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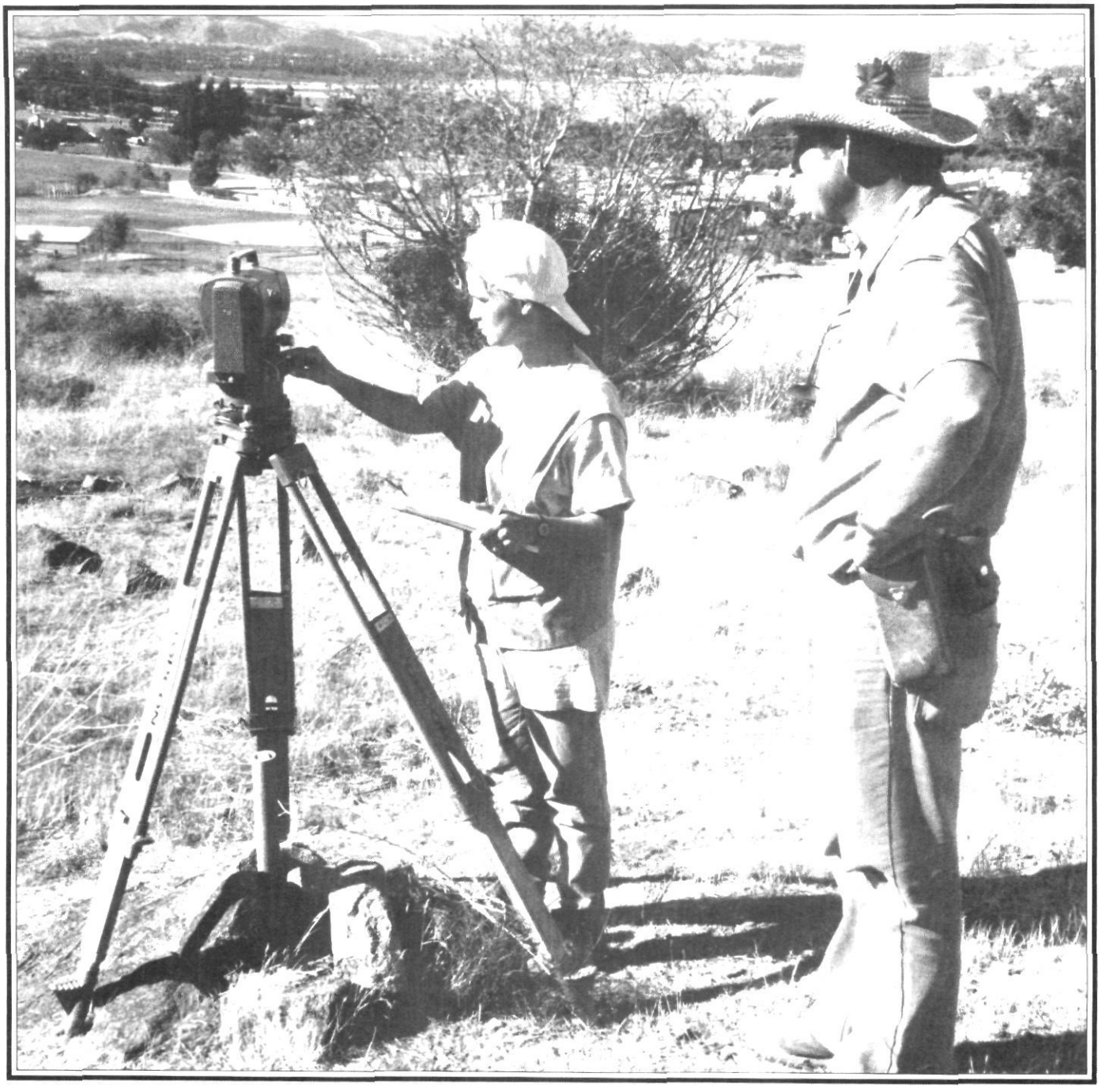
The California Surveyor

No. 95 The Voice of the Land Surveyors of California Fall 1991



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The California Surveyor

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"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

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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, Inc. Contributions submitted on floppy diskette medium is encouraged. For compatibility, disks should be 5-1/4 inch, MSDOS (IBM compatible) format. We can accept ASCII text files or word processor files from the following programs: WordPerfect, Microsoft Word, Windows Write, Multimate, DCA (Displaywrite III and IV), Wordstar, Xerox Writer, and Xywrite.

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DEADLINE DATES

Winter 1991 . . . . . October 10, 1991
Spring 1992 . . . . . January 10, 1992

Articles, reports, letters, etc., received after the above mentioned date will be considered for the next edition.

Cover Photo: CLSA member John Johnson, P.L.S., instructs CLSA Associate member Micki Zak on the techniques of Total Station operation for control networks.

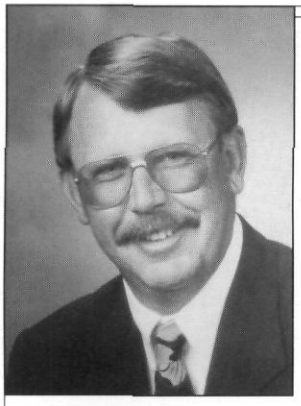
Opinions or assertions expressed in articles in this publication do not necessarily represent the official views of the Association.

Table of Contents

FEATURES

DEPARTMENTS

Index to Advertisers



Message from Kenny L. Fargen
CLSA's 1991 President

IT HAS BEEN a very interesting first quarter for your new California Land Surveyors Association (CLSA) President. Other than the ordinary functioning of the association, which our central office in Santa Rosa handles extremely well, my time has been spent in two areas.

The major task to date has been to locate and interview interested candidates for the Land Surveyor position on the State Board of Registration. With the 13 (thirteen) member board being comprised of 7 (seven) public members, 5 (five) engineers and only 1 (one) land survey member, you can grasp the important effect this position could have on issues relating to your licenses. This position is a four-year political appointment, and if Governor Wilson is re-elected, the appointment could last as long as eight years.

Every person who expressed any interest in the position, including any who were rumored to be interested, were sent applications for endorsement by our association. Four individuals submitted their resumes, their application packages and their position papers. At the April 20th, CLSA Board Meeting, the four people seeking our endorsement addressed the board in a closed session. All were qualified candidates with very good credentials. Each had taken their own time and money to seek this position. The entire Board of CLSA participated in oral review of the candidates and through this process endorsed Donald Bender.

Don Bender has been a Licensed Land Surveyor since 1968 and an active member in CLSA since 1969. Don's achievements are too numerous to list in this article, but suffice it to say that Don has been, and is, a Professional Land Surveyor, attorney, educator, prolific writer, and above all, a very involved person in whatever he participates in.

The other area my time is spent, is in directing the 14 (fourteen) different committees and 6 (six) liaisons with other associations or groups. Each of these committees is comprised of a number of people who donate their time in support of your association. It is only through the unselfish devotion to what people feel is important, that any one group could represent issues on a statewide basis. Volunteer time and effort still amazes me! I think what I find so hard to believe is that so much work gets done by volunteers. People who feel that they have something to contribute, and are willing to help bring about change.

The entire Board of CLSA participated in oral review of the candidates and through this process endorsed Donald Bender.

Critical to both of these issues has been — and will continue to be — membership. Membership is presently about 1500 and increasing. The more members, the more people to get involved and carry the load. With more volunteer help, we could solve some of the burn-out caused by too few people trying to represent all land surveyors on statewide issues.

I ask one thing of each of you, and that is to get involved. Help your association obtain new members to have a viable statewide voice!! ⊕

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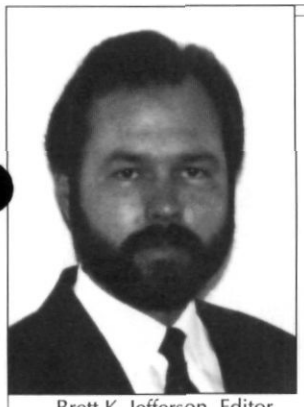

Brett K. Jefferson, Editor

From the Editor

By Brett K. Jefferson, P.L.S.

WELCOME TO this issue of the *California Surveyor*. For those of you to whom I have not been introduced, I have the difficult task of continuing the successful tradition of maintaining the voice of California land surveyor's established by my predecessor Jeremy Evans. This decade is shaping up to be an exciting time for our profession, and I am honored to be a part and contribute what I can.

This issue of the *California Surveyor* is dedicated to surveying education, and we offer a variety of perspectives on the subject. Dr. James Crossfield provides us with an update on the established program at California State University, Fresno. Dr. Howard Turner gives us a similar message on the status of the new program at California State Polytechnic University at Pomona. In addition, Paul Cuomo's "The Last Word" column discusses the achievements of the CLSA Orange County Chapter's involvement in building a successful two-year program at Rancho Santiago Community College.

We should also keep in mind that an integral part of surveying education takes place outside of the formal classroom. A friend of mine, Michael McGee, gave me a book some time ago entitled *Boundaries and Landmarks, A Practical Manual* by A.C. Mulford. I would like to share a quote from that book with you to help me make my point. Mulford writes, *"It is far more important to have faulty measurements on the place where the line truly exits, than an accurate measurement where the line does not exist at all."* I think that we would all agree with this statement. I can assure you that Mr. Mulford never conceived of E.D.M. or G.P.S. in 1912 when he made that statement. But, his statement holds true today and represents the importance of practitioners fully understanding the art of land surveying. It makes little sense for an individual to learn the use of sophisticated technical instruments — which are quickly becoming the standard of our profession — if the individual does not possess the understanding to properly identify what it is that is to be measured.

An integral part of surveying education takes place outside of the formal classroom.

Surveying education is not only the responsibility of our universities, colleges, and CLSA. It is also the responsibility of each of us, as professionals, to support and perpetuate our profession. I believe that land surveying is as much an art as a science. The science of surveying can be taught by professional educators. But, the art of land surveying is best learned by example and "hands-on" training from those actually making the field decisions as to what it is that is to be measured. Our State Board supports this philosophy with strict field requirements as part of the qualifications necessary for registration. The need for formal education in the science of land surveying is important, however, we all must dedicate ourselves to take the time to pass on the experience we have gained throughout our careers to those junior in our profession. I believe, and hope you will agree, that this is the best way to pass on the art of land surveying to our next generation of professionals. ⊕

Letters to the Editor

■ AN APPEAL FOR SUPPORT

I am writing this letter on behalf of a longtime friend and professional associate, Jan Modeland, 37, who is fighting for her life from the ravages of cancer. This is the first such letter I have ever written in my life, but I make no apology for the fact that it is a direct and urgent appeal for financial support for Jan in her brave fight for life.

Jan has been active in the Professional Land Surveyors of Colorado for many years and is former president our northern chapter. A self-employed surveyor who owns Precision West Land Surveyors and Impact Business Systems in Estes Park, Jan is highly regarded by all who know her on a professional and personal level.

Jan was diagnosed with breast cancer in 1987. She had a radical mastectomy and underwent six months of chemotherapy, but by 1989 the cancer had spread. A year later, despite thirty radiation treatments, the cancer is invasive. Jan's doctors tell her the only chance for survival is an autologous bone-marrow transplant, which harvest the patient's own bone marrow. Jan and her family are trying to raise more than $200,000 for the procedure.

I ask you, as fellow professionals and caring people, to help in any way you can. Publicize Jan's need, perhaps in your local association newsletter or by personal contacts with anyone you may know who can help. So far the response to appeals has been rather disappointing; however, I firmly believe that surveyors will rally around their own.

Contributions should be sent to the Jan Modeland Treatment Fund, c/o Central National Bank, Alva, OK 73717. Contributions are tax deductible. Cards or letter may be addressed to Jan Modeland, Box 1294, Estes Park, CO 80517.

Arthur W. Hipp

■ WHO'S RESPONSIBLE?

Specifically, my first question is whether or not the "individual authorized to practice land surveying" is directly or indirectly responsible for the descriptions that are prepared pursuant to Section 8730. The reference in Section 8730 (c)(2) to being "capable of answering questions regarding the preparation of those descriptions" seems to indicate *some* type of responsibility. Secondly, if the "individual" is, in fact, responsible for the description, is the "individual" required to sign and seal the document pursuant to Section 8761 or is there some hushed intent in Section 8730 that exempts the "individual" as well as the officer/employee of the utility companies.

I would be interested in the opinions/feelings of other members on this matter.

Les Freligh, P.L.S.

[Following are portions of Sections 8730 and 8761, Business and Professions Code, State of California. — Ed.]

8730. Exemptions to licensure

(2) (c) Any officer or employee of an electric, gas, or telephone corporation, as defined in Sections 218, 222, and 234, respectively, of the Public Utilities Code, with annual revenues of twenty-five million dollars ($25,000,000) or more, whenever he or she prepares a legal description of an easement for utility distribution lines and service facilities, provided the following conditions are met:

(2) (c) (1) Each description identifies the corporation that prepared the description and states that it was prepared pursuant to this exemption.

(2) (c) (2) Each corporation has in its employ, or on contract, an individual authorized to practice land surveying who shall be responsible for establishing criteria for determining the qualifications of technical specialists preparing those legal descriptions, specifying the format and information to be shown on maps or documents containing those descriptions, and capable of answering questions regarding the preparations of those descriptions.

8761. Use of signature and seal

All maps, plats, reports, descriptions, or other documents issued by the licensed land surveyor or registered civil engineer shall be signed by the surveyor or engineer to indicated the surveyor's or engineer's responsibility for them.

■ CONFERENCE ANNOUNCEMENT

The California State University, Fresno Surveying and Photogrammetry Student Association is proud to announce their 31st Annual Surveying Conference will take place on January 31 and February 1, 1992, at the Centre Plaza Holiday Inn in Fresno at 2233 Ventura Avenue. The contact person if you or your readers would like more information is: Dr. James Crossfield, Surveying Engineering Program, CSU Fresno, Fresno CA 93740-0094. (209) 278-4827.

Paul Fredrickson
Publicity Committee Chair

■ ON THE MOVE TO METRIC

Americans should urge Congress to complete the transition to the metric system as swiftly as possible. The country has been plagued with this old-fashioned set of units far too long.

There are 807.8961039 U.S. liquid quarts in a cubic yard. That's just one cumbersome conversion factor in the old-fashioned measures. There are 1000 liters in a cubic meter, so if a tank has a capacity of 3.8 cubic meters, t will hold 3800 liters of milk.

You cannot enter 5 feet, 7 and 9/16 inches into a normal calculator, but you can enter 1.716 meters, because calculators have decimal points.

The U.S. Constitution gives Congress the power to "fix the Standard of Weights and Measures" (Article I, sec. 8, clause 5).

Trouble is, members of Congress keep getting all these nasty letters from clods who just can't figure out how many liters come in a 2-liter bottle, and who fear that the metric system will be just too much. They often write these letters after shopping, then unpack their 35 millimeter film, 100 watt bulbs, and 500 milligram vitamin tablets.

The pro-metric, intelligent people should make themselves heard in Washington, D.C., too. And they should be sure to mention to Congress that the people sending those anti-metric letters are useless idiots anyway.

Tom Alciere ⊕

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Scholarship Extravaganza CSU FRESNO

By Jim Crossfield, Ph.D., P.L.S.
Professor of Surveying Engineering
California State University, Fresno

THE THIRTIETH annual CSU Fresno Surveying Conference was a stunning success. The magnitude of this success was especially enjoyable when we remember the context within which this conference occurred. Recessionary pressure was beginning to build and the Gulf war was not yet over on January 25–26, 1991. These concerns did not stop 425 surveyors from participating in another record-setting event.

Conference Chair Brian Dodd coordinated a fine program. Speakers included: Patricia Caldwell-Lindgren, Richard Weaver, Ira Alexander, Fred Henstridge, Bob Hoerger, Carol Morales, Kenny Fargen, Jim Dorsey, Bob Packard, Jim Duffy, Yahuda Bock, Wes Parks, Bob Nelson, Ken Meme and Lorraine Amenda, and Kent Whittaker.

Noted surveying textbook author and professor Paul Wolf spoke at the banquet. Then the awards ceremony began. A total of $29,300 in scholarship support was presented to fifty worthy surveying students. CLSA provided $6,800 to the largest collection of future surveying talent in the nation as follows:

ORGANIZATION	PRESENTER	AWARD	RECIPIENT
San Joaquin Valley	Chuck Barsuglia	$ 200	Eric Adney
San Mateo/Santa Clara	John Betz	$ 200	Scott Peronto
Monterey Bay	Steve Wilson	$ 250	Albert DeLeon
Central Coast	Clay Margason	$ 300	Larry Dibble
Sacramento	Jim McCavitt	$ 500	Linda Malcom-Lim
Riverside/San Bernardino	Jim Donahue	$ 500	Kevin Allen
Orange County	Woody Oehlert	$ 500	Karl Riesen
Los Angeles	Bob Hennon	$ 600	Karen Duran
East Bay	Pat Tami	$ 750	Bill Weber
San Diego	Gary Lintvedt	$1000	Chuck Zamites
CLSA – Ed Griffin	Howard Brunner	$ 500	Stevie Ray
CLSA – Jim Adams	Paul Cuomo	$ 500	Ken Paul
CLSA – President's	Kenny Fargen	$1000	Lisa Henstridge

The total of $6,800 demonstrated once again that CLSA does more to support *surveying* education at CSU Fresno than any other organization in the State of California. We all want to take this opportunity to thank CLSA for this exceptional scholarship support.

Conference proceeds have facilitated lodging and partial travel expenses for eight Fresno surveying students who went to Baltimore for the Annual ACSM-ASPRS meeting. There, Lisa Henstridge won the $1,000 Lieca Scholarship and Ken Paul won the $2,000 Dracup Scholarship. Additionally, conference proceeds have gone to provide housing for twenty-five Fresno students attending the Las Vegas WestFed-CLSA meeting in April.

Mark your calendars now. Walt Robillard will be doing a one-day boundary workshop on Thursday, January 30, 1992. The Thirty-First CSU Fresno Surveying Conference reconvenes at 8:00 a.m. on January 31, 1992. Many fine speakers and all of your old friends will be on hand to participate in history once again. See You There! ⊕

California State Polytechnic University, Pomona

The Surveying Engineering Program

By Howard Turner, Ph.D, P.L.S.
Surveying Coordinator
Cal Poly Pomona

THE SURVEYING Engineering Program at California State Polytechnic University Pomona was established as a surveying option within the Department of Civil Engineering in 1985. It was operated on a part-time basis until January 1989, when Dr. Howard Turner, P.L.S., joined the faculty as the Coordinator of the Surveying Engineering Program.

ENROLLMENT

In January 1989, enrollment in the program was approximately twelve students. Through a vigorous recruiting campaign a large number of students have transferred from the general civil engineering option into the surveying option. The current enrollment in the program is approximately one hundred students. There are a number of reasons for the rapid transfer of students, but one reason predominates over all other. The students who transfer have their primary interest in land surveying, not civil engineering. They "suffer" structures courses; they do not take them willingly.

RESOURCES

In January 1989, the resources of the Surveying Engineering Program consisted of seven transits, three optical theodolites, one total station, two operational pieces of EDM equipment, three archaic non-operating photogrammetric plotters (a multiplex, balplex, and a kelsh), a Calcomp 9100 digitizer, a Calcomp 965A plotter, a photogrammetry laboratory used for teaching other civil engineering classes, and a surveying briefing room.

A strategy was envisioned to develop the resources of the program to the maximum extent at minimum cost to the University and the State of California. The rationale for this approach is that in the future, with the need to implement a four-year degree in Surveying Engineering in Southern California, the route cannot be blocked by an argument that the program is too expensive to run. This argument is used by many universities to close existing surveying programs or not to develop existing ones. The plan used to develop the resources was that the civil engineering courses, occupying the third and fourth years of the program, would be replaced by surveying and geographical information system classes as the four-year degree in Surveying Engineering developed in the future.

At present, the additional resources of the Surveying Engineering Program acquired since January 1989, are as follows: Seven Geodimeter CDS Total Stations with data collector and software, four copies of Intergraph MicroStation, eight copies of PC ARC/INFO, twelve copies of all DCA software, twelve workstations of VANGO software, two copies of Autocad 11, three Lietz DT2 electronic theodolites, one Nikon EDM, eight copies of all Civilsoft software, eight PC 386SX machines, two K&E CP5000 photogrammetric plotters, fifteen GPS points on campus, and thirty-five additional 2nd Order control points for construction field exercises. The photogrammetry laboratory was renovated by a donation from the California Foundation for Land Surveying Education and will return to its laboratory function in Fall 1991 as the "Photogrammetry and GIS Laboratory." The quality of the elementary surveying laboratory will be improved through Topcon's Educational Laboratory Improvement program. The transits used in the past have now been replaced by DT05A electronic transits. The list price value of the resources added to the program since January 1989 equals $725,000,

"RIGHT OF ENTRY" CARDS

The California Land Surveyors Association has prepared a field notebook insert of the surveyors' "Right of Entry" law, Section 846.5 of the State of California Civil Code and Section 8774 of the Business and Professions Code. This heavy duty, water resistant (varnished) card can be carried in the field book; handy for showing to property owners, as needed. Just hole punch it to fit your particular notebooks. To order your "Right of Entry" Cards, fill out the CLSA Publication Order Form, which can be found on Page 35 of this issue of *The California Surveyor.*

while the amount invested by the University equals $30,000. Plans are now in progress to acquire an analytical plotter and global positioning system (G.P.S.) equipment.

CURRICULUM

Between the time the program was established in 1985 and a full-time faculty member was employed in January 1989, the Department of Civil Engineering was visited by ABET (Accreditation Board for Engineering and Technology). The decision was made to request the surveying option be accredited as part of the Civil Engineering Program, rather then have no accreditation at all. At the time, this was the only alternative. There was insufficient faculty to ask for Surveying Engineering accreditation and the initial curriculum was incorrectly configured.

Since January 1989, numerous changes have taken place in the Surveying Engineering curriculum. When the original program was designed, under the internal structure of Cal Poly Pomona, an option was allowed forty units of specialized courses. To acquire Surveying Accreditation, ABET requirements state "at least one year of surveying be required." One year is defined as forty-eight quarter units. The curriculum has been modified to reflect forty-eight units of surveying practice as defined by California Law, while maintaining the necessary units in mathematics and basic sciences, engineering sciences and engineering design. Of these forty-eight units in surveying practice, twenty-three reflect aspects of boundary law. Surveying Engineering accreditation will be requested by the University in 1993.

FACULTY

Currently, there is the equivalent of two faculty positions teaching full time in the Surveying Engineering Program. Dr. Howard Turner teaches full time in the program. Professors Ray Morals and Peter Clarke each teach half time to make up the additional equivalent faculty member. An additional faculty position has been advertised, candidates have been interviewed and an offer has been made. It is anticipated that by the Fall of 1991, the program will have at least three full-time equivalent faculty members needed for Surveying Engineering accreditation.

FUTURE

The rapid development of the Surveying Program at Cal Poly Pomona will continue. It is only hindered at present by the lack of faculty and budgetary constraints. The largest undergraduate surveying program in North America is Laval University in Quebec City with an enrollment of 220 students. It is the goal of the Surveying Program at Cal Poly Pomona to overtake Laval and occupy the premier position within five years. The continuing support of California Land Surveyors Association, California Foundation for Land Surveying Education, American Congress on Surveying and Mapping, California Council of Civil Engineers and Land Surveyors, and private industry will help achieve these goals rapidly. ⊕

Continuing Education

A Continuing Issue For the 1990s

By Ira H. Alexander

Editor's Note: *Comments from the readership are solicited on this topic.*

IN RECENT years, considerable attention has been paid to the relationship of the professions to the public they serve. The concepts of registration, licensure, and governing body control have been the subject of studies in many states.

By and large, the professional surveyor has not fared too badly. If anything, the control of the surveying profession has received more attention, and the process of deregulation imposed on many industries has not occurred. The fact that many new ways of performing surveys are available to surveyors has not been questioned, nor has the tremendous improvement in data gathering and measurement equipment reduced the argument for the continuing public concern. In addition to being aware of how to use this emergent technology with a high degree of expertise, the practicing professional applies it to serve the public in a manner that meets the criteria of a state board of registration and appropriate technical and professional societies. The American Congress on Surveying and Mapping has endorsed the need for development of professional standards and competency, and has served the public's interest in advancing standards of practice, ethical conduct, and the qualifications and credentials of persons working in the profession.

It is through the medium of continuing education that many surveyors find the means to carry out their responsibilities. Continuing education in surveying may consist of formal courses offered by engineering and surveying schools. Many universities provide programs for continuing education through what is referred to as university extension courses. The catalog of extension courses in some universities is quite impressive, and the variety of subjects provide a definite means by which the working professional may keep abreast of his field.

Continuing education courses may be in the form of seminars, symposiums, specialty extension courses, or special sessions given by technical societies such as the American Congress on Surveying and Mapping and the American Society of Civil Engineers. Many of these courses are given at off-campus locations, sometimes during evenings or weekends to accommodate students who maintain jobs during normal work hours. Considerable flexibility has been evident in the way these continuing education courses have been scheduled to be useful to the working surveyor.

In recent years, the subjects listed under continuing education have covered the entire spectrum of surveying, including applications of state-of-the-art global positioning systems and land information systems. Courses on retracement of U.S. public land boundaries, inventory and analysis of easements, and conveyances compose another group. The list of courses offered is quite broad, ranging from the highly scientific to the more mundane — but just as important — day-to-day operational type course.

Most schools offering continuing education courses grant credit or continuing education units (CEUs) for the successful completion of a course. One definition of a CEU is ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction, and qualified instruction. These are criteria that some state boards wish to use to evaluate the renewal of a license. The American Congress on Surveying and Mapping compiles CEUs for those who have completed various courses.

Mandatory continuing education as a requirement for recertification has not been widespread, but is slowly increasing in the United States. The states of Arkansas, Delaware, Florida, Iowa, Michigan, New Hampshire, Nebraska, and Texas have all enacted laws pertaining to mandatory continuing education for license renewal, but there is wide variation in actual implementation. In some states, it is just an enabling act; thus, the Board of Registration may set standards in the future. In other states, implementation has been delayed because of fiscal restraints. For the most part, the enacted laws are simply expressions of legislative intent and leave the actual regulation to the state board.

The recommendations by the American Congress on Surveying and Mapping for qualifications for continuing practice as a land surveyor follow. To date, they are only guidelines for voluntary recertification.

1. Recertification every three years is recommended for all land surveyors (date based on requirements of the law in each particular state, if and when recertification becomes mandatory).

2. Certification should be based upon three measures of competency as follows:

   a. Evidence of current practice – "practice" as defined in applicable state laws to include:

      (1) Holding a responsible position in a firm whose workload is primarily (33⅓ percent or more) in surveying or surveying-related activities, or active practice in a position that requires the applicant to work as a land surveyor at least 33⅓ percent of the time.

      (2) Teaching surveying courses at the community college level or higher (for professional surveying educators).

   b. Professional development – to include such activities as:

      (1) Publications in professional surveying-related technical journals.

      (2) Presentations at professional surveying meetings.

      (3) Serving as an officer, member of a major committee,

or task group in surveying-related profession, such as membership on a registration board.

3. Competency would be numerically evaluated through a point system as follows:

a. Current practice:

(1) One year of practice: 3 pts.

b. Professional development:

(1) Membership for one year in a professional society that publishes literature: 1 pt.

(2) Officer or committee membership for one year: 1 pt.

(3) Attendance at professional meetings of at least ten hours duration (to nearest 1/10 point): 1 pt.

(4) Publications or presentations: 1 pt.

c. Education:

(1) Semester hour credits: 2 pts. ea.

(2) Continuing Education Units (CEUs): 1 pt. ea.

(3) Teaching courses (noneducators): 1 pt./CEU or 2 pts./cr. hrs.

4. Point requirements for certification:

a. Total minimum required by age group for the three-year period:

(1) Under 50: 12 pts.

(2) 50 – 65: 9 pts.

(3) Over 65 or retired: 3 pts.

b. Minimum required points by category for the three-year period:

	POINTS		
	Under 50	50–65	Over 65
(1) Current Practice	3 (25%)	3	No. min.
(2) Professional Development	3 (25%)	2	By categ.
(3) Education	3 (25%)	2	
(4) Any of these	3 (25%)	2	
TOTALS	**12**	**9**	**3**

The problem facing the profession of surveying today is to convince all members of the need for a uniform set of standards for relicensing and to encourage full implementation of the laws rather than the mere enacting of them. Solving this problem will not be an easy task as there is some opposition to the entire process, mostly from those who feel that not enough credit is given for continuing work experience as opposed to merely taking courses. As implied by the title of this article, we have an ongoing issue for the 1990s.

Reprinted from *Surveying and Land Information Systems*, vol. 50, no. 2, 1990, American Congress on Surveying and Mapping. ⊕

On Compulsory Continuing Education

By Gerald F. Oldenburg, P.L.S.

Editor's Note: *The opinions presented in the following letter — which was addressed to the CLSA Board of Directors — do not necessarily represent those of the* California Surveyor *or it's staff. However, in the interest of promoting an open forum on the topic of compulsory continuing education the* California Surveyor *invites the CLSA Board of Directors and general membership to respond in writing to express their opinions and view on this controversial topic.*

ON OCTOBER 19, 1990, I was informed by a phone call from another CLSA member that a plan was being formulated for implementation of a compulsory continuing education program for land surveyors in California. On October 22, 1990, I received the September/October CLSA newsletter, which not only confirmed this information but detailed guidelines for this purpose.

The newsletter indicates that the proposal is already at the stage where legislation is being developed and that the only discussion that is to be held is for chapters to review the guidelines. It also indicated that these are "revised" guidelines. These actions took place at the July 1990 Board meeting.

All this tells me that this proposal has been under consideration for some time. The Education Committee has apparently had enough time to prepare guidelines, consider them, and even revise them. If the Board is already at the stage of directing legislation to be prepared, I can assume that considerable time has been spent considering the proposal. It's not an issue to be decided without considerable discussion.

I am dismayed that a proposal which so significantly impacts not only CLSA members and its Board of Directors but every land surveyor and future land surveyor in the state has not received widespread publication and discussion in open forum during an apparent extended period of consideration. I would certainly hope that the CLSA Board does not consider itself to be our "Big Brother" and presume to be in a position of telling the land surveyors of California what is or is not good for them. There are numerous questions that this proposal raises, which may or may not have been discussed by the Board or its committees, but certainly needs to be answered by discussion with all of the surveying community.

I wish to offer my comments and raise several questions about the proposal. I'm sure others will wish to do the same. I hope that all comments and questions raised will be published and discussed in open forum and in as widespread a manner as is possible. Until it is thoroughly discussed and all questions answered, I would hope that the Board will cease all attempts at legislation. If legislation does result, it will undoubtedly need to address factors that appear to have not been addressed at this point. If they have, then the information being aired publicly is incomplete and not truthful.

There are absolutely no demonstrated reasons for a continuing education program in California. If the proposal is offered because there is a sense that there are too many surveyors doing incompetent and negligent surveys, the evidence does not support that conclusion. Anyone connected with, or reasonably involved with, the Board of Registration (as I was for many years) knows that of all the complaints filed with the Board only a small number relate to incompetent or negligent work by, not only surveyors, but all disciplines regulated by the Board. The majority are contract disputes or other civil matters not of issue to the Board. Some complaints are simple misunderstandings by the public of the issues involved and are solved by a letter from the Board in explanation of the facts. A few other are situations where a registrant made a relatively minor, unintentional mistake and, when it is brought to his/her attention, the problem is corrected with no harm done. Considering the large number of registrants, it is in relatively few cases that the Board, through its enforcement program, actually needs to take a registrant through due process and invoke

There are absolutely no demonstrated reasons for a continuing education program in California.

penalties. Regardless of whether we have a continuing education program or not, there will always be those among us — as there is in every profession and every walk of life — who will violate the rules, disobey the law, and ignore moral and ethical norms. Should every surveyor be encumbered with this burden on the chance that a handful of surveyors may be diverted from committing a negligent or incompetent act? I think not.

Is the perception that this program is necessary related to the concept that in order to be "professional" we need continuing education to be like doctors, nurses, lawyers, and CPAs? This is ludicrous. These professions have continuing education programs for very valid reasons. Anyone who reads newspapers and magazines or watches any amount of television knows that changes in the medical profession are dramatic, occur almost daily and impact the health and lives of every human being one or more times in a lifetime. There are hundreds of other developments in the medical profession that also occur that most of us never hear about but that every doctor must gain at least some knowledge of if they are to provide us with the health care we expect when we need a doctor.

Lawyers and CPAs are bombarded with literally thousands of new or changed laws and new court

CONTINUED ON PAGE 14

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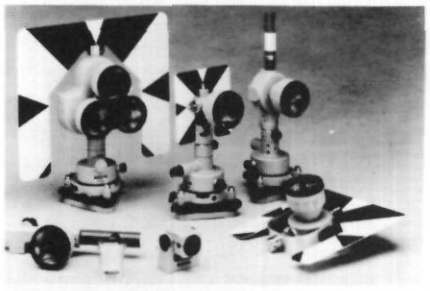

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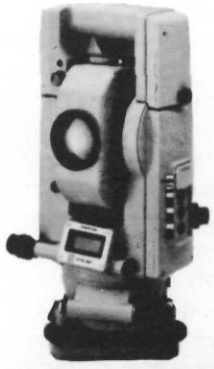

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Education . . .

CONTINUED FROM PAGE 12

decisions every year which affect their ability to serve clients and the public. California alone has over 3,000 new pieces of legislation introduced every year which impact our business and personal lives and it is the attorney, more than any other, who needs to know the application of these laws and interpret them for the rest of us. Add to this the changes in Federal law and new court decisions and the need for continuing education becomes even more obvious.

There is absolutely no logical comparison that can be drawn with regard to surveying. Our technology — even considering the relatively significant changes that have occurred in the last twenty years compared to the previous two hundred years — have been comparatively slow with no critical "need to know" situations occurring. Nothing has developed so fast that would cause a surveyor who didn't incorporate the changes, even for several years, to be materially affected in the ability to function competently in practicing his or her profession.

What a surveyor needs to know is dictated by either job requirements, a desire to learn, or, most importantly, the market place.

There are changes made to very few, and only two major laws, that affect a surveyor's practice, whether public or private. The two major laws are The Subdivision Map Act and The Land Surveyor's Act. Generally these changes are easily enough absorbed by any reasonably intelligent person with an hour or two of reading and possibly a seminar or two when the occasion arises. The CLSA and CCCE &LS and other professional societies also provide recaps of recent pertinent legislation and significant court decisions by which we can all keep abreast of such changes. Even those who don't belong to professional societies find ways to keep informed. Continuing education would most certainly be an overkill to solve any problems that may exist in keeping surveyors abreast of the few changes that occur to the few laws and court cases we are generally concerned with in our profession.

If there is a feeling that **all** surveyors should know **all** things about **all** aspects of surveying, and that this could be accomplished by continuing education, I find that ridiculous as well. What a surveyor needs to know is dictated by either job requirements, a desire to learn, or, most importantly, the market place. If a private practice surveyor is aware that the competition is providing services that are better quality and are produced quicker, and at less cost, then that surveyor will soon become knowledgeable in the new techniques, equipment, or whatever it is that the competition is doing to gain an advantage by whatever means it takes.

A surveyor's "need to know" is dictated by what is required to do his/her job, get promotions, or operate a business. As we all know, Board Rule 415 places limitations on each of us and infers that further education and/or training might be required in areas in which we are not proficient or competent before we attempt to operate in those areas. But, if it is not necessary to know it, and/or it is not offered as a service, there is no need to be proficient or competent to do it.

Another factor, which I hesitate to broach but I feel must be addressed, is the profit motive that this proposal unfortunately seems to suggest by its surface appearance. Without any discussion or proof that the program is necessary, it appears that this may be an attempt by those who offer courses and seminars for profit to generate a captive audience and create an employment contract for themselves in a state that probably has more surveyors and potential surveyors than anywhere else in the country. It might also be assumed that it is a ploy to get more members for CLSA, after all, PDUs are given for membership if the association is approved. I certainly hope that none of these reasons are a matter of fact, but nothing offered so far allows one to think otherwise.

I would like to raise some questions about the proposal which I feel (and I assume many others as well) should be addressed before this proposal goes any further.

1) How will this proposal affect those of us who have spent a career not only trying to become good practitioners, but have, in various ways, given back to the profession time and energy at our personal expense or the expense of our businesses? Are we to be told that we have to start all over again and, in order to gain PDUs, get totally active in all types of association activities as we were in the past?

Do we get any credit or exemption for all this work? Do we have to take courses in plane coordinates, boundary surveying, record map preparations, ALTA surveys, and the like to maintain our license? How about business courses for those who operate or have operated successful and highly esteemed businesses for twenty-five, thirty, or fifty years? Are we now expected to take classes to learn about what we did right? (Obviously, we didn't do much wrong!) Many of us have been the ones who have "set the standards" by which surveyors, at least within our local area, do surveying and mapping today. We have employed and trained many of those who are now taking our place and I, for one, am very proud of what these people are accomplishing. Is the CLSA Board now going to tell us that we are history and our contributions mean nothing; that we need to relearn the basics that we have shared and taught? As they say today, "Get real!"

Though some of us have retired, semi-retired, or may be considering it, I think most will want to maintain our license in full. The "Inactive Status" proposal is not an acceptable option, at least not for me. I need my license, even though I am no longer doing the day-to-day survey work most associate with a surveyor. I now use my license to provide consulting services to others, particularly attorneys who defend surveyors and engineers. It would not make much sense for me to tell a court that I used to be licensed but I'm not anymore because I didn't recently take any courses in boundary analysis or how to write a legal description. Be alert, CLSA members. You don't know when the next knock on the door will be a summons to a lawsuit and you might want one of us old gray beards on your side — with a current P.L.S. license!

2) Does the Board of Registration

know that this proposal is in the offering and is intended to be legislation which will require significant funds and personnel to administer? If not, you better get them involved and do it **now.** They do not like to have legislation concerning them going on without their ability to have a say in what's occurring. (That's understandable!)

3) Where are the fund to implement and regulate this program going to be generated? How does the Board of Registration get the money it needs? How do the associations generate money to meet their obligations under the proposal?

a) Would they have to come from taxes, through the legislature? (Fat chance!)

b) By increasing licensing fees for surveyors (and engineers authorized to practice land surveying)?

c) By increase fees for all disciplines regulated by the Board to spread the cost? (Wouldn't that stir up a hornet's nest?)

d) By taking a portion of the course fees (whether from private or publicly conducted courses) and contribute them to the Board? (Highly unlikely and probably not legal anyway)

This leads to more questions. It would appear that the only logical sources of funds is the increase in licensing fees for surveyors (and RCEs). If that is the case, how much? Has there been a cost determined for the implementation and **ongoing** regulation of the proposal? It is obvious that it will require significant dollars. Let's talk more about that later after we considered other issues.

4) What about registrants who live out of state, or out of the country, but still must have their license or who use their license only on a project-needed basis? Will they have to come to California to get needed courses, bearing heavy costs and time considerations? Will the Board have to spend additional time and money reviewing and approving courses they might have in their home arena? A quick look at the roster indicates they'd be looking at material from every state and around the world!

5) How will pre-1982 registered civil engineers be treated? Will they be required to get forty-eight PDUs to maintain the C.E. registration, will they only lose their right to survey, or can they allow their surveying rights to go inactive? (Now those possibilities will really create some bookkeeping and regulatory nightmares, let alone significant costs for the Board.) If they can't survey, how will the public and the public agencies be kept current?

6) Has any consideration been given to what this is going to cost the individual registrant? I'm not talking about those who work for public agencies that might pay the way because a license is required to keep a job and the PDUs are required to keep the license. Nor am I talking about those working for big companies or owning big companies that can or will pay the way. I'm talking about those people with small companies or who work for companies that can't afford these types of expenses and must pay out of their own pocket. I'm taking about people who live in rural areas that will have to travel extended distances to reach course and seminar sites or attend conferences and conventions. They not only endure course fees, but travel expenses, meals, lodging, and often the loss of a day or more in pay or chargeable hours. These people who will have to endure the largest cost are most often the people who can least afford it. They do not have wages or company earnings anywhere near what those in the metropolitan areas realize, yet will have spent the most. If an honest assessment is made, it is very possible that a land surveyor, particularly one from a rural area, could easily spend $10,000 over the course of four years to obtain the required PDU's.

Where do we go from here? I say scrap the proposal because: a) there is absolutely no demonstrated reason for it in California; b) the costs to implement and regulate the program are prohibitive and are totally disproportionate to the minimal (if any) benefit that would be realized by the surveyor and to the public's health, safety, and welfare (which is the reason we are licensed); c) the costs for the individual surveyor are not equitable and impose an unfair financial burden on those who can least afford it; and d) for totally selfish reasons, it does not provide a means by which those with demonstrated histories of quality professional work and contributions to the profession can be recognized.

The efforts, monies, and energies being put into this proposal should be redirected to increasing the availability of surveying education to all surveyors in the state who wish to attend on a need-to-know basis (for whatever the need-to-know reason may be). This is a topic that has been well discussed for many years and the CLSA Board should not need to be reminded of what is necessary.

The CLSA Board and membership should be steering its efforts into adjusting the attitude within the profession relative to filing complaints against those determined to be acting incompetently or negligently. As I mentioned, based on my Board of Registration exposure, relatively few complaints relate to incompetency or negligence. If, in fact, it is perceived to be more widespread than it appears, then let's get this before the Board so it can take proper action. Most of these people do what they do because they think they can get away with it, not because they don't know better. Continuing education courses are not going to change that thinking. Knowledge that the Board will penalize them might. There is a tremendous reluctance by private surveyors, county surveyors, and city engineers to take action and file complaints. Until that changes we will always have the violator.

Where do we go from here?

I say scrap the proposal.

I assume this letter, along with others you will undoubtedly receive, will be made available to the entire surveying community by appropriate vehicles, and I hope that public forums will soon be established to provide the ability for the broadest segment of the surveying community to be heard. On the other hand, if you just decide to drop the whole thing, it won't bother me at all.

Thank you for listening and giving my thoughts your attention. For your information, copies of this are being distributed rather broadly but, at the time of this writing, I'm not sure who that may all include. ⊕

Concerning Mandatory Continuing Education

By Robert D. Hennon, P.L.S.
Hennon and Associates

THE SUBJECT of mandatory continuing education — the definition, the need, and the implementation — is currently being discussed by many surveyors in California and the rest of the country. Surveyors' opinions on this subject range from strong support to virulent opposition, and as a member of the CLSA Education Committee I have heard from most viewpoints. In a letter to the CLSA Board of Directors, included within this issue of the *California Surveyor [see page 12]*, Mr. Gerald Oldenburg, a long-respected member of the surveying community, has eloquently stated his opposition to continuing education. As a supporter of a mandatory continuing education, a holder of a baccalaureate degree in surveying (University of Florida, 1981), and an owner of a survey practice, I feel compelled to counter Mr. Oldenburg's arguments.

Mandatory continuing education, or professional development, has been discussed within CLSA for at least ten years, and the implementation of a mandatory continuing education program has been a long range goal of CLSA for many years. Surveyors active within CLSA have been aware of and have participated in discussions relating to continuing education; however, as Mr. Oldenburg has pointed out, a topic with this impact on the survey profession deserves as broad base of discussion as possible. Contrary to Mr. Oldenburg's fears, the CLSA Board is not suffering from a "Big Brother" complex. The Board is attempting to determine both the future needs of the surveying profession and the viewpoints of surveyors. While the Legislative Committee of the Board has begun to study how continuing education legislation may be developed, it should be understood by all surveyors that this has not been presented to the legislature, and is subject to complete modification at this time.

Mandatory continuing education is becoming more common within professions and trades ranging from law to real estate. The Department of Consumer Affairs is in fact in the process of writing model legislation concerning the implementation and regulation of continuing education in response to requests from many professions and trades under its jurisdiction. Surveyors in several states, including Florida, are already subject to continuing education requirements when renewing their survey license. The Florida laws were heavily incorporated into the current proposal.

On reviewing the current proposal it is clear that the requirement is limited to about twelve hours of time per year. This time could be spent in a variety of ways, from a correspondence (and perhaps video) seminars for those surveyors in remote areas of the state, to attending a multi-day conference (with seminars) once every few years. Attending local chapter meetings and their educational programs would also gain credits. The monetary outlay required of surveyors could easily be kept minimal, and most certainly would be far below the $10,000 figure quoted by Mr. Oldenburg.

Why, after being studied for at least ten years, is a mandatory continuing education program being proposed now? I feel that current forces within both the surveying profession and society are at work. Contrary to Mr. Oldenburg's viewpoint, surveying is not now a static science. Equipment advances have changed the way we survey, and will continue to do so, in subtle ways that have major impact. New equipment — from GPS, to robotic total stations, to GPS controlled photogrammetry (remember, GPS kinematic receivers will soon be on board the planes with the camera), to standard total stations with data collectors — are all positional-based technologies. By this statement, I mean that these technologies collect XYZ coordinate positions. The days of measuring angles and distances are quickly ending. We were all comfortable with estimating our angular and distance errors and determining what resulting numbers were significant. How many of us are equally comfortable determining the significant errors of a list of XYZ coordinates created by modern equipment? How many of us are comfortable with the analysis of error ellipsis? The next rewrite of the ALTA/ACSM Land Title Survey standards will most likely exchange error ellipse specifications for the current requirements of number of times an angle is turned and methods of distance measurement. What field techniques will be required? Is that building corner truly an encroachment? A thorough understanding of statistical error analysis is going to be required in the near future whenever a surveyor certifies his/her work. The public is at risk whenever a surveyor certifies to matters either not true or not within the surveyor's scope of knowledge. The public is at risk of spending far greater sums of money than required if tomorrow's surveyors do not understand statistical error analysis and make use of this understanding when "designing" their surveys.

Mandatory continuing education is becoming more common within professions and trades ranging from law to real estate.

As a current practitioner, I cannot agree with Mr. Oldenburg's statement that the public is accepting of errors made by today's surveyors. Unfortu-

CONTINUED ON PAGE 18

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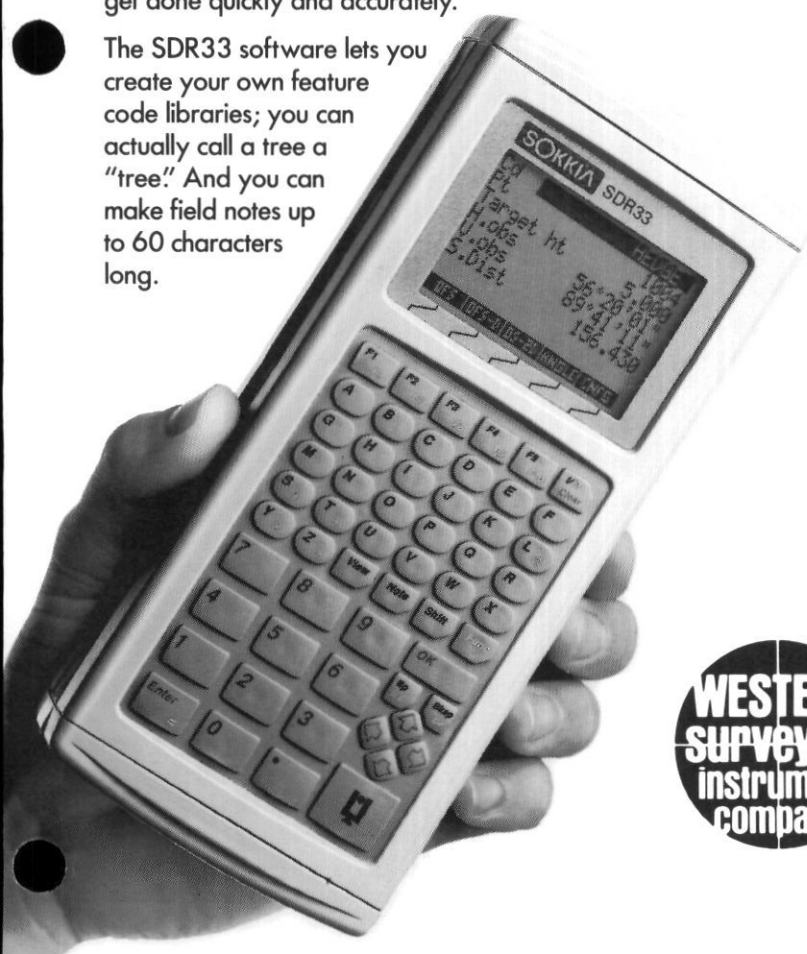

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Concerning . . .

CONTINUED FROM PAGE 16

nately, the trusting style of doing business common even ten years ago has given way to an atmosphere of extreme caution, distrust, and expensive litigation. A single error now has the potential to completely wipe out a survey practice. Remember, we are registered in order to safeguard the public. The public loses, as well as the surveyor, when the surveyor makes *poor judgements and/or errors. What* new notes and/or disclaimers need to be included on drawings to both protect the surveyor and help the public in the proper use of that survey? Today's business climate is extremely unforgiving, and if these are my perceptions from working in a major metropolitan area (Los Angeles), I will guarantee that this same atmosphere of business relations will soon migrate to the most rural areas of the state. The surveyor of today must be thoroughly knowledgeable about all laws, board rules, ALTA standards, *and community standards of practice.* Just reading the revisions to the Subdivision Map Act and the Land Surveyors' Act is no longer going to be enough. Condominium law is changing, ALTA standards are changing, and the local standards of survey practice are most definitely changing.

The entire business end of the operation of a normal survey practice is changing at a rapid pace. Mandatory health insurance requirements for employees, mandatory written safety programs (now in effect as of this year), a sales tax on survey fees, and even mandatory errors and omissions insurance (already in effect in some parts of the country) are looming *ahead. The public is not protected* when their surveyor is forced out of business for non compliance with the law. Contrary to Mr. Oldenburg's views, a surveyor having successfully operated a practice of twenty years is still in need of education to continue that successful operation.

The surveying profession of today is also at an important crossroads concerning the range of services that will fall within the scope of surveying in the future. The question of whether or not GIS/LIS will fall within surveying is currently being studied. I feel that *the stand surveyors take on mandatory* continuing education will have a direct impact on the profession's ability to halt the "chipping away" of our scope of work (civil engineers doing "engineering surveys") as well as having a direct impact on the expansion of the survey profession. A well-educated, up-to-date survey profession will be in a much stronger position. Whether or not surveyors are directly interested in GIS/LIS, I think most of us can see the potential for disaster resulting from improperly controlled GIS/LIS systems. Remember that these technologies are in their infancy. Unlike Mr. Oldenburg, I have to be vitally concerned about where the survey profes*sion will be thirty and even forty years* from now. Now is the pivotal time in our profession. Now is the time for us to stand up and further ourselves and our profession.

While I agree with Mr. Oldenburg that most surveyors are avoiding incompetence, the general level of practice among fellow surveyors in the community has a direct affect on the level of practice I am able to offer my clients due to basic economic and competitive constraints. While I have been involved with the Los Angeles Chapter of CLSA since its inception, I *still have not heard of or met the ma*jority of licensed surveyors in Los Angeles County. From personal experience, when I have a discrepancy with another surveyor, a surveyor who never attends CLSA meetings, who is out there as a "loner," that individual will give me erroneous interpretations of the LS Act at least fifty percent of the time. When clients come to me to correct another surveyors work (which, by the way, is normally done without the client having interaction with the State Board, thus resulting in the low number of complaints) and I review that individual's maps or other documents, I see a direct relationship between that surveyor having attended our local chapter meetings and the apparent quality of their work. I feel one of the most important aspects of the proposed mandatory continuing education is the credit received for surveyors meeting their local fellow practitioners. As we rub shoulders with these "loner" practitioners, I truly believe that the lowest standard of professional practice will rise (and, in turn, the highest standard of professional practice will rise) and the benefit to the public will be great.

Of course all surveyors do not need to be completely knowledgeable in all areas, but all surveyors do need to

have enough understanding in all areas in order to provide good advice to their clients. Twenty or thirty years ago a surveyor at the end of their career really could "semi-retire" and not adversely affect the public or their fellow surveyors. Today this is no longer the case. In fact, I feel the words "semi-retire" should be used with great caution. Is a "semi-retired" individual such as Mr. Oldenburg, who offers expert testimony to attack or defend the professional practices of a "working" surveyor still qualified to do so? If a mandatory continuing education program were in place and Mr. Oldenburg used such a program to keep current with his profession, then I would say, yes, Mr. Oldenburg is very qualified; in fact he may be the most qualified surveyor to testify. If however, Mr. Oldenburg relies solely on his practice of years past predominately with transit and tape, and attempts to influence a judge and jury concerning my field methods based on robotic total station/data collectors, or kinematic GPS, or analytical photogrammetry, then I am indeed very worried. Remember, the "right" side does not always win. Just as a working surveyor must pay to keep their equipment in good adjustment, so must a practicing (on any level, from working day-to-day, through only offering testimony and opinions) surveyor "pay" through the completion of continuing education to keep their license in "good adjustment."

In discussing the possibilities of mandatory continuing education with fellow surveyors, I have not encountered one surveyor holding a baccalaureate degree in surveying that does not enthusiastically support mandatory continuing education. I believe that this results from the greater knowledge a surveyor acquires the more they realize how much it is they do not know. The supporters of mandatory continuing education will be subject to the same requirements as all surveyors, including the same requirements when we retire. We feel that the development of the survey profession is worth the extra effort, and indeed hinges on it. Service to the profession in years past is a great personal testament, but any surveyor that receives the rewards of practicing as a professional surveyor must continue to "put back" into the profession. A mandatory continuing education program is an excellent vehicle for this, and in fact, if Mr. Oldenburg were to rethink his position, he might find that compliance with a mandatory continuing education program would insure that his license and opinions continue to be sought after no matter how many years he has been out of active practice.

The question of what would be required of pre-1982 civil engineers in the way of continuing education is basically settled by politics. Surveyors do not have the political clout to force continuing education on engineers. Of course, as each year goes by, this problem slowly solves itself. On a more urgent note, it is obvious that the surveying profession having a mandatory continuing education program in place will make it much more difficult for civil engineers to reverse the LS Act and begin again the practice of land surveying. Surveyors should remember the shortage of practicing surveyors in the late 1980s, and keep in mind that the same situation could easily occur in the future. At a time of a shortage of surveyors we are particularly vulnerable to encroachments by the engineering community. Will we be prepared to safeguard both the profession and public, who cannot understand the difference between hiring a surveyor or an engineer?

The actual implementation of a mandatory continuing education program will come after consultations with the State Department of Consumer Affairs, the State Board of Registration, Cal Council of Civil Engineers and Land Surveyors, and others. The particulars of implementation are still subject to debate and adjustment. Cost, of course, will be a major issue. Remember, however, that even the field of real estate has continuing education requirements (I personally feel real estate sales is a less challenging field than the practice of land surveying), so the implementation questions can obviously be answered. The model legislation developed by the State Board of Consumer Affairs will most likely be used. The pressing question is what direction the surveying community wishes to take on this endeavor. If the surveying community, and the CLSA State Board of Directors, is veering off the course you envision as the best, then you had better become active to change that course. Remember that those of us who are active in CLSA are active because of a vision we have for where we wish our profession to head. If you give us no input, then you cannot blame us for our actions. In response to Mr. Oldenburg's allusions of possible profit motives, I can only say that the people I have met involved with survey education within the state, both at formal universities and at the seminar level, are involved with survey education because of a vision they share for the survey profession. Believe me, lot surveys tend to be more profitable than educational endeavors. If anything, we need to recognize and thank these individuals for their contribution to surveying, and not accuse them of lining their pockets.

In conclusion, I can only hope to have convinced some of you to support a program of mandatory continuing education. If you take into account some of the changing issues of our profession I have discussed, and include other issues such as toxic wastes on property we survey, tree studies, subdivision map requirements, solar and view easement issues, and lien law changes that I did not bring up, it becomes apparent that the list of seminars a surveyor should take is almost endless. We are not discussing basics. We are discussing knowledge a surveyor should have to best serve both the public and himself. And I can guarantee that when we have educated ourselves in all of these fields, new fields will spring up to challenge us further.

Whatever your views on mandatory continuing education, please make them heard. Should the mandatory continuing education program as presented be narrowed, should it be broadened, or should it be dropped altogether. Your views can be heard both at your local chapter meetings and by writing directly to the CLSA state office. While I believe that a mandatory continuing education program, as proposed, will greatly unify and raise the standards of the survey profession, I also recognize that a debate of this nature within the profession is healthy in and of itself. For this reason I sincerely thank Mr. Oldenburg for airing his viewpoints, and hope that other surveyors will expand the debate. Thank you for taking the time to study this issue. ⊕

Incompetence: *Challenge for the 1990s*

By Dennis Mouland

ONE OF THE main purposes for licensing land surveyors is to "protect the public." The entire concept hinges on the licensing board identifying, correcting, or withdrawing licensure from incompetent practitioners. We see this in the medical, legal, and other professions. If the number of surveyors in the country whose license have been revoked is a measure of how much incompetence is being dealt with, one can come to one of only two conclusions: either there is very little incompetence or the governing bodies are not addressing the issue. I tend to lean toward the latter conclusion.

Measuring incompetence within our profession is a very difficult task. We like to think our testing processes take care of the largest percentage of the problem, but this is rather naive.

To test this assumption, ACSM could launch a major study. But how would you do this; make everyone take a survey competency test? What would be on it, and who is qualified to write it? Perhaps we could get a copy of every plat filed with every county and see how many surveyors followed the rules.

This would not be a fair measure, since many surveyors have never filed anything at the court house in their lives. Maybe we could poll the engineers, architects, realtors, and other "users," as an ACSM study did two years ago. In my opinion, however, none of these people are remotely qualified to measure the surveying profession's competence level.

The measurement of competency must be done on a local basis. This is why each state has its own laws, registration boards, and policies.

Durint the 1990s, even more localized groups will have to begin to deal with the problems. The truth is, in any community, there is a grave concern on the part of a few surveyors that the majority of the profession is incompetent in some facet of the discipline. I share this concern.

There are two fronts upon which we must do battle to deal with incompetence. The first is the initial licensing process. The second is in monitoring and correcting incompetence among those already licensed. Few states have gone beyond attempting to deal with the first. We have all heard the policy of our testing entities that we are "only testing for the minimum entry level." In my opinion, this is sheer folly. The minimum entry level is often ridiculously low. I met the minimum level when I was licensed, but I often wonder if I personally should have been turned loose on the "protected public."

Would you accept this testing policy with medical doctor? We have allowed the term "licensed land surveyor" to mean next to nothing. Our testing procedures, no matter how perfectly worded, only test for limited knowledge. They cannot test for skills, abilities, or understanding. So the end result is a screening of sorts that weeds out the absolute idiots — something I'm sure would reassure the public about their protection.

The types of screening by the registration boards are usually limited. While they make sure the applicant has all the right references, all the necessary humanities courses, or all the "years" of experience prescribed by law, they are unable to adequately measure the skills of evidence search, the abilities to deal with complex overlapping rights, or the understanding of seniority of calls in a legal description. Tests could be expanded to forty-eight hours and you still could not measure all that needs to be measured.

Surveying cannot be minimally tested as the sole method of measure initial competence. An apprenticeship or sponsorship program needs to be developed. The tests need to ask more difficult questions that reflect real-life, everyday surveying problems. The references need to be personally queried in detail as to the skill levels of an applicant.

The four-year degree requirement is not the solution to incompetence in the 1990s. It will address ten percent of the problem, at best. I support the degree requirement, but let's not fool ourselves; the majority of the incompetence in our profession is already licensed!

How can we deal with incompetence within our ranks? Establish a nationwide witchhunt? I hope not. There are a few things we must begin to do as a united profession. First, document and remove licensing from those who are willingly ignorant and whose apathy prevents them from ever achieving competence. That means reporting those who perform improper work. It means revoking licenses in a consistent and tough manner.

Each state must absolutely require continuing education to bring every existing surveyor up to a competent level.

Each state must absolutely require continuing education to bring every existing surveyor up to a competent level. It means even those who already "know it all" must attend (they can offer encouragement to the rest of us. It means a financial burden to the registrant, but it would probably be on the level of a dinner out with their mate two or three times a year.

But most of all, to deal with incompetence in the 1990s in our profession we must have the guts to admit that it is there, and that it is a far greater problem than most realize. Let's deal with it now before the public catches on and deals with it in their own way. Our "profession" might not survive that! Are you interested enough in your profession to deal with this at your local level? That will be the real test as to whether surveying is a profession or not. Apathy at the local level will determine whether incompetence will be eliminated in the 1990s.

Dennis Mouland is a regional land surveyor for the USDA Forest Service, Southwestern Region. He is also president of Cadastral Consultants, Inc., a boundary consulting and survey education service in Albuquerque, New Mexico. ⊕

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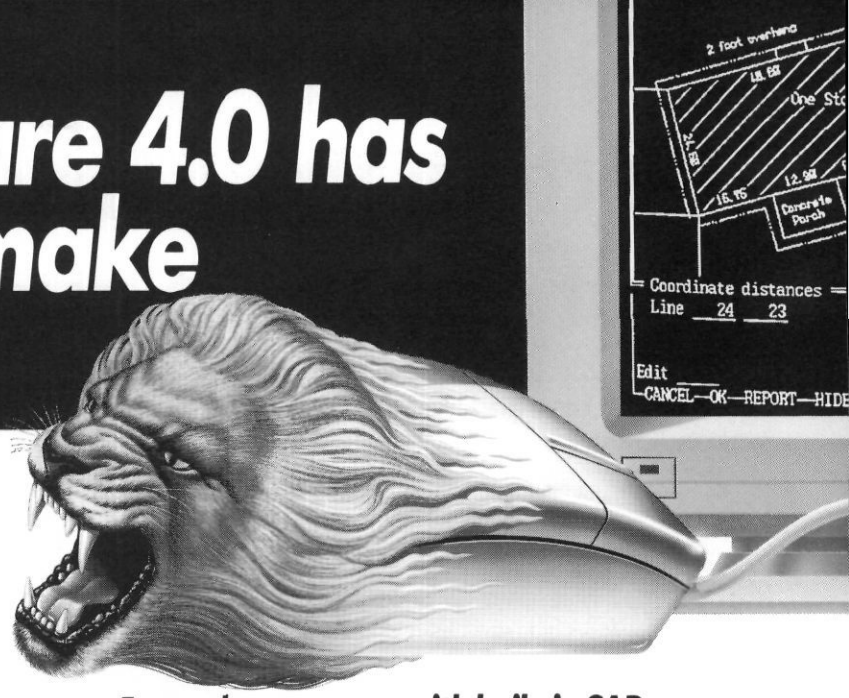

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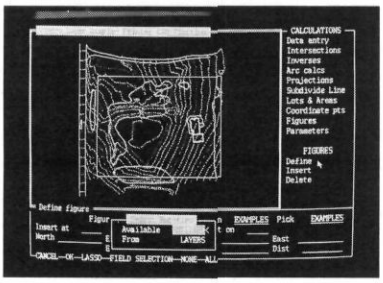

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Getting the Most Out of Least Squares

By Sean Curry and
Ron Sawyer

"LEAST squares! I don't do that kind of survey — haven't done a large network in years. Most of our work is just *regular* survey work. Our compass rule works fine; just press a button and the whole thing's balanced. Why would we want to use something as sophisticated as least squares? Anyhow, I'm not quite sure what it does."

Does this sound familiar? Unfortunately, the lease squares adjustment method seems to be a mysterious creature to most surveyors. It is frequently thought of as being difficult to learn, or not being applicable to "the type of surveys that I do." The fact is that least squares is not difficult to understand once a few basic principles are explained; more importantly, it is applicable to nearly all types of survey work, including the small "regular" job. It does not require you to make major changes in your daily practice, although certain field procedures enhance its power.

In addition to producing the best adjustment of field data, least squares provides other benefits not even possible with other adjustment methods. It helps you to locate errors in your survey data, gives you an easy way to plan surveys, and provides a statement on the amount of uncertainty for every point in your network. Our goal in this article is to remove the mystery of least squares by explaining, in nonmathematical terms, some of the basic concepts, and to illustrate its application to a number of common surveying problems.

EXACTLY WHAT IS LEAST SQUARES?

A least squares adjustment is a rigorous mathematical method for adjusting survey data. It has actually been used by surveyors for a number of years, but was generally implemented only on mainframe computers and was somewhat difficult to handle for the uninitiated user. With the advent of new high-speed, inexpensive personal computers — and especially modern software techniques — least squares is now readily available to every surveyor.

As surveyors, we have long recognized that adding extra angle and distance observations adds strength to our surveys and allows for error checking. But we also realize that these extra measurements make the resulting survey computations more complex. What can we do to resolve these redundant observations to arrive at a single set of coordinates for all our points? Some type of adjustment must be applied. In the case of interconnecting traverse loops, arriving at the single best solution can be difficult. In fact, how can you even define a "best" solution?

Various approximate adjustment methods such as the compass rule and transit rule have traditionally been used. But how, for example, do you resolve a multiloop traverse with a compass rule adjustment? You probably attack one loop at a time, first "balancing" the angles by adding the same amount of correction to each angle, and then "correcting" the bearing and distance of each leg, based on some mechanical proportioning of the closure error. Then you move on to the next loop and repeat the process. When all the loops are adjusted, you call it quits if they all fit together pretty well. Otherwise, you might rebalance the loops in some other order to see if the fit gets better.

If this procedure sounds messy and potentially time consuming, you are right. But even more importantly, it can be shown that the underlying logic of these approximate adjustments is wrong, even for a single traverse loop. Survey errors are random! These methods make assumptions about measurement errors accumulating in proportion to the lengths of traverse legs that just are not true — in fact, they can introduce distortions into the final coordinates that were not present in the original survey.

In addition, approximate adjustment methods provide no means of analyzing your survey. But, you ask, is not a traverse closure good enough? Not at all! It is like your accountant giving you a final bank balance for the year, but not giving you a breakdown of income and expenses by various categories. You would be hard pressed to determine exactly why you ended up where you did financially. Least squares gives you an itemized "accounting sheet" for your survey, showing exactly how each of your field observations fits into the overall survey.

WHAT DOES LEAST SQUARES ADJUST, AND HOW?

As a surveyor, you know that all measurements contain error. In fact, a measurement is only an estimate of the true value, which is never really known. The table below shows three types of errors commonly present in surveying data (although strictly speaking blunders are not errors) and three methods for handling them.

Blunder (mistakes, recording errors, etc.) must be eliminated! No adjustment method can tolerate blunders, although least squares can help you detect and remove them from your field data. Systematic errors, such as in electronic distance meter (EDM) calibrations, must be compensated for before any adjustment takes place. What is left? Random errors! These are small unavoidable errors that are an integral part of the measuring process. They are the few seconds difference in angle readings, and the few hundredths difference in distances that you see all the

CONTINUED ON PAGE 24

TABLE 1: Error Types

Error Type	Method for Handling
Blunders (Mistakes, recording errors, etc.)	Eliminate
Systematic Errors (EDM calibration, etc.)	Compensate
Random Errors (Normal, unavoidable)	Adjust with Least Squares

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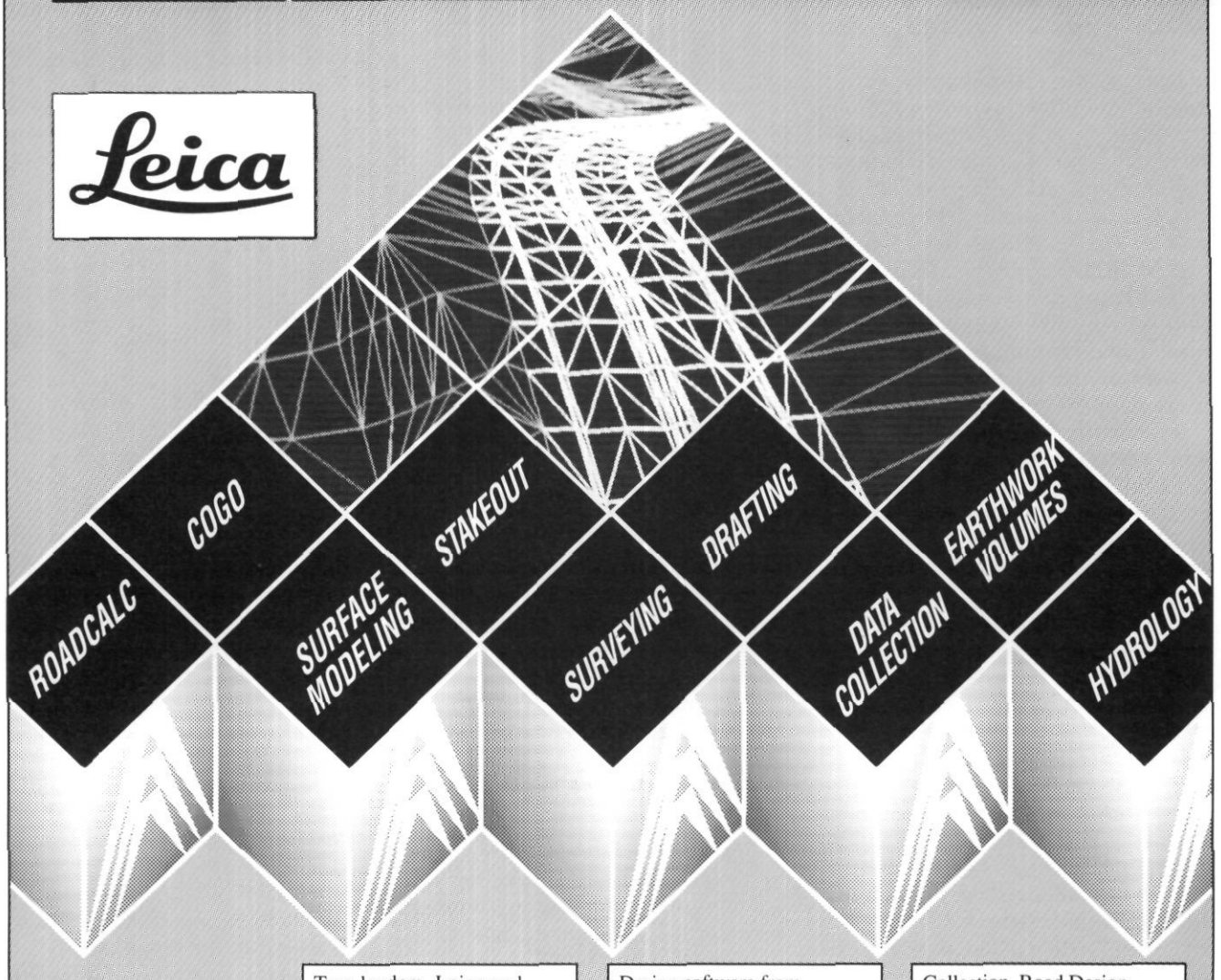

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Least Squares . . .

CONTINUED FROM PAGE 22

time in the field. They are no cause for concern, except that they must be adjusted correctly, and this is the job least squares does right.

Least squares simultaneously adjusts all field data, even in multiloop traverses. In a least squares adjustment, the "best" solution is defined as the solution producing the smallest changes to the input field measurements. These changes between the best-fit measurements and the original field data are called residuals. Technically speaking, the least squares adjustment method minimizes the sum of the squares of the weighted residuals — hence its name.

But now we have introduced a new term — weight. The weight tells the adjustment how much influence a measurement should have. In least squares, each observation (distance, angle, etc.) can be given an individual weight.

The weight you place on your measurements might be based on the type of instrument you are using, the method of observation (chained or EDM distance), and the skill of the field crew. Low weights can be given to less accurately known field data and greater weights to observations that are more accurately known. During the adjustment, larger changes will be given to the less accurate data. For example, an angle with short sights can be given a low weight so that it does not influence stronger angles with longer sights. Table 2 summarizes the relationship between weights, precision, and influence on the adjustment.

TABLE 2: Weights

	"Strong" Measurement	"Weak" Measurement
Weight	HIGH	LOW
Precision	HIGH	LOW
Influence	HIGH	LOW
Standard Error	LOW	HIGH

This ability to weight individual measurements is only available in least squares, and it gives you the extra control needed to produce the best adjustment. However, least squares does far more that compute the best adjustment. It also provides a complete analysis of the survey, including a list of residual for all measurements, and a statement on the positional accuracy of each computed point. This analysis can assist in the detection of survey blunders and the preplanning of surveys to meet specified accuracy requirements.

```
C     1      1000.00      1000.00
C     5       427.12      3245.55
#
TB    N45-30-40W                     # Backsight to fixed bearing
T     1      123-40-28      537.52
T     2      217-11-37      719.56
T     3      113-53-15      397.66
T     4      260-19-24      996.23
TE    5      121-22-46      N70-56-55E  # End by turn to fixed bearing
#
TB    1                             # Backsight to known station
T     2      120-11-12      473.25
T     6     -101-32-30      625.76
T     7      198-13-09      533.66
T     8      172-07-27      753.22
T     9      -84-32-20      661.01
TE    5       48-20-00      N70-56-55E  # Close to fixed bearing
#
D     4-8        361.30               # Extra distance tie
```

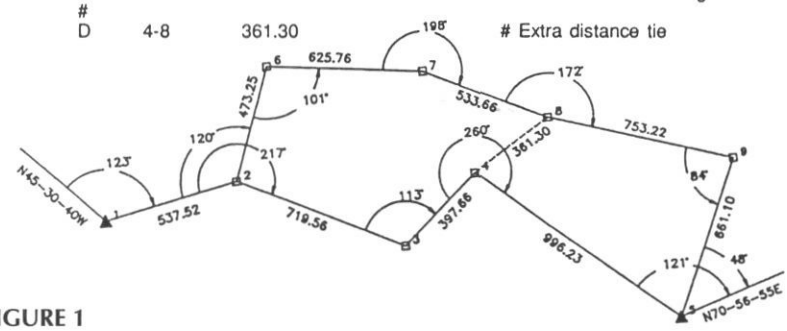

FIGURE 1

WHAT ARE ITS ADVANTAGES?

Least squares provides a number of advantages over other adjustment methods.

- It is mathematically correct for all types of surveys, including traverses, triangulation, trilateration, resection, and intersection in any combination.
- It computes a *single* solution, no matter how complex the survey.
- It does not distort field data, as do some approximate methods
- It allows independent weighting of all field observations
- It allows flexibility during data collection — field data can be collected in any order and configuration.
- It gives you a statement of the accuracy of each computed point.
- It helps detect blunders in field data.
- It helps with survey planning.
- It tells you a lot about the survey.

HOW DO YOU USE LEAST SQUARES?

You do not need to make major changes to your field procedures in order to use least squares. In fact, least squares adds a lot of flexibility to data collection. Distances and angles can be conveniently collected in any order without worrying about how the survey will be computed, because the adjustment handles all the data simultaneously. Traditionally, cross-ties and extra shots were used mainly to "check-in." In least squares, these redundant shots actually become part of the adjustment, adding strength to the survey (more *is* better). Rather than making the survey solution more difficult, redundancies strengthen the survey; major blunder detection is easier and adds more confidence that the adjustment is the "best" solution. Also, to make a surveyor's life really easy, additional field data can be added to an existing survey at any time, and the adjustment can be rerun.

Figure 1 illustrates a small survey with two traverse loops and a distance tie between the loops. The two known points have coordinates supplied, and the rest of the field measurements are supplied as angle and distance traverse legs. The sample data field uses a simple code to indicate coordinates (C), traverse lines (TB, TE, and T), and distances (D).

Once the field data has been prepared, you need to decide how the observations will be weighted. You do this by establishing a "standard error" for each observation. Think of the standard error as a way of expressing your confidence in your field data.

CONTINUED ON PAGE 26

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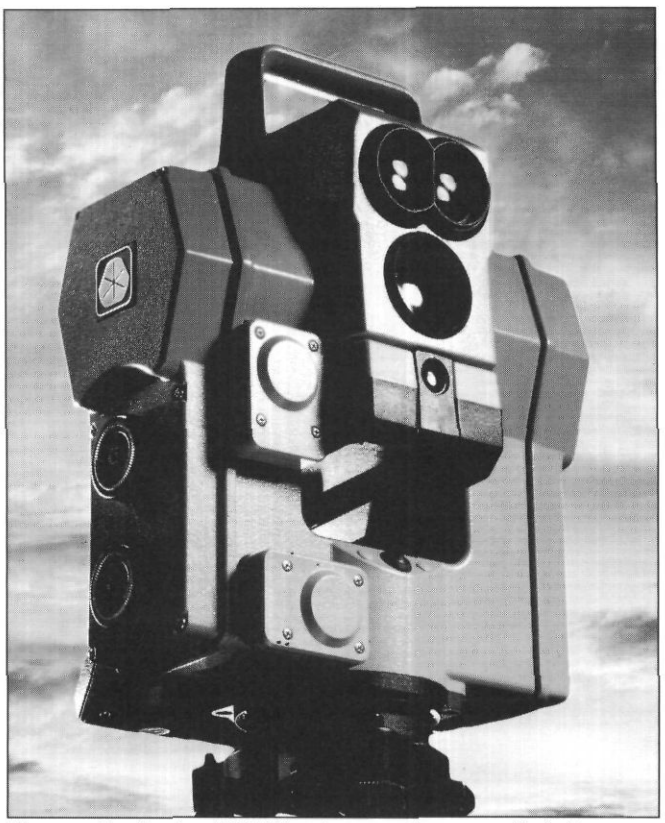

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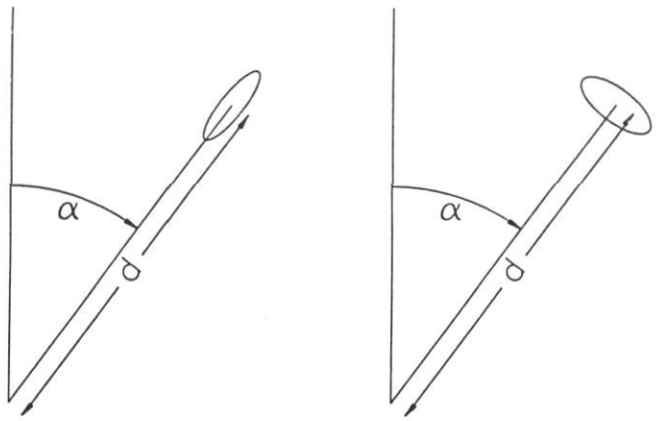
FIGURE 2



Angle measured with high precision.
Distance measured with low precision.

Angle measured with low precision.
Distance measured with high precision.

Least Squares . . .

CONTINUED FROM PAGE 24

For example, you might decide that your distances have standard error of 0.02 feet ±3ppm, and your angles five seconds. These values are normally determined from instrument specifications and observations procedures. In addition, you might choose a centering error of 0.005 feet to account for imprecise instrument centering. This centering error value will increase the standard error value for angles with short sights so that they have less influence in the adjustment than those with long sights. The least squares adjustment will use these standard error values to determine weights for all the field data in order to arrive at the best solution.

Now that you have established the amount of influence that each measurement will have, you can run the adjustment and analyze the output. Although the specifics of running an adjustment depend on the software package being used, some output elements are common to most least squares programs. These include:

- A brief summary of the overall strength of the adjustment. This summary often provides a useful breakdown of how individual measurement types (distances, angles, etc.) fit into the adjustment.
- A list of residuals for all input observations. This list is a valuable tool for finding blunders in the survey and for checking the weights you assigned to your input observations.
- A list of adjusted coordinates for all stations in the survey. These coordinates can be transferred to your CAD or COGO package.
- A list of the computed positional tolerances (error ellipses) for all stations in the adjustment. The ellipses (to be discussed next) show the amount of uncertainty in the computed position of each point, and can often be viewed graphically.

WHAT DO ERROR ELLIPSES REVEAL?

Error ellipses are used to indicate the amount of uncertainty in a computed point's position, sometimes called the point's positional tolerance. As one surveyor put it, "It's not that the *point* is uncertain — it's a well-established monument. It's my *idea* of where the point is (as expressed by its coordinates) that has some possible error." If you look at the northing or easting of a point by itself, you can express its error as plus or minus so many hundredths of a foot. However, to show the combined effects of the uncertainty in northing and easting requires an error ellipse.

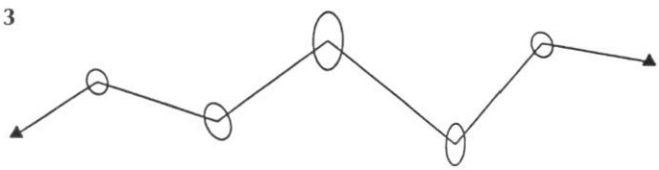
Why does the point have this positional uncertainty anyway? Again, as the surveyor said, "Surveying is one of the few professions where you rarely get to measure what you really want. You want coordinates, but you have to settle for measuring angles and distances, and then computing coordinates." Remember that all your measurements are affected by small random errors. Therefore, you would expect any value computed from these measurements to also be affected. Least squares, as a part of the solution process, computes how much uncertainty in the coordinates results from the random errors in the field measurements. It is all there in the solution — you do not need to go to any trouble. These positional uncertainties, as represented by the error ellipse, are also affected by the geometry of the survey.

Two simple cases of error ellipse are illustrated in Figure 2. The ellipse dimensions indicate the size of the error region, and the orientation indicates the weaker and stronger directions.

In a simple traverse between two fixed points, the error ellipses tend to increase in size according to the point's distance from a fixed station, as shown in Figure 3.

You should realize that least squares gives numerical values for the positional uncertainty of each point. For example, Figure 4 shows an actual ellipse that resulted from the adjustment of a multiloop traverse survey. Also shown are the ground dimensions of the error ellipse around the point. Even survey loops that close with very high precision may have large ellipses around the points, depending on the geometry of the survey.

FIGURE 3



Take the example of the surveyor who traverses through several miles of forest to discover that his newly located section corner was a half a foot away from a monument he found. When he traversed back, he closed to 1:55,000 — so should the corner be reset? *A least squares adjustment of the survey shows that the error ellipse for the new corner was over 1.5 feet long. This ellipse obviously raises some doubt about*

CONTINUED ON PAGE 28

Here's Some Important Information About CLSA

The goal of the California Land Surveyors Association is to promote and enhance the profession of surveying, to promote the common good and welfare of its members, to promote and maintain the highest possible standards of professional ethics and practice, and to elevate the public's understanding of our profession. CLSA represents all land surveyors, whether they are employees or proprietors, whether in the public or the private sector.

Representation

LOCAL: Your local chapter represents you in local issues. Through your chapter representative to the State Board of Directors, the individual member can direct the course CLSA will take. STATE: The surveyor is represented at the state level through an active legislative program, legislative advocate, and liaison with the State Board of Registration. REGIONAL: CLSA is an active member of the Western Federation of Professional Land Surveyors. This federation is composed of associations throughout the western United States and addresses regional issues. NATIONAL: Through institutional affiliation with the National Society of Professional Surveyors and the American Congress on Surveying and Mapping, CLSA is represented at the national level.

Education Opportunities

CLSA presents annual conferences which provide technical and business programs, as well as exhibits of the latest in surveying and computing technology. Seminars and workshops are presented to assist in continuing education. CLSA publishes the *California Surveyor* magazine and the *CLSA News* to keep the membership abreast of changing legislation, legal opinions, and other items which affect our profession.

Business and Professional Services

CLSA provides a fully staffed central office which is available to answer questions or to provide up-to-date referrals concerning legislation, educational opportunities, job opportunities, or other issues concerning our membership. Health and professional liability insurance programs are available to members.

Join CLSA Today!

Application for Membership in the California Land Surveyors Association

Mail Your Completed Application To:

CLSA Central Office
P.O. Box 9098
Santa Rosa, CA 95405-9990

Questions?

Phone (707) 578-6016
Fax (707) 578-4406

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☐ $ 66.00 ASSOCIATE MEMBER: Any person who holds a valid certificate as a Land Surveyor in Training.
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Least Squares . . .

CONTINUED FROM PAGE 26

whether the new point is really any better than the existing monument. The closing precision resulting from a compass rule adjustment tells you nothing about the positional accuracies of individual points. Only error ellipses can do that correctly.

A WORD ABOUT FINDING BLUNDERS

As you know by now, blunders cannot be part of the adjustment; they must be located and removed from your field data. Least squares provides some useful tools for locating blunders. Normally, the entire adjustment is subjected to a statistical test (called

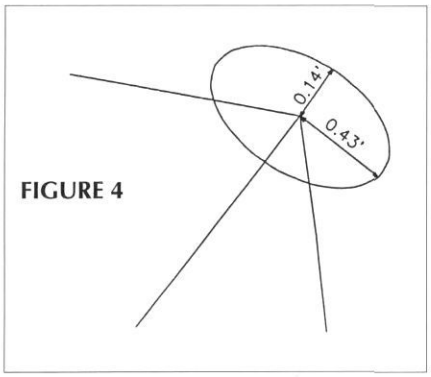

FIGURE 4

the Chi Square Test, for the experts in the crowd) that checks the overall validity of your data, the standard errors that you assigned, and the adjustment results. You do not have to understand statistics to know that if your adjustment fails this test, you had better start looking for the source of the problems. This test is usually a part of the adjustment program, and failing it sounds a warning bell to alert you to a potential problem.

Let us imagine that you carefully prepared your field data, assigned standard errors that really reflect the way you survey, and have run your first least squares adjustment. Unfortunately, the program has told you that your survey "Fails the Test." Should you give up and return to the compass rule, because it never gave you such discouraging news? If you have read this far, you know by now we are not going to allow that.

At this point, you need to perform some detective work, with the adjustment providing all the clues you need to find the source of your problems. There are a number of techniques for finding blunders in a least squares adjustment, including automated blunder detection routines in some software. However, one simple manual technique is to look at the resulting *residuals* on your field data after the adjustment. If everything was perfect, you would expect the residuals to be roughly equal to the standard errors that you chose for your field data. Due to random errors, there will be some variation up and down, but if a residual exceeds three times its standard error, there may be a problem.

Table 3 shows an excerpt from an actual adjustment containing a blunder. The last column in the table, called the *standardized residual, is the ratio of the residuals to the input standard errors. Those with values above 3.0 are flagged to draw your attention to them. You can see immediately that there are several very large standardized residuals on the angles. A good place to start looking for blunders would be the angle with the largest standardized residual. That may not always be the one, and you may need to look at the next few angles as well, but it represents a good clue.*

USING PRE-ANALYSIS TO PLAN SURVEYS

Least squares can be used to compute the accuracies of survey points, and the relative accuracies between points, *before* any field observations are made. How is this possible? First you supply a list of input station names along with their approximate coordinates scaled from a map or photograph, indicating roughly where the survey points are planned. Then you enter a list of the proposed measurement, using "From and To" station names rather than actual field

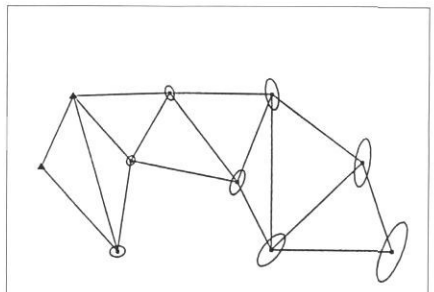

FIGURE 5

survey data. Finally, just as in regular data, you need to indicate standard error values for these proposed measurement so that the proper weighting can be applied.

The least squares pre-analysis will now take this proposed survey and generate computed accuracies (error ellipses) for all survey stations. You can then review the results, and add or delete measurements as needed to meet the required accuracy specifications. Even if the actual survey varies somewhat from the proposed configuration, this technique allows you to develop a general plan for each survey that will result in the most efficient use of your field time.

WHAT ELSE CAN I USE IT FOR?

Because least squares allows so much flexibility in data collection, and because it provides a single "best-fit" solution no matter what kind of survey was performed, you can use it to help you in a variety of field applications. For example, imagine that you are running a traverse and reach a point where several short legs would be required. You know that the short sights will weaken the traverse, but with least squares you can set an additional point, and observe all possi-

TABLE 3: Checking For Blunders

Residuals In Angles

At	From	To	Adj Angle	Residual	StdErr	StdRes
1	4	2	+58-15-40.22	+0-00-27.22	4.00	6.8*
3	2	4	+129-57-21.68	+0-00-32.68	4.00	8.2*
4	3	1	+99-58-37.68	+0-00-29.68	4,00	7.4*
1	2	6	+61-47-49.93	-0-00-02.07	4.00	0.5
6	1	7	+90-00-02.47	-0-00-02.53	4.00	0.6

Residuals in Distances

At	To	Adj Dist	Residual	StdErr	StdRes
1	2	973.9700	-0.0090	0.030	0.3
2	3	422.5785	0.0675	0.030	2.3
3	4	512.6738	0.0298	0.030	1.0

ble distances and angles to it. The adjustment will use all the data, and strengthen the corner considerably.

Resections can be easily handled, with any number and combination of angle and distance observations. Least squares will automatically compute the best coordinates, plus produce an error ellipse showing how accurate the resection was. Traversing becomes much more flexible. You can begin with or without a backsight to a known bearing, and close to a known point with or without a closing angle to another known bearing. Solar azimuths, appropriately weighted, can be added wherever needed to strengthen the traverse. Additional distance and angle ties can be observed wherever possible. They will assist with blunder detection and will strengthen the traverse.

Least squares is a powerful adjustment technique that gives you a compete accounting sheet for your surveys. It gives you the best possible results while preserving your field data as much as possible. It provides

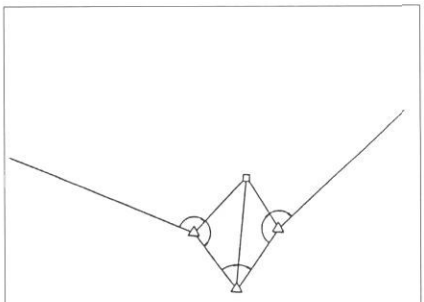

FIGURE 6

you with a detailed statement of how each observation fits into the adjustment, and a statement of accuracy for each computed point. All this information allows you to make intelligent and informed decisions about the strength of any particular survey. Least squares also provides tools for locating blunders in field data, and for preplanning surveys to meet accuracy specifications. Least squares is the *only* adjustment method that does justice to your high precision equipment and your good field practice.

Several states and many Federal government agencies are now (or soon will be) requiring the use of least squares adjustments and positional tolerance statements for all surveys, rather than the more traditional traverse closing precision. In the near future, we will probably look back and wonder how we ever managed without least squares.

Sean Curry is currently a Project Manager in the Surveying and Mapping Group of Trimble Navigation. He was formerly the director of STARPLUS Software, where he helped develop the STAR*NET program. He has graduate degrees in Civil Engineering from the University of California at Berkeley, where he has taught surveying.

Ron Sawyer serves as director of sales at STARPLUS Software, Inc. He has a Master of Science degree in architectural engineering from the University of Illinois and is a registered civil engineer in the state of California. He has developed software for civil engineers and surveyors both as a private consultant and as a manager of a software service company

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CADD: An Overview

By Tommy L. Nasworthy, C.S.T.

IN THE YEARS I have been involved with surveying and CADD, I have seen the CADD marketplace explode. It seems each "new advance" in CADD software is, within months, replaced with a more sophisticated version by another company. This has pushed CADD development farther and faster than could have been imagined just a few years ago. At the same time, these technological leaps have caused many concerns among possible buyers. Cost ranks among the top concerns since there seems to be a vast price range of software packages that, on the outside, seem to do all the same tasks. It is my opinion, from working with a number of different packages over the years, that you basically get what you pay for. Low-end packages seem, for the most part, to be limited to basic COGO calculations with primitive "point-line" plotting. Some packages have more sophisticated text fonts and line styles available as "extras" to the basic package. The high-end packages, on the other hand, have many more text fonts, line styles, measure/report options and COGO/CADD interaction than their low-end counterparts. Each firm must make their own analysis of what they need based on how they intend to use it and how far they intend to advance their CADD involvement over the next few years. Digital Terrain Modeling is definitely worth the investment for most engineering/surveying firms if you are willing to commit at least a couple of operators to some in-depth training for one to two weeks. Take it from experience, the software without the training will be a waste of money unless you already possess a CADD "guru" who will spend countless hours at night and on weekends figuring out how to use it. Believe me, I've been there. Which brings us to our next concern — training. Very few of the firms I have had contact with have held formal training classes for extended periods. A half dozen lunchtime training encounters does not constitute formal training, nor will it produce the results hoped for by those who invested the company's hard-earned cash into said software. Most of the better-known software companies offer "on-site" training to get you up and running, but you need at least one "computer head" to do both extended training and R&D (research and development) if you really want to use your software to its potential. I've seen a number of firms invest large amounts of money into complex software, then hand the manuals to the technicians and say "Hit the ground running." While these firms will begin turning out production right away it may take months or even years before their CADD departments are actually profitable, and it's my experience that the software may never be used to it's full potential. In fact, many of these companies may believe the fault lies in the software, and will go on to invest in other CADD software thus, beginning the whole cycle all over again! You've heard the old adage, "an ounce of prevention . . . ." Well, in this case, an ounce of knowledge is worth a pound of dollars. I can't stress the importance of training enough. Even after formal training, monthly classes should be held to inform operators of new developments and to iron out differences in drafting standards — which brings us to our next concern. Since the beginning of time (well, almost), firms have battled the stress-causing problems of drafting standards. It seems the simple utility pole can be drawn at least 437 different ways — on one drawing! Alright folks, I'm gonna let you in on the most well-kept secret in CADD history — how to make all those drawings from today to a year from next Tuesday look the same — TRAINING (there's that word again). Develop standard symbols and line styles, then hold training classes to see that ALL of your operators are using them!

I'll leave you now to ponder one last thought; do you know the potential of your CADD software? How much of that potential you use is up to you. It's sitting there right now waiting to be used.

Tommy Nasworthy is CADD Manager at Post, Buckley, Schuh & Jernigan, Inc. ⊕

Of Course I Delegate!

By Edward J. Stewart, P.L.S.

I OFFER THE FOLLOWING as food for thought not only to all my peers who have found themselves in the position of a company project manager, but to all employees who someday hope to be project managers.

"I have a great staff and I delegate those activities that I know my staff can do. The rest of the work I do myself because I am the technical expert and can do those activities better than my staff can."

Unfortunately, this is the typical feeling when a good technical person climbs the ropes into management. It is also one of the hardest feelings for a technically-orientated person to eliminate. Yet for the manager in the world of today, it is imperative to be able to properly delegate, or the manager will wind up doing all the work while his staff sits idle. This leads to a drop in real productivity and breaks up the concept of the team. The staff feels that they are looked on as incompetent and not able to perform. The attitude that I will put in my eight hours, pick up my paycheck, and go home, begins to spread like a cancer.

Recently I was watching a training video, and one of the central themes of the video was the inability of the manager to properly delegate. The manager in the video made this statement to his superior; "I can't assign that task to her. She doesn't know how to do it and would just botch it up." The superior instantly pointed out to the manager that the company had provided him a staff to do those tasks so that he could concentrate on business. If his staff did not know how to do a task then he should coach and train them to do it. The company did not hire him to perform tasks but to make sure his staff performed those tasks.

What a perfectly simple, yet realistic, point of view. The coach is the one who trains and leads the team but he is not the one who performs the plays of the game. I thought about this and realized that I was not training my staff to play the game, I was playing the game for them. No wonder I never seemed to have enough time to get my work completed (i.e. proposals, communication with clients, billing, etc.) I was doing the work my staff was supposed to do.

I finally admitted to myself that I had a real problem. I found relief in a book by Robert B. Maddux entitled *Delegating for Results.* Mr. Maddux helped me to recognize two important facts. First, as manager, my role changed from performing tasks to managing the performance of others. Second, I have a staff who expects to use and develop the knowledge and skills each has brought to the company.

Delegation is not a mysterious art available to a chosen few. It is a basic management process that can be learned by anyone who is willing to make the effort. For those of us who — because of advancement within firms or agencies or because of the big step into our own practice, now find ourselves responsible for the work of others — the ability to delegate will decide our success or failure. I have found *Delegating for Results* to be a good practical resource for the principles of delegation. ⊕

Mount Diablo Surveyors Historical Society Established

A NUMBER OF CALIFORNIA members of the Surveyors Historical Society (SHS) have established a new group to be know as the Mount Diablo Surveyors Historical Society. Deriving from the fact that Mt. Diablo was the first meridian in California, this new organization will represent a large portion of California and Nevada.

Dinner meetings are held monthly to plan and coordinate exhibits and other survey related activities. This fledgling, but on-the-move, society is committed to action — as can be seen in their calendar of events for the first six months of 1991:

January 25 – 26
California State University, Fresno. Thirtieth Annual Surveying/Photogrammetry Conference. Display.

March 11 – (several weeks)
County Government Center Building for Santa Clara County. Large survey artifact exhibit in lobby.

March 16
Evergreen Valley College, San Jose. Exhibit for Settlers Day.

June 22 – 23
San Jose Living History Days in Kelly Park. Exhibit and demonstration.

Also, the group is working with SHS members Dave Goodman and Bud Uzes in preparing an extensive surveying display at Folsom which will run August, September, and October.

Officers and directors of the new society are: Norman Payne , Chairman; Eugene Phipps, Vice Chairman; Donald Marcott, Secretary/Treasurer; Christy Davis, Director; and Myron Lewis, Director.

For further information about Mount Diablo Surveyors Historical Society activities and membership, contact Donald Marcott, 5042 Amethyst Court, San Jose, CA 95136.

The new society plans to be come an affiliate of the National Surveyors Historical Society at a later date. ⊕

Stolen Survey Equipment

Taken from a white Chevrolet suburban stolen in Taft and abandoned in the Covina-Azusa area about March 19, 1991. If you have any information about the possible whereabouts of any of the following, please contact John Hoffman at (805) 763-3620 ■ Topcon GTS 3B electronic total station, in case, with accessories serial #Q31989 ■ CO-OP data collector, in brief case, with instrument cable, rainglove & soft cover serial #3-0620 (includes HP 41CX #2837S20526) ■ Wild NA 1 automatic level #494528 ■ One hand-held UHF 2-way radio, "Standard" model 734 Serial #45U470251 or 45U470260 with two extra batteries ■ Two Topcon Wild-type tribrachs, with optical plumb, in padded cases ■ Retro-Prisms: two each Triples, with solid steel adaptor bases, in padded bags, lexan housing, composite frame; one single in metal house and frame, with padded bag; one single tilting, plastic frame ■ One Lietz surveyor's compass, in leather case; one pair binoculars, in case; two hand levels, one K & E, one Seco (with leather cases); one Lufkin 50" steel case tape; three plumb bobs, two sheathes, 2 with gammon reels; one Lufkin 12" engineers pocket tape; two chaining clamps; one canvas stake bag. ⊕

ETSU Surveying Perspectives

By Dr. Ben Buckner

For many years I have felt that most of the problems surveyors have with their image as a professional can be traced back to the formal education process. Dr. Ben Buckner, from East Tennessee State University (ETSU), is one of the best thinkers we have today in the field of surveying. He has written a description of the tasks surveyors perform and the educational requirements that will be needed by tomorrow's surveyor to accomplish those tasks. Dr. Buckner concludes with an argument for having colleges and universities that would serve a region of several states rather than each state struggling to maintain individual program.

— Neil R. Phillips, R.L.S.

A. PERCEPTION OF SURVEYING EDUCATION

Professional Education (B.S. Degree)

It is felt that professional education should prepare an individual for practice, either as a licensed surveyor operating a business, or as a surveyor employed in practice or in government work. The best preparation to become a professional surveyor is a four-year B.S. Degree which embraces the scope of surveying as explained in Section B. The professional surveying graduate should be able to think, analyze, create, oversee, manage, direct, design, and take responsibility.

It is felt that the standards reflected by the current ABET-RAC (Related Accreditation Commission) are appropriate for design of a professional level curriculum in surveying and mapping science and practice, and that credit hours less than those outlined in those guidelines is an unacceptable compromise. The only true "major" in surveying and mapping (or "land surveying" or other such name) will have a "core" of courses directly in surveying and mapping, totaling at least forty-five semester hours, plus adequate preparation and background in math and physical sciences, communication, social science and humanities, and related areas such as real estate law, geography, etc., to the extent possible considering institutional and other constraints.

The B.S. degree program in surveying should prepare a graduate for tomorrow's problems — to serve the public in the future — and this means more than merely preparing the student for practice as narrowly defined in many areas today.

The goals in the B.S. Degree program are to present and teach theoretical and practical knowledge and information, stimulate the analytical and creative thinking process and develop an attitude of responsibility and ethical values in the student. All three of these focuses are important to develop a future professional.

The education at ETSU is a combination of both theory and practice, with a solid foundation laid in the theory, and enough "hands-on" experience to develop basic understanding of theory and skills in the applications.

The B.S. degree is intended to be a terminal degree, preparing the graduate to be a responsible member of the surveying profession. Coupled with on-the-job training, the graduate should not be expected to be such a professional without experience. The formal education is the foundation of theory, thought, and values. The graduate is refined and matured by experience.

The B.S. program is also intended to serve as preparation for graduate study, should the graduate desire to go into teaching or research.

Technical Training (A.S. Degree)

A two-year A.S. Degree should not be designed or intended to prepare a surveyor for professional practice. There is not enough time in a two-year program to develop the theoretical background or the analytical and creative thinking processes, or to teach the subject matter itself. A.S. degrees should train technicians who will assist professional surveyors as instrument operators, computational technicians, drafters and plotters of data, records researchers, and party chiefs. These roles and functions are consistent with expectations under the current ACSM Technician Certification program.

An A.S. degree should be designed to meet the standards of the ABET/TAC (Technology Accreditation Commission), except that there should be a clear intent that it does not prepare the graduate for professional practice, but rather technical duties.

The A.S. Degree at ETSU emphasizes both basic theory and practice. Students receive training and practice with several commonly-employed instruments, field problems, computations, and graphics used in surveying. The student is taught to be responsible for execution of surveys and maintaining accuracy and efficiency of operations. There is exposure to professional level surveying in a few courses taking by both A.S. and B.S. students.

The A.S. Degree is intended to prepare graduates to quickly become a contributing part of a survey crew and handle tasks commonly encountered by surveyors in practice.

B. PERCEPTION OF THE PROFESSION

General Scope of Professional Surveying

The specialized body of knowledge of land surveying is broad. The public deserves to have professional surveying services performed by individuals having adequate scientific, technological, and legal background in surveying and mapping science practice. Surveying and mapping includes property boundary retracements, land subdivision, topographic and site surveys, engineering and construction surveys, control surveys, mining surveys, hydrographic surveys, environmental surveys and any other surveys needed to determine accurate distances, directions, areas, volumes, positions, and natural or qualitative features of the land surface. The display and communications of the data and survey results in the form of maps, plats, computer retrieval systems, printed data, survey descriptions, and photographically based media are included in the practice. "Land Surveying" is considered as "surveying and

mapping science and practice," and is not limited to boundary retracement.

As we move into the twenty-first century, tomorrow's surveyor will need to know more than surveyors of today. It is felt that a broad education, as outlined in the following paragraphs, and as characterized by ETSU's B.S. program, will develop a group of professional surveyors who will be strong, unified, and capable of being lead professionals in the areas defined.

Specific Scope of Surveying Practice

1. *Measurement and Computational Analyst.* The most unique and important function and role of the surveyor is an analyst of measurement data. The surveyor plans measurements, designs measurement systems, establishes field control, executes measurements, evaluates results, analyzes errors and mistakes, oversees quality of results, adjusts errors when appropriate, and manipulates measurement data. Measurements relate to boundary lines, various controls for mapping and construction, and other purposes. Included are indirect measurements determined by calculations based on geometry, evaluation of quality of results based on statistical concepts, and evaluation of errors based on physical phenomena related to the instruments and nature. Thus, the surveyor must thoroughly understand the three dimensional geometry, the error sources, how errors propagate, instruments and their calibration, and the art and science of making computations using measurements. The surveyor is, above all else, land measurement scientist.

2. *Land Boundary Analyst.* The modern surveyor must combine measurements and mathematics with legal and other principles and evidence to analyze locations of real property lines. In addition to measurement science, the surveyor must understand the rules of evidence, precedence of deed terms, and what constitutes a preponderance of evidence regarding locations of lost or obliterated property corners. The surveyor should understand the laws on boundaries and how they are established. As the professional closest to the land, and with unique expertise in measurement, the surveyor should be an expert analyst regarding location of land boundary lines.

3. *Generalist in Surveying and Mapping.* The modern surveyor must be reasonably knowledgeable in all of the surveying and mapping specialties, in order to perform the above principle roles properly. Being conversant, as a minimum, and having some expertise in geodetic control surveying, mining surveying, hydrographic surveying, photogrammetric surveying and mapping, remote sensing, cartography, and engineering/construction surveying rounds the modern surveyor into a professional person. For example, geodetic and photogrammetric surveying is another part of measurement science, and should be understood as part of the role as measurement analyst. Also, these specialties have application in boundary line analysis, subdivision design, and land information systems. Without broad, general background, full development in the major roles mentioned cannot occur.

Tomorrow's surveyor will need to know more than surveyors of today.

4. *Land Subdivision Function.* The surveyor should understand the art of subdivision design, including the design and layout of streets, lots, sewers, and drainage systems. Basic site planning and the engineering associated with land subdivision should be understood and appreciated. This function requires another level of knowledge beyond measurement science and legal principles of boundaries, since new land divisions and living environments are created.

5. *Land Information Systems.* The modern surveyor should be the leader in development of LIS/GIS systems, including designing and implementing the control systems for mapping, performing the surveys for large-scale mapping, and supervising the mapping and gathering of three dimensional data to be incorporated into data bases. Working with computer scientists, planners, cartographers, and government officers, the surveyor should become the lead professional in this area. LIS/GIS is just another form of surveying and mapping.

6. *Business Person.* Some surveyors will own businesses. Most will not. Courses in economics and similar areas help to develop background, but there isn't time in a B.S. program in surveying to develop this area fully.

Summary Remarks on the Profession

The first two roles are indispensable. Without expertise in measurement science and land boundary principles which molds the surveyor into an "analyst," there would not be enough depth to deserve the title "professional." The third role of generalists is also important. Without general knowledge the professional surveyor is not a practitioner, but merely a manipulator of scientific and legal principles.

The fourth and fifth roles add depth to the profession. The fourth role varies with state laws on local subdivision and platting and may vary in importance accordingly. The fifth role, in particular, is futuristic and LIS/GIS is still evolving. It is important and logical for the surveyor to take the lead in this area, and so an awareness of LIS/GIS should be taught in any degree program in surveying.

The education at ETSU emphasizes these roles, somewhat in chronological order. All cannot be equally emphasized as there is not sufficient time to do so. A firm foundation in mathematical, physical, and measurement science would seem to be most important, regardless of the profession otherwise evolves, and regardless of the areas of specialization a surveying graduate may wish to move toward. It may be desirable for some students, if interested, to add a M.S. degree focussing on one of the survey sciences or business, if they wish to develop further in one of these areas.

C. PERCEPTION OF DEMAND FOR SURVEYING EDUCATION

Formal education in surveying takes many forms — from a course or two in a civil engineering or technology program to graduate degree programs. The author's philosophy on what is appropriate for tomorrow's practitioners should be apparent from Sections A and B of this article — a four-year B.S. degree with at least forty-five semester hours directly in the surveying and mapping sciences and practices. This is needed for future unity, image, and assurance of

CONTINUED ON PAGE 34

ETSU . . .

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adequate background for graduates to handle future problems. But, a program of this scope cannot be offered in each state. Lesser programs can, perhaps, be offered in local areas, but a "critical mass" of about twenty to thirty million population is needed to allow development of a quality program. The demand for surveyors is simply too low to expect to attract sufficient students to programs serving low populated regions.

The alternative to supporting regional schools is compromise of quality and content. The larger the number of programs — fed by the desire to have local or individual state programs — the lower will be the quality. Several states in the Southeast have continued to accept lower standards for the sake of having local programs, or no programs at all. One state even changed its law reading "four years of surveying education" plus experience, to "two years of education" plus the same experience because they had no four-year program in their state, but did have junior colleges. The Licensing Board, the State Surveying Society officers, and the NSPS representatives in that state could not accept the regional concept, even though students in their state could attend ETSU's program at in-state tuition rates and one student from their state had just received the B.S. degree from ETSU. Another state decidedly rejected the regional concept and has put energy and resources into building a program having less than half of the surveying content of ETSU's — again, even despite the fact that several students from their state were attending ETSU's program at in-state tuition rates. There are other variations of these stories. The common theme in these stories is that surveyors are willing to accept less, for the sake of keeping education "close to home."

Ironically, the type of student who wants the best ignores all of this and moves out-of-state anyway. These few will be the leaders of the profession in the next century. It is sad that they will need to fight future battles related to professionalism, standards, and image — battles that may be worse than the ones we experience today because the professional will be even more fragmented.

As surveyors and licensing boards continue to prolong the non-acceptance of quality formal education for future surveyors, instead accepting compromises or "stepped" progressions toward the B.S., are reluctant to accept the realities of the need for regionalization, and ignore an existing degree program (complete with out-of-state tuition waivers), they unnecessarily confuse and complicate the quest toward developing a higher professional status and help create even more lack of unity for the future then we now experience.

It is hoped that readers will recognize the existence of quality education for future surveyors in the Southeast, recommend it to prospective students, adopt it as their own local program, and recommend it to the licensing boards and legislators as satisfying their states's need for B.S. level education in surveying. ETSU's complete program, with out-of-state tuition waivers, is a gift. A gift shouldn't be ignored. There may not be another quite like it for a long time. ⊕

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THE LAST WORD

Making a Local Education Program Work – Part I

By Paul Cuomo

HAVING A successful community college surveying program produces many benefits for the surveyors in the area. Not only will it provide the basic education that the technicians need to progress towards licensure, a well-structured program compliments on-the-job training, which, in busy times, can be sparse at best. By attending classes, the students will often learn a different approach to solving problems than presented by someone at work. They will be able to share experiences with the instructor and other students thereby increasing their understanding of the profession and realizing that there is more to life than setting 20's and 80's. Students are encouraged to further their education when they see how interesting and diverse surveying can be.

I have been involved at Rancho Santiago Community College, in Santa Ana for seventeen years, both as an instructor and chairman of the Surveying Advisory Committee. I have seen the program grow from a few union classes to a very fine, well-rounded program offering an A.A. degree in surveying and mapping. The core classes are Basic Surveying, Advanced Surveying, Boundary Control I (Public Lands) Boundary Control II (everything else), Legal Descriptions, Advanced Surveying Problems, Photogrammetry, and a new class, Office Surveying. There are five L.S.'s on staff, with one soon to be. We are all very proud of this program, however, I am just as proud of the reason that this program has grown. That reason is the involvement the Orange County Chapter has had in it's development.

Six years ago the program began to flounder. The two Saturday surveying classes were going fairly well. Mike Petyo, the instructor was a great teacher with a good reputation. He had no problem keeping his classes full. However, some of the evening classes, mine included, were suffering due to low attendance. (Keep your remarks to yourself, please.) We tried to resurrect the Advanced Problems class but it died from lack of a minimum amount of students. We were discussing this dilemma at our Orange County Chapter Directors's meeting one evening. Dave DeGroot suggested that the chapter put on the class. We would get a mailing list from CLSA Central Office and advertise the program by mailing flyers. We would also supply the instructor and asked the school to provide a room. The class outline was already in place. John Pavlik volunteered to be the lead instructor and would find a couple more to help. The school was very cooperative; the arrangements were made and the flyers sent out. The response was so overwhelming that the school could not accommodate the class. At the eleventh hour I was able to procure a training room in one of the county buildings where I work. Ninety-five students applied for the class. We had to cut the class to seventy because of the room size. The others were told to come back next semester (they did).

From that point on, the program grew dramatically. I have had as many as eighty-two students in a Boundary Control class. The Legal Descriptions class and Advanced Problems class normally have over fifty students, while the Saturday classes get as many as thirty-five students.

Encouraged by our impact on education, the Chapter now holds an annual education night at our regular October or November chapter meeting. Students from local programs are invited as guests and the program features someone associated with education. Some past speakers have been Roy Minnick, Michael McGee, Dr. Fareed Nader, Dean Holmann and Dr. Howard Turner from Cal Poly Pomona, Dean Stringer and Assist. Dean Don Deely from Rancho Santiago. Several programs have featured students from CSU Fresno. John Pettley and Tracie Mesloh-Hennon presented a slide show on their surveying adventure in Alaska while working in a BLM cooperative program. John Webee and Krisite Davis spoke about the program at Fresno itself. One evening Karen Koclich spoke about the advantages of a four-year surveying degree and how it benefitted her. Additionally, scholarships are awarded to deserving Fresno and Cal Poly Pomona students. At the October 1990 meeting $4,000 in scholarships were presented. The Chapter gave $3,000, and Bobby Johnson presented the first annual Joseph Bell Hyde $1,000 Scholarship. The Chapter and CFLSE donated $7,600 to Rancho Santiago towards the purchase of a total station. The funds for these types of activities are derived from income from seminars and private donations. On May 11, 1991, a GPS Seminar was held. It was jointly sponsored by the Orange County Chapter and Rancho Santiago College. Forty percent of the profits were given to the school for the needs of the surveying program.

The purpose of this article is not to showboat our accomplishments. It is to encourage those chapters who are not involved in educational activities to think about doing something positive about enhancing surveying education at the local level. The schools are not going to come to you for advice. You must take the first step and make contact. Don't expect an overnight success. A good program starts out slowly and builds as the needs increase.

In 1989, the State CLSA Board of Directors adopted "Educate, Communicate and Legislate" as it's motto. State CLSA's involvement is focused on providing seminars and on annual scholarships. Local programs must be initiated and supported at the chapter level.

In the next issue Mr. Cuomo will discuss the nuts and bolts of developing a program, choosing instructors, and building course outlines. ⊕

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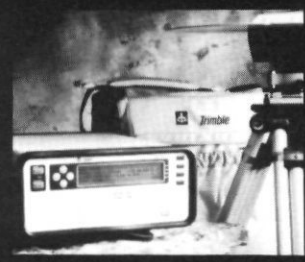

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