES (Lunch included)		20.00	23.00		
FRIDAY DINNER (Roger Rocka's Good Company Music Hall (transp. incl.)		21.00	25.00		
SATURDAY MENS LUNCH		7.50	8.50		
SATURDAY LADIES ACTIVITIES (Lunch included)		15.00	17.00		
SATURDAY DINNER "Armenian Kef Time"		20.00	22.50		
THURSDAY Surveying Conference Tennis Tournament		6.00	7.00		
SATURDAY FUN RUN T-Shirt size ( ) Sm ( ) Med ( ) Lg ( ) X-Lg		6.00	7.00		
Spouses are welcome at the Tennis Tournament, Fun Run and Golf Tournament					
Thursday GOLF TOURNAMENT (See Golf Registration card) MUST be returned by 3-15-80		15.00			

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PRELIMINARY PROGRAM

"FRESNO 1980"

Thursday, March 27, 1980

7:00 a.m.	"Golf" Breakfast
8:00 a.m.	Golf Tournament
8:00 a.m. - 5:00 p.m.	Registration desk opens
8:00 a.m.	Decorator sets up exhibit boots
9:30 a.m.	Tennis Tournament
1:00 a.m. - 5:00 p.m.	Exhibitors move in
3:00	General Meeting
6:00 - ????	Exhibitor's Cocktail Party

Friday, March 28, 1980

7:30 a.m. - 5:00 p.m.	Registration desk opens
8:00 a.m. - 8:30 a.m.	Coffee and donuts
8:30 a.m.	Introduction of Dignitaries, announcements, etc.
8:50 a.m.	A historical discussion on Land Surveying in general and California in particular
9:30 a.m.	The historic development of land surveying. A description of the methods, equipment, laws and organizations used to make surveys in the past
10:10 a.m. - 10:40 a.m.	Coffee break with Exhibitors
10:40 a.m. -	Problems caused by past surveys
11:20 a.m. -	Title problems caused by past surveys
12:00 Noon - 1:30 p.m.	Luncheon with Speaker
1:30 p.m. -	The liability of Contours
2:10 p.m. -	Ways of avoiding liability
2:50 p.m. - 3:20 p.m.	Coffee break with Exhibitors
3:20 p.m. -	A discussion on Easements
4:00 p.m. -	A general discussion on land law
6:30 p.m. -	Dinner - Roger Rocka's Good Company Music Hall

Saturday, March 29, 1980

7:00 a.m. -	Fun Run
7:30 a.m. - 12:00 Noon	Registration desk opens
8:00 a.m. - 8:30 a.m.	Coffee and donuts
8:30 a.m. -	A review of the latest developments in computers and surveying equipment.
10:10 a.m. -	Coffee break
10:50 a.m. -	Current Legislation and what the CLSA Legislative Committee is doing
11:40 a.m. -	Federal procurement and the land surveyor
12:00 Noon	Luncheon with Speaker
1:30 p.m. -	Condominium boundaries
2:10 p.m. -	The Surveyor and improvements. Should the Surveyor be allowed to do cookbook engineering
2:50 p.m. -	Coffee break
3:20 p.m. -	How to deal with the Planning Department
4:00 p.m. -	Real Estate - Boom and Bust
5:30 p.m. -	Evening Dinner and "Armenian Kef Time"

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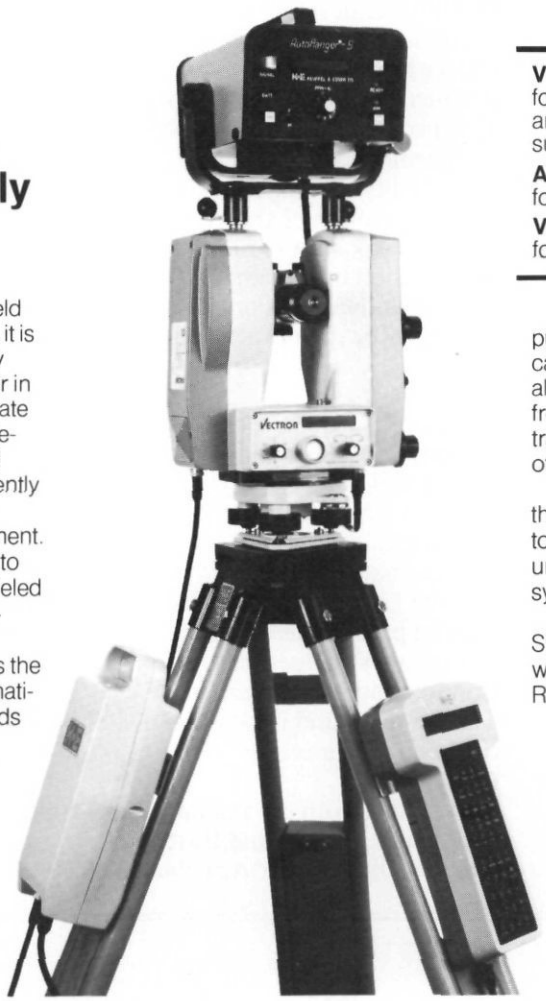

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Accreditation

ACCREDITATION FOR C.S.U.F.

The surveying and photogrammetry program in the School of Engineering at California State University, Fresno has received national accreditation by the Engineers' Council for Professional Development.

CSUF is the only university west of the Mississippi which offers a baccalaureate of science degree in surveying and photogrammetry engineering, and is the only school in the nation with an accredited program at the present time.

Dr. Fareed Nader, curriculum head of the program at CSUF, said the accreditation is based on the Council's evaluation of the program's content, quality of faculty and graduates, equipment available, technical staffing and support from other areas of the University.

The significance of the national accreditation for the program, said Dr. Nader, is severalfold. It is recognition by an impartial outside observing team that the program is a high calibre one; state registration boards will accept the CSUF degree as four years toward the requirement of six years of education and practical experience; and graduate schools will more readily accept students from accredited undergraduate programs.

A further advantage of the professional recognition, Dr. Nader added, is that it helps the University in recruiting high quality faculty members and in attracting more students into the program.

The graduates of the program are highly sought after by industry, with job offers numbering from three to six for each gaduate and starting monthly salaries ranging from $1,000 to $1,900. Numerous inquiries are coming from petroleum and coal mining companies with the recent surge in exploration for new energy supplies. The vast majority of the graduates join private surveying firms and several have established their own companies. Twenty-three graduates have become registered land surveyors.

The success of the surveying and photogrammetry graduates was one of the criteria considered in the Council's accreditation of the program.

Established in 1970 by Edward Kulhan, now professor emeritus of engineering, the program was the first in the nation. Most recently, the program was enhanced by the construction of the University's new Engineering Building, which provides the students with the latest technology in equipment. ▲

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CALIFORNIA LAND SURVEYORS ASSOCIATION
March 27-29, 1980

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Perspectives

EDUCATIONAL NEEDS FOR 21ST CENTURY SURVEYORS IN PRIVATE PRACTICE

By Gunther Greulich[1]*, M. ASCE*
One of six Directors of ACSM's Land Survey Division

Considering that we have just entered the last quarter of the 20th century, this is a timely subject. Two hundred years ago, George Washington had retired from land surveying. Although he was successful without a formal education, his is an example we can no longer afford to follow. The American public is unable to wait for its surveyors to be trained on the job. Today, we have neither the time nor the patience to learn as we go–making mistakes on the way. Clients are unwilling to pay the price for incompetence. Contrary to the bad habits of some, surveying is not merely an exercise of leg muscles, but first and foremost an activity of the mind.

The sciences of mathematics, astronomy, geodesy, cartography, and surveying attracted America's best 150 years ago. There was so much to do. The most brilliant minds and talents accepted the challenge to discover the land and chart its course of development. It took ingenuity, perseverance, and courage. Before a canal could be built, it had to be surveyed and designed. The surveyor did both. How to get from here to there, across the unknown, was the challenge.

As technology spread and the engineering sciences multiplied, surveying lost its monopoly in attracting technical minds. The demand for surveys, however, increased as the development of the country continued. The surveyor who once knew *how, where,* and *why* to set the stake was succeeded by the man who had learned how to find it. Education concentrated on structural design and new technology at the expense of surveying. Educators forgot that a structure is only as good as its foundation and that design decisions are based on surveys. Students were no longer taught surveying and teachers no longer knew how to teach it. Subsequently, surveying and mapping activity in America became stagnant and wasteful. Apprenticeship training, a poor substitute for education and a system of diminishing returns, has produced more good land measurers than good land surveyors.

The profession survived, however, thanks to those exceptional men found in every state today. The Registered Land Surveyors and a few Professional Engineers have remained dedicated to the surveying profession. Their background is as varied as that of the politicians. The official ballot of the 1976 election of officers and directors for the Land Survey Division of the American Congress on Surveying and Mapping is indicative of that situation. Of the seven candidates listed, only two have a B.S. degree (one in civil engineering and one in mechanical engineering!). One has a degree in forestry, one has an associate degree in structural technology, one was a schoolteacher, and two have come up "through the ranks," taking college courses on the way. In other words, six out of seven leaders in today's surveying became surveyors via the apprenticeship system. It is obvious that the one civil engineering graduate must have taken sufficient surveying courses to have retained an interest in this field; otherwise, he might not have been among the candidates for this important office.

19th and 20th Century Surveyors–

Rensselaer Polytechnic Institute took care of the educational needs of the 19th century surveyor. In 1835, the first "civil engineers" graduated (6). A review of the courses offered shows that their graduates might have been more properly called "survey engineers," but that title had not been invented yet. Surveying subjects certainly dominated his education.

It is safe to say that the educational needs of the 20th century surveyor in the United States have been ignored. That we were able to land on the moon accurately and return safely from it is a miracle in more than one way. We may credit scientific disciplines outside surveying with this achievement. It was accomplished despite a general lack of geodetic education.

Electronics and the space industry have revolutionized the surveyor's equipment, while he himself has advanced little, content with following in the footsteps of his pioneering predecessors. Because he stood still, the surveyor has fallen behind. Lawyers, title insurers, land-use planners, environmentalists, and computer systems experts–not surveyors–have discovered the need for a modern land data system. Only recently, and sometimes reluctantly, have the land surveyors begun to join the others. The search for such a system, however, can and will succeed only with the surveyor's leadership. He must have the desire and the ability to create this sorely needed multipurpose cadastre. He must learn to be innovative and creative. The right kind of education will show him how.

Some Misconceptions–

"Surveying and mapping don't belong in a university," said a not-so-wise professor of water resources from Minnesota to the Surveying and Mapping editor of ASCE at its convention in Denver, Colorado, last fall. "Learn Surveying at Home" was the advertising slogan of the North American School of Surveying. The ad promised "Excitement! Fun! and High Pay." A surveying career was "ideal for men who like to work with their hands." It assured the prospective mail order student that he needed "no technical ability." Such an ad appeared in a sports magazine a few years ago.

During a panel discussion on surveying education held by American Congress on Surveying and Mapping in St. Louis, Missouri, in 1974, a member of the National Council for Engineering Education (NCEE) was introduced. Not being a surveyor, his credentials as an "expert" in surveying were nevertheless explained by the chairman: "When he was a young man, he personally surveyed 5,000 acres of land in South America for United Fruit."

The same year, during the FIG international conference in Washington, D.C., a representative of NCEE proudly announced to a room full of PhD's and Doctors of Engineering in surveying, that as a civil engineering student of the 1920's or 1930's he has had "more surveying education than anybody in the room." "Surveying is so simple, why do you have to go to school for that," a sanitary engineer once asked me.

At the XIV International Congress of Surveyors, two American professors

delivered the introductory address to Commission 2, Professional Education (4). Although I am in agreement with much of what they said, some of it disturbs me deeply. This is what they wrote regarding post-graduate education: "Very few (graduates in surveying and mapping), if any, will seek employment as a practicing land surveyor . . ." The image of the future graduate is described as one who "would be prepared to work and lead in areas or levels generally out of reach of the (future) land surveyor." With friends like that . . .

Only 20 years ago, Massachusetts' best-known professor of civil engineering at Northeastern University expressed doubts that the school could continue sanitary engineering education because of the very small number of students taking an interest in these courses (1). How things have changed!

The surveyor of the 21st century must develop his own leadership. As there are today thousands of environmental engineers with a master's degree in private practice, so will the complexity of future surveying and land records systems require post-graduate education for the private practitioner in surveying.

The Survey Engineer–

This is where we stand, and on we must go. Tomorrow's surveyor in private practice must be in tune with the times. Although the glamorizing of titles and tasks may be superficial and cosmetic, it is often necessary. As the language lives and changes, so must a profession if it is to stay healthy and attractive to the next generation. Field work is often called the "data acquisition phase." Office work has become the "data reduction phase." Likewise, a land surveyor of old should become the new survey engineer. After all, he is a member of the engineering team, both civil and military. Unfortunately, the English language has a hangup with the word engineer. It puts the emphasis on engine, be it design or operation. In all other European languages the word engineer starts with the letter I (as in Ingenieur) and is derived from ingenuity.

Before I came to this country, I was reasonably sure that I was an engineer. Besides, I had a certificate on the wall that said so. But, on arrival in Tulsa, Oklahoma, 20 years ago, I found out that I was "only a surveyor." I have heard it many times since. That connotation of inferiority. The "ordinary surveyor," the "plain and simple surveyor." I am convinced that the label must change in the best interest of the profession.

The title, civil engineer, has become an umbrella term for a field too big to be confined within its limits. It now serves to describe a general and wide range of engineering disciplines. We already have registration laws which in many states distinguish between civil, sanitary, and structural engineers. A survey engineer will be one more specialist who has branched out from the all-encompassing civil engineering. The civil engineer as we knew him 100 years ago no longer exists. Yet in a way the 21st century surveyor will more closely resemble the 19th century engineer than any other engineering specialist. He will remain the generalist of land engineering, the overall planner, the land manager. His education must enable him to attain registration as both a land surveyor and a professional engineer. Only he will be prepared to serve in this dual capacity, a prerequisite for independent private practice.

There are, of course, other disciplines that have managed to retain their image without a change of name; geographers and architects, for instance. The surveyor's past decline in education, knowledge, and status, however, has resulted in confusion between aide, technician, and professional. Who is who is sometimes the big question. Major surgery is needed. A survey engineer may be the answer.

To Glorify the Ordinary–

In 1936, Paul P. Rice of Lafayette College, Easton, Pennsylvania listed as one of his objectives in Geodesy and Surveying that "We should train men to glorify the ordinary" (3). Surveying is a basic but very important discipline of engineering, whose importance is increasing every year. The surveyor's education must prepare him for what is to come without losing sight of what has been.

Photogrammetry and automated surveying will become sufficiently refined to take the place of most of today's slow and tedious surveying methods. Theodolites and EDM equipment, as we know them today, will follow the decline of the slide rule into obsolescence. Automatic recording of field notes for X, Y, Z positions of any point, such as was pioneered by the Zeiss Reg-Elta 14, will become standard procedure. Terestial photogrammetry may even replace that method of data acquisition in its entirety. Computerized plotting and mapping, coupled with remote controlled and instant reproduction, will become routine efforts. Nevertheless, the surveyor will continue to walk the land. Because the average person will grow so accustomed to the climate-controlled sterile world of television and to an artificial life of voluntary isolation, it will take a land engineer–the surveyor–to show them where it's at. More than ever the public will rely on his expertise and on his intimate knowledge of the land.

In addition to superior knowledge of up-to-date technology the survey engineer needs to be taught some time-proven values. He must be taught the basic meaning of the word *survey*. Its synonyms are listed in *Roget's College Thesaurus* as *"vision"* and *"measurement,"* in that order. The 21st century surveyor will need vision. He must be taught logic, a systematic approach to all problems, thoroughness and pride in his work, the theory of errors, an awareness of human imperfection, and the constant need for checking. He must be told that surveying is not a footrace, that it is more than mere measurement. He must learn to preserve and to respect the old while aiming at permanence in his own work, even if it does cost a little more. A strong sense of responsibility must be instilled in him. Someone must tell him that shortcuts in surveying lead to shortchanging the client as well as the public. He must be cognizant of the immorality of his reputation, good or bad. Who remembers the designer of a sewage treatment plant of 20 years ago? Who really cares? A surveyor's plans and records live forever in court houses and registries of deeds and will still be referred to by the 22nd century surveyor. Think about that.

The surveyor must be capable of negotiating a professional contract with his clients without compromising his integrity. He must anticipate and be able to distinguish between the dif-

ferent reasons that cause a lawyer, a realtor, an architect, a design engineer, or a contractor to ask for a survey.

A client's needs, tempered with the public's rights and guided by the surveyor's conscience are the ingredients of a successful professional service.

He must be taught sound business habits and an appreciation of the value of his contribution to society. He must be made aware that most of the important design decisions are based on a survey. Structures and sewers are vital; without surveys there would be neither.

Registration laws authorize the land surveyor to subdivide land. Too many subdivisions have been designed by surveyors without regard for drainage. The 21st century surveyor in private practice must be capable of road and utility design. He will call in the hydraulics engineer for a special problem and the sanitary engineer for a sewage treatment plant. He is the master planner, because he has the overview.

Education isn't everything, of course. Sometimes there is no substitute for practical experience. Science doesn't always win out over good, common, or other sense. The United States Food and Drug Administration presently employs one full-time and 24 part-time "fishsniffers." They actually sniff out three different classes of decomposition of imported food products at their port of entry. And they are more efficient than any other known method, scientific or otherwise. Twenty-four cans of tuna can be sniffed in one hour, while chemical tests take from eight to 20 hours (2).

What has that got to do with surveying education? The future surveyor, however highly educated, must retain a feel for the land. If he is to be the land planner and the land engineer upon whose judgment the public can rely, he must know the land intimately from first-hand personal experience.

Environmental restrictions are defined by boundaries. The surveyor translates them into reality. Lines on paper become meaningful features on the ground through his effort. His advice will be sorely needed. He must be able to express his opinion in well-written reports. Not every client understands all symbols and numbers on a surveyor's plan. He must be taught to explain his work and the reasons behind it to an audience of lay people at a public hearing. The 21st century surveyor in private practice will continue to be called upon as an expert witness. His testimony in court will require knowledge of an extra hundred years of surveying history and background. Chains, links, rods, feet, miles, and acres will be a mystery to the SI-oriented land owner and realtor.

New Challenges–

By the turn of the century, a great majority of the United States will have established a multipurpose cadastre–a computerized land record system based on accurate, standardized, uniform large-scale maps. Planners, environmentalists and public pressure, if nothing else, will have made such a system necessary. The surveyor must and will be its manager. Although a large number of government-employed surveyors are required for its maintenance, it will not exclude the surveyor in private practice. On the contrary, when properly educated and examined, he will be the necessary link between big government and the private land owner. He will be the mediator, the expert who understands the workings of a land data system. He can bring it to the people who want and need prompt, personal attention. Because he is well educated and experienced, the survey engineer will assist the cadastral agency with the creation and maintanence of the land record system as well. He will become the information manager who can fit engineering data into a system of legal constraints. Coal is once again getting attention as a major energy source. Strip mining will be even less popular in the 21st century than it is today. Small seams of coal at great depth will require the special skills of the mine surveyor. Questions of location and of ownership rights will provide the challenges.

Construction surveys of the 21st century will no longer tolerate the hit-or-miss method. Modular construction and precast building blocks are economical only if they can be assembled on precisely located anchor points. The survey engineer in private practice will help the building contractor to make an architect's dream come true. More structures have been erected in the 20th century than at any time before. The 21st century cannot and will not tear down these buildings. Precise monitoring of vertical and horizontal alignment of old structures will make demands on the future surveyor. His education must prepare him for this task.

In addition, another breed of surveyors will soon be needed–the underwater ocean land surveyor. Offshore positioning of oil rights will be followed by precise boundary determination of mineral rights, gravel deposits, fishing rights, ocean farming, pipeline right-of-way, offshore supersonic jet ports, offshore nuclear power plants, and other energy-related facilities as yet unknown to us.

Rare Opportunity–

"To call engineering a profession is to express a faith rather than describe a reality, and to attach a label that is more an indulgence than a truth." This is what Ralph Nader said 10 years ago. As a major reason, he gave that "by and large, the engineer is not an independent practitioner, but is employed by commerce and industry . . . where he can be hard put to try to match his professional ethic against power and profit" (5). Nader may not have been too far off when referring to the majority of engineers. The surveyor in private practice, however, is different. Amos E. Kent of the Massachusetts Board of Registration, reported recently that most of the public complaints received by the Board are against land surveyors. This despite the fact that, in Massachusetts, professional engineers outnumber registered land surveyors by 20:1. The reason for it is simple, said Kent. "Surveyors, by the nature of their work, have a much greater direct contact with the public and the consumer than do (professional) engineers" (personal communication).

In this age of bigness–big government, big corporations–few avenues are left where an energetic and ambitious individual can still make it on his own. Surveying is one of them. Much like the general practitioner in medicine, the land surveyor is still in daily contact with people. In contrast, the engineering specialist, be he a structural, sanitary, hydraulic, or highway engineer, is apt to be employed within the corporate structure of a large consulting firm. More often than not is he one of the anonymous cogs of that proverbial wheel.

There is little reason to believe that the 21st century will bring a reversal of the worldwide trend towards more government, more unionism, more socialism, and less individualism. America may perhaps be the only country where a happy blend of private enterprise and profit sharing will prevent total socialism from killing all incentive and all personal initiative. A private practice in surveying may just be one of those rare opportunities

where initiative and personal leadership will still have a place, the same kind of challenge and opportunity that helped to develop a George Washington 200 years ago. I certainly hope so.

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