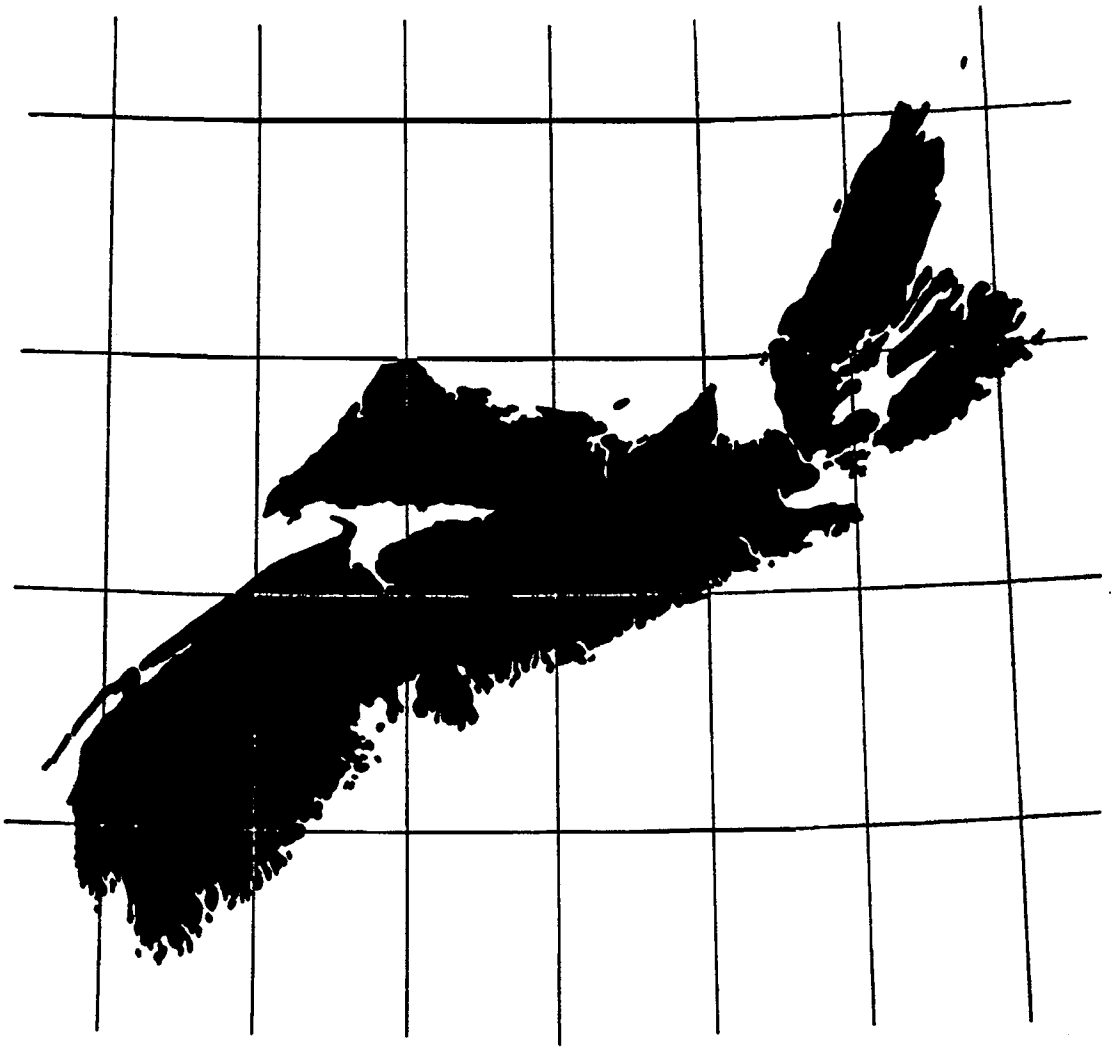
The NOVA SCOTIAN SURVEYOR



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Progress Of Hydrography In Canada

By H. FURUGA, Ottawa

Introduction:

Hydrography in Canada first became the responsibility of the Dominion Government in 1883 and it has grown considerably since that time. The greatest advances, however, have been made roughly within the past decade.

Prior to 1902 all finished work was sent to the British Admiralty for engraving. (I believe the first Canadian fair copy was sent to them in 1886.) Since that date the production of charts has been done entirely in Canada by the Hydrographic Service and this production has run to many hundreds. To accomplish this our Service has grown to many times its original size of two hydrographers and one second-hand tugboat.

Our increase in production, however, has been the natural result of improved methods, instruments and equipment as well as increase in field staff. For example, in the old days soundings were obtained by a leadline. This meant that for every sounding taken a 14-pound lead had to be dropped to the bottom and hauled up again, and a position had to be fixed every few soundings. In deeper water the ship would have to stop or travel slowly in order to obtain the correct depths. Much detail, such as shoals, banks and critical depths, could be missed, but it is remarkable how well early surveyors did without the advantages of modern equipment. Today, with echo sounders capable of producing up to 200 soundings per minute in shallow water and 33 per minute in deep, the same area can be charted at the same scale in a much shorter time, with better coverage and detail.

Similarily, the chart construction methods have changed so that a chart can now be constructed much more rapidly.

Growth in Recent Years:

The demands upon our service have greatly accelerated its growth and have stimulated the search for, and adoption of, better methods, materials and equipment. We did very little surveying in the North before the Second World War, but now we have several survey units operating every summer in that vastly important and difficult region. With the entry of Newfoundland into the Confederation, we now have the formidable task of charting all of the coast around the island and the entire coast of Labrador.

So great has been the increase of our work on this coast that it was found necessary in 1959 to open a Regional Office in Halifax similar to the one on the west coast. Housed at present in temporary quarters, this office will eventually move into the new buildings of the Bedford Institute being constructed on the Dartmouth side of the Bedford Basin. Oceanographers and other scientific groups concerned with the marine sciences will share occupancy of the Institute buildings with our Regional Office.

In recent years the number of small boats has increased rapidly to great numbers in the inland lakes and rivers as well as on the coasts. This has accelerated the demands for small boat charts and we have made a start on the production of such charts. This is a relatively new field of endeavour for the Hydrographic Service and we are well aware of the work load that it will create for us.

During the depression and the Second World War, this Service had a field staff of about eighteen, a chart construction staff of sixteen, a hand revision staff of two. Between 1946 and 1960 the number of hydrographers increased fivefold, from 18 to 95. During the same period, the chart construction staff increased at a similar rate to 80, and the hand revision staff increased from 2 to 8.

Prior to 1946 the greatest number of ships we had at any time was five. Now we have five ships of our own, three on loan from the R.C.N., and three vessels chartered every summer, a total of 11 ships, another ship, the "Maxwell", will soon be added to our fleet.

The number of sounding launches on hand before 1946 was about 12, while today we have 65.

There has been a fairly steady increase in the number of charts published during the last 60 years, but in the past decade the increase has been much more rapid. In 1910 there were about 45 editions of our charts published; in 1950 there were approximately 450 editions, representing an increase of 10 charts per year. However, in 1960 the number of published, catalogued charts had increased to about 775, which shows an increase of more than 32 charts per year. In other words, from 1910 to 1950, in a span of 40 years, approximately 400 new editions were published, but from 1950 to 1960, in a span of just 10 years, 325 new editions were published, which is a very large increase in production.

Our annual distribution of charts has also shown a sharp increase during the past decade. In 1950 it totalled about 52,000, but by 1960 it had jumped to approximately 145,000. These are only the figures for standard nautical charts. If we count all charts, including Special Charts such as the plotting sheets for the RCN and Fisheries, then the figure for 1950 would be about 118,000 and for 1960 — a quarter of a million.

The production figures themselves do not give an accurate indication of the amount of extra work involved; the greater number of charts published and the larger number of each printed to meet the increasing demand have resulted in the necessity of maintaining a very large quantity of charts. In 1950, the aggregate of hand revisions was about 300,000. In 1960 it had risen to some 920,000. One may wonder why we make hand revisions to our stock. By international agreement all charts must be brought up to date from NOTICE TO MARINERS before they are sold.

The maintenance of charts with up-to-date information is occupying more and more of our time. This maintenance may be done by the hand correction of our stock, as mentioned, by correcting the negatives to produce a "corrected reprint", by issuing an amendment patch, or by issuing a new edition, depending on the circumstances.

Advances in Survey Facilities:

Over the past decade vernier theodolites have been gradually replaced by the internal-reading type and the use of the one-second instruments is becoming common practice. The introduction of the tellurometer has been a great boon to us. We are using it to measure long bases from which local surveys are evolved, whenever it is not feasible to extend control the necessary distance from known Geodetic stations. It has proven to be of great value in areas difficult to triangulate, and we now traverse our sounding control stations and markers where previously we had to spend considerable time and effort in triangulating the stations either from shore or by ship stations. The latter was a time-consuming method and not very accurate even under the best conditions. In the north, where normal Geodetic nets

do not exist, the tellurometer has proven to be very valuable in running the control from shoran stations to the coast. These shoran stations are generally located several miles inland.

Many other advances have been made in the electronic field and we have been quick to take advantage of the benefits these advances have afforded in the field of position fixing. Decca, a very accurate electronic positioning device, has been used by the Service for the last seven years. It has proved to be invaluable when charting offshore beyond the sight of land. Visual fixing used to be the limiting factor in the extent of our accurate surveys offshore, but with Decca our surveys may cover areas well over 100 miles out to sea and sounding operations need not cease because of fog, rain, haze, or smoke, as they must do when positions are obtained from visual fixes. We are using both two-range Decca and the conventional navigational Decca chains, with survey receivers, in some of our survey units. The Two-range Decca, can be set up wherever required, but the conventional system utilizes the Decca chains established for navigation. The Two-range Decca is more accurate due to the configuration of the propagation pattern and the choice of suitable sites where the transmission path over land is kept to a minimum. The velocity of propagation of radio waves over land differs from that over sea water and therefore in order to maintain a nearly constant velocity, transmission over a medium of uniform conductivity is mandatory for accuracy. The sites selected have had almost a total seawater path in the survey area. On the other hand the conventional system utilizes the Decca chains set-up for navigation, and these chains have been located to give a wide coverage and not just a local coverage as is possible with the Two-range, so that transmission over land is unavoidable and the percentage of land path could be very high.

Numerous other electronic positioning devices, applicable to inshore surveys, have been tried out but we have not adopted any particular one of them. We have tried out, or observed in operation, Radar, Hydro-dist, Hi-Fix and the Micro-Wave positioning devices.

Not only are the instruments we use improving but also the ships we use are gradually being replaced by modern vessels. The oldest ship we have at present, C.N.S. "Acadia" is almost 50 years old and is probably one of the few coal burners still in operation. The newest is the "Baffin". All of our major ships will carry helicopters, which are a great asset to our surveys. They have outmoded the old method of battling one's way through thick underbrush and up steep hills to build survey markers on the summits.

The materials we use in the field are steadily improving. One of the more important advances made within the past decade is the use of transparent stable-base plastic sheets. This saves one step in the transfer of the field data from the working sheets, or boat boards as we call them, to the main field sheet. The old method entailed tracing off the control and any other requisite information from the field sheet and transferring to a plain white sheet of heavy paper, often the back of a cancelled chart. These were our work sheets or boat boards, upon which each launch party of the ship would plot its sounding fixes throughout the day. At the end of each day all the sounding lines were traced off the boat boards and transferred onto the field sheets. With the transparent, stable, plastic sheets, the boat boards could be traced directly off the field sheets; similarily, the day's work could be transferred directly onto the field sheets. The newer types of plastic sheets can also withstand a lot of handling, and even if they get covered with water no harm is done.

We are also using the stablebase plastic sheets and laminated foil paper sheets for our field sheets to replace the old linen-back heavy paper sheets. The fact that these materials are not subject to change in scale by any appreciable amount is the important factor for their use. Field sheets of transparent stablebase plastic also save a step in the initial stage of chart construction.

We are gradually recognizing and utilizing the fact that field sheets can now be laid out almost to the stage of being ready for sounding before the field season

begins. An accurate plot of the shoreline and other salient shore features can be made from controlled aerial photographs; therefore all that remains to be done in the field before sounding is to build stations and sounding markers at suitable and identifiable locations. This can dispense with part of the normal triangulation observing, computation and plotting. However, in practice some of the stations or markers have to be fixed by sextants or other means, from positively located stations. This method is actually suited for surveys at small scales and for areas where the shore has a fairly steep slope. Small-scale sheets do not show up discrepancies. Where the fore-shore is comparatively flat, a rise of 1 or 2 feet of tide may cover several hundred feet of ground, which means that photogrammetrically the shoreline would be difficult to plot accurately. Flights at low and high water would overcome this to a great extent but this is more costly and often difficult to attain. A better method, especially for larger-scale work, would be to establish the requisite stations and sounding markers before the aerial photos are taken so that they will show up in the aerial photos for positive identification. Also, if the main stations were triangulated, it would provide more control points and therefore result in a more accurate plot. The survey of the Ottawa River from Ottawa to Carillon will utilize this latter method, and surveys such as those of North Channel, Georgian Bay, Moosonee, Vancouver Harbour and the Ottawa River above Ottawa, have been conducted in the same manner.

Advances in Chart Construction Methods:

The advances in survey facilities have created the necessity for improved processes and techniques to put in chart form the increased volume of more precise data being submitted from the field surveys.

The major advances are in new materials now being used, such as stablebased plastic films and laminated foil paper replacing the unstable paper work sheets that have already been mentioned. Plastic flims have also been adapted to the photo-lithographic processes and have enabled tremendous gains to be made in the whole field of map and chart production. These basic changes in techniques have resulted in the adoption of new instruments, inks, procedures and attitudes. One of the more important changes is the use of cameras to provide precise scale adjustments to basic data so that the resulting photo-positives can be assembled into a mosaic of the chart to form a transparent compilation media. This replaces old reduction methods such as squaring down, pantographing, and saltzman projectors, and provides mechanically accuracies far beyond the average human skill. The age-old method of copper plate engraving has now been replaced by the photolithographic process of fair drawing for photography, but the engraving of plastic, also known as scribing, has now evolved with simple and efficient tools, some of which are made in our office, to further improve the quality and reduce the time costs of production.

The hand lettering of charts, once considered the ultimate in drafting skill, has been replaced by type setting all nomenclature, notes, soundings, and other text that appears on charts.

In our new quarters in the Surveys and Mapping Building in Ottawa, our chart construction offices are air conditioned and can now be maintained at a constant temperature and humidity, which is of importance in maintaining a constant scale in the materials used. It is also more comfortable for compilers and draftsmen, during the hot and humid Ottawa summers.

Developments in Tide, Water Levels and Currents:

At one time survey parties based a man ashore to read a tide staff scale, but today all parties are equipped with automatic self-recording gauges. Even these initial self-recording gauges have had their recording media changed first from 24-hour graphs to one-week graphs and now to continuous strip graphs.

Many of the float-operated gauges are being supplemented by pressure gauges, either pneumatic or electrical, for use where wharves or any other suitable structures are not available.

Telementering gauges are now found in various stages of development for use in difficult sites and for long distance transmission to a central office.

The current meters we have been using have also changed. Observations of currents were at one time confined to brief samples in surface waters, using free drift-poles or non-directional meters. Now our standard equipment consists of automatic self-recording current meters capable of measuring speed and direction at any depth on the continental shelf for periods of two weeks or more.

All the tide and water level heights were formerly scaled off by hand, but now they are abstracted by a semi-automatic tabulating machine which records the values directly onto tapes or punch charts for analysis.

Ten years ago all harmonic analysis of tides and currents was carried out at the Liverpool Tidal Institute in England. Today, a great majority is done in an electronic computer by our own people.

Upon looking ahead, who knows exactly what the future will have in store for us? Much of what is common-place to us today was beyond the widest imaginings of earlier surveyors and compilers. Perhaps we will be able to conduct our surveys merely by pressing a button. There are some of us who would like to use a device that would sound by remote control from shore so that hydrographers would not have to go out in pitching and rolling ships. There is also speculation that a submarine type of craft will one day be able to obtain soundings and accurate positions under ice.

If a device could be invented that would automatically and accurately plot the ship's position, scan and record the latest soundings at fixed intervals, reduce the soundings from continuous transmissions from a tidal gauge, and print the resultant soundings onto the field sheet, all at the same instant, we would have a device that would revolutionize hydrography.

Actually, this might not be too far in the future, for we are at present engaged in research into the production of a semi-automatic plotting device. It is expected that this equipment will obtain the position of the ship and the soundings simultaneously and print them onto a field sheet at any desired interval in their actual position. The Treasury Board now has approved an expenditure for research and development of this equipment. We expect that this plotter will be fitted on the "Baffin" next summer, ready for our northern survey.

What Does The Property Surveyor Owe His Client?

By SOL A. BAUER, Civil Engineer and Surveyor, Cleveland, Ohio.

Editor's Note: This article is a slightly revised reprint of a paper presented by Mr. Bauer at the 50th Anniversary Convention of the Ohio Title Association, and published in *Title News*, Vol. XXXVIII, Number 12. Mr. Bauer is well known to members of the ACSM, having been active in Congress affairs for the entire twenty years of its existence. He was Chairman of the Property Surveys Division for several of the early years, then, in 1950, he became President of the ACSM. He is the author of numerous articles published in SURVEYING AND MAPPING and elsewhere. The contributions to the ACSM of which he is proudest, however, are the development and publication, by committees working under his chairmanship, of the "Technical Standards For Property Surveys" and "Equitable Fees For Property Surveys."

PROPERTY SURVEYING or land surveying predates written history. It is generally believed that land surveying began in ancient Egypt along the River Nile for purposes of relocating the land boundaries of the various kingdoms after the yearly floods. It is believed that, for this purpose, base lines were fixed during the dry season on the high ground beyond the reaches of the highest flood waters. The boundary lines of the various kingdoms were then referenced to those base lines by applications of some of the simpler laws of geometry and trigonometry, and, after the floods receded, the lost boundary markers were re-located from those previously established base lines. Titles were presumably guaranteed (in those less complicated times) by the sizes of the armies of the various kingdoms.

The Bible, too, has many references to land boundaries. In fact, the Book of Joshua is largely a series of land descriptions which, incidentally, are no worse than many that are still on our deed books within this very county.

Land boundaries even in biblical days were important, and seemingly boundary disputes existed or started then. For instance, in Deutronomy, chapter 19, verse 14, we read: "On the property which you inherit, which the Lord, your God, is giving you to occupy—You must not remove your neighbor's land mark which the early inhabitants put in place." In chapter 27, verse 17, we find: "Cursed be he who moves his neighbor's land mark and all the people shall say, 'So Be It'."

There are many other records in the Bible indicating that land ownership carried with it throughout the ages the questions of location of boundaries, their permanence, and their marking.

We surveyors do not want to compete for the title of "oldest profession in the world," but surveying apparently runs the accepted oldest profession a close second as to time, in any event, even if not in other respects.

EARLY INSTRUMENTS

During the 19th century the standard surveying equipment consisted of the open-sight compass, which was in active use from before 1842 to 1924 for observing bearings, and the Gunter chain for measuring distances. The open-sight compass supported by a single rod called the Jacob staff, and balanced by hand, was a very inaccurate instrument as compared with our present day instrumentation. Bearings could rarely be observed much closer than the nearest quarter of a degree.

The Gunter chain of 66 feet was designed by and named after Edmund Gunter, an English astronomer. He chose this particular length because 10 square chains of 66 feet on a side make one acre of 43,560 square feet and 80 linear chains make one mile of 5,280 feet, making computations quite simple.

The Gunter chain is composed of 100 pieces of iron wire, each called a link and each about 8 inches long. Each link was bent at each end into a ring fitting into the ring of the next link. A 66-foot chain, then, was a heavy piece of equipment, and occasionally surveyors used a 50-link or 33-foot half-chain as a more manageable device. This fact often led to trouble because line lengths were recorded in terms of chains, sometimes without indication of whether a half or full chain was used. Somewhere in this county is a deed calling for distances by chains, but adjoining titles indicate that the same number of half-chains was intended. Chains were often made by the local blacksmith, each according to his own idea of the length of the 8-inch link. Even when made with thin wire, the chain was very heavy, and had to be pulled with great force at its ends to take out the sag. Such pulling tended to elongate the rings at the ends of the links, thereby increasing the length of the chain.

The Gunter chain, then, was not a precision measuring device, but it served its purpose notably for at least 100 years.

At about the beginning of this century, the surveyor's transit reading to the nearest minute of arc began to replace the open-sight compass in this vicinity, though to this day the open-sight compass is in limited use in some regions.

The surveyor's transit remained almost unchanged in design until 1921, at which time a Swiss inventor named Dr. Heinrich Wild built an optical theodolite. This is a departure from the old surveyor's transit in which the silvered circles were replaced with graduated glass cylinders and the vernier was replaced by an optical micrometer, enabling the instrument to be read by microscope to the tenth of a minute or even to the nearest second.

The surveyor's chain of 66 feet gave way at about the same time to the surveyor's tape of 100 feet in length which modern procedures can produce to a high precision and uniformity of absolute length.

The mathematics of surveying has remained as it started—that is, geometry and trigonometry.

BOUNDARY LAW

The legal phases of surveying have remained as they were, that is, based upon English Common Law, aided, abetted, and contradicted by subsequent court decisions or local custom. The law of boundaries of our courts remains to this day as the essence of land surveying.

So property surveying is a hybrid art made up of two principal component parts: (1) the law, and (2) engineering. Which is the more important it is difficult to say, though clearly the legal or title phase is the more difficult, since it is not so readily reduced to sets of rules or formulae as the engineering and the mathematical phases of surveying can be and are.

Many papers and books have been written on the law of boundaries. The two best known books on the subject for use of surveyors are "Surveying and Boundaries" by Clark and "Boundaries and Adjacent Properties" by Skelton, both published by Bobbs-Merrill. Clark was a member of the Minnesota bar and Skelton was assistant professor of civil engineering at the University of Maryland.

It is an accepted fact in the profession that the legal description of a property is the controlling document governing the work of the land surveyor. One of the best papers on the subject is rightly entitled "Property Surveys Must Fit Their Titles," written by William C. Wattles of Los Angeles. Mr. Wattles, now retired, is known as the Dean of Surveyors on the West Coast, and was for a long time chief engineer for the Title Insurance and Trust Company of Los Angeles.

IMPROVEMENTS

During the last 30 years or more, great changes have taken place in the design of surveying equipment. The transit and theodolite have been improved for greater efficiency and accuracy of observation; atmospheric conditions remain the limiting factor in angular accuracy. Tapes are now made of lighter and more durable steel ribbon and of more uniform absolute length, but otherwise quite like those of 30 years ago. One widely used tape, checked in our office over a period of 15 years, has an average accuracy as to absolute length of 1 part in 30,000 at 68 degrees and 20 pounds, or an average error of about 1/25th of an inch in 100 feet. At a tension of 19 pounds at 68 degrees, this tape has an average accuracy of one part in 50,000 or about 1/40th of an inch in 100 feet. The greatest problem in the matter of accurate measurement of distance by tape still remains that of determining the temperature of the tape at the time the measurement is made. Tapes are generally manufactured to be 100.00 feet long at 68 degrees with a tension of 20 pounds at the ends when supported only on the two ends, or 10 pounds when supported throughout. A fifteen-degree change of temperature will increase or decrease the length of a 100-foot tape by 1/8 of an inch, making an error of 1 part in 10,000. Careful surveying procedures require that these temperature changes be considered and that lengths of lines be corrected accordingly. For high-precision, geodetic surveying, invar tapes are used. Invar is a nickel-steel alloy and has such a low coefficient of thermal expansion (about 1/25th that of ordinary steel) that the effect of temperature change can be largely ignored. However, invar tapes have their limitations—they are prohibitively expensive and too brittle for ordinary use. They are also unstable and change in absolute length in an unpredictable manner.

The big change in linear measuring devices has come about in the last four or five years. There are two such new linear measuring devices. The first of these developments is the Geodimeter, developed in Sweden. This instrument employs a modulated light beam directed from an apparatus set up at one survey station to a reflector set up at a second station. "The distance between the two stations is determined as a function of the phase difference between the emitted beam and the reflected beam," (it says in the book), "and the precise value of the velocity of light." The system requires clear weather, some darkness, and an unobstructed path between the two stations. Distances up to 25 or 30 miles have been measured with an accuracy good enough for geodetic base lines. The manufacturers claim an accuracy of 1 to 2 parts per million for distances of 10 to 30 miles. The Geodimeter also gives good results for short distances. The manufacturers claim that distances as small as 50 feet can be measured with suitable accuracy. It is not affected by moving or stationary objects in the vicinity of the stations or the sight-line. Distances have been measured with the Geodimeter while a long freight train was crossing the line of sight between transmitter and reflector, enough light getting through between cars to be measurable.

Soon after the introduction of the Geodimeter, another valuable, distance-measuring device, the Tellurometer, became available. Developed in South Africa, the Tellurometer, in effect, "utilizes a modulated radio signal transmitted from a master unit set up at one survey station and received and retransmitted by a remote or slave unit set up at a second station. The phase of the return signal is compared with that of the initial signal, and the distance is derived from the phase difference and the known velocity of the radio waves." Again I quote from the book.

The Tellurometer can be operated by day or night; it can penetrate haze, smoke, fog, clouds, light rain, and even a limited amount of foliage or timber if the obstruction is not too near one of the stations. At an optimum distance of 10 to 25 miles, it has an inherent accuracy of 1 part in 300,000, plus or minus 2 inches, the 2 inches being independent of distance. Distances of 40 or more miles can be measured under favorable conditions. The Tellurometer is less accurate for distances of less than one mile since the basic error of 2 inches would be unacceptable for short lines. The system is affected by reflections from nearby moving objects such

as people, vehicles, or waving grass. A year of experience by the U. S. Geological Survey indicates good results.

About 100 years ago, surveying calculations were done by graphical means—that is, by drawing the boundaries with care and scaling the wanted lengths on the drawing. The more careful practitioners who were familiar with the mathematics of trigonometry relied upon logarithms and logarithmic functions for solutions of unknowns.

Early in the 1920's the manually operated calculating machine used in conjunction with natural trigonometric functions came into wide use—to be supplanted in a short time by electrically operated automatic calculators and more recently by electronic computers. Electronic computers are appearing with surprising frequently in spite of their very great cost and the new techniques that must be learned for their operations. Much work is being done now to "program" the calculations for entire subdivisions for calculation by electronic means.

Since 1920 photogrammetry—that is, plotting or surveying from aerial photophotographs viewed in stereoplotting instruments—has reached a high stage of development. Stereoplotters ranging in cost from a few thousand dollars to well over a hundred thousand may be bought; and, although it is true that photogrammetry has largely replaced ground surveying methods for topographical surveys, particularly of large tracts, photogrammetry probably will not entirely replace ground methods for land surveying for a long time to come, if ever.

It should be reported, however, that photogrammetry was used for land acquisition by TVA with great success. There the problem was only that of determining area for purposes of payment for land purchase. Although it was assumed that points or lines determined photogrammetrically probably were accurate to only plus or minus 10 feet, the land values in the area were so low that this probable error did not justify the slower and more expensive, though undoubtedly more precise, ground survey method. The Land Title Guarantee and Trust Company of Cleveland used applications of photogrammetry in its title work on land acquisition for the Ohio Turnpike.

BOUNDARY TITLES

In other respects, land surveying remains dependent upon the law of boundaries as interpreted by our courts, with particular weight being given to "monuments" — whether natural, artificial, or title as by reference to boundary titles.

The level of the practice of land surveying generally varies directly with the level of title work in any given community. A "tough" title company in any community means above-average, land surveying practice. That is probably why surveying procedures in and around large cities usually are so much more detailed than in outlying communities. Of course, high land values such as are found in and around large cities account for both better surveying and better title procedures.

ERRORS VERSUS MISTAKES

At this point, I should explain the term "accuracy" as I use it. The accuracy of an observation is measured by its "error." Please note that it is a physical impossibility to make any observation, whether of angle or distance, with absolute accuracy—that is, without error. May I point out that "error", as used here, is not the same as "mistake". Mistakes are generally large in quantity and totally unpredictable. Errors generally are small in size and generally are predictable as to effect, and thus are capable of mathematical adjustment. It may be clearer to explain that errors as referred to in measurement are similar to tolerances in dimensions of machine parts.

The recording of a wrong figure—a 6 for a 9, for example—is a mistake— a booboo or a goof, if you want—but not an error. Dropping or forgetting a tape length is a mistake. Calling a line 10 chains long when a 33-foot or half-length chain was used is a mistake, unless the chain length is stated.

The variation of length of a tape caused by changing temperatures is an error. Its probable effect can be determined, within limits, if the tape temperature is known. A tape that has been stretched by overuse creates an error. Careful observation procedures and good measuring devices permit the surveyor a high accuracy with most modern equipment. A surveying accuracy of plus or minus 1 part in 10,000 is readily obtainable with ordinary care and good instrumentation in flat country. In fact, an accuracy of plus or minus 1 part in 20,000 is not difficult to obtain in this county. I should repeat here that the accuracy of an observation is determined by its "error" and in saying "an accuracy of 1 part in 10,000" we really mean the observation has an error of 1 part in 10,000 or *less* — that is, an error of not more than about 1/8 inch in 100 feet.

FIRST RULE OF SURVEYING

As the first rule in surveying, I would suggest: "Take nothing for granted, trust no one, not even yourself. Check and re-check everything." Don't be too ready to blame "the other guy." He is sometimes right.

It is not a surveyor's job to "fix" property lines. He is rarely in a position to "establish" a boundary line unless it is a new line just being created. Most property surveying is for the purpose of reestablishing old lines. In these cases the job of the surveyor is that of a fact finder. Starting with the deeds of record and other pertinent data, the surveyor's job is to find all facts (both those in agreement and those in disagreement) that apply to the problem in hand and from which an opinion as to the best location of the property line can be reached.

The surveyor may express his opinion based upon the facts he has found and may accordingly recommend the use of a certain position of boundary, but as a surveyor he does not have the legal authority to "fix" a line. It is one of the interesting facts of surveying that the surveyor has no legal right to fix boundaries, that being the right only of a court of law. However, it is a strange and satisfying fact that, having none of the privileges of lawyer, judge, or court, the property surveyor can and does exert the influence of all.

ACCEPTANCE

One of the chief rewards in this profession of ours is the willingness of title companies, lawyers, courts, and owners to accept the opinion of a surveyor on matters of title, not because he has any legal status but merely because he has presented his case with a thoroughness and sound reasoning that, combined with an established reputation within his community for technical skill, knowledge, and integrity, give his work and word an authority that is accepted by those who have the power and function to translate his opinions into decisions with the weight of law. In some 35 years of practice in the city of Cleveland, this writer has appeared in court only once to dispute the work of another surveyor. It developed that we agreed. On the other hand, large numbers of titles have been changed and corrected without court action, merely because of the willingness of title companies to accept work from this and other offices where such work indicated careful, studious, and detailed investigation of conditions by surveyors of recognized professional standing. Acceptance of a title change by a major title company in practice generally carries all the weight of a court decision, since rarely is it contested. That extra-legal privilege of the surveyor is the best indication of the service he is rendering the community.

So, a surveyor of long standing and of good repute will often have his opinion accepted by attorneys, title officers, and even the courts, thereby giving his opinions the legal weight they otherwise would lack.

The land surveyor has many problems in addition to clients—or the lack of clients. One of the most trying problems that we have encountered is the unwillingness of clients (principally mortgagees and lawyers for mortgagees) to accept or even want to receive survey reports that show some difficulty of survey or title.

It would seem that, when a client decides he needs a survey, he would then want a full impartial statement of all facts pertaining to the property, favorable and adverse. However, a mortgage broker who has already resold a mortgage does not want to know that there is a title gap or building encroachment affecting the property.

The obligation of the surveyor as fact-finder is to report all facts pertinent to the property, good, bad, or indifferent. The importance of the facts is not his concern, but that of the client.

May I assure you that in 35 years of practice I have seen very few cases where a surveyor reported a situation other than as he found it. He may have been wrong in his finding but, right or wrong, that's the way he must report it. We surveyors are a stubborn lot. Stubborn and sometimes wrong but generally honest.

Too often the surveyor is expected to do title search. Many of our large industrial holdings are accumulations of purchases and accruals through street vacations, altered by half-forgotten conveyances, street alterations, and so forth. It is generally held by surveyors that the client should furnish the surveyor with a description of the land to be surveyed. Good practice often makes it advisable for the surveyor to check ownership and title through such means as he may have at his disposal. But title search is not the function of the surveyor except for verification.

Together with the surprisingly recent developments in surveying practice has come a coincidental improvement in surveying professional consciousness.

STANDARD OF PRACTICE

Until 1940 there existed in the United States no land surveyor's association of more than local scope. In that year a few leaders of surveying practice and surveying teaching formed the American Congress on Surveying and Mapping, with headquarters in Washington, which now has several thousand members in some fifty countries. In 1943 ACSM formed a committee of surveyors in private practice in all parts of the United States to formulate, for the first time in the long history of land surveying, a standard of practice for property surveying. That was an answer to the frequent question: "What have I a right to expect when I order a survey made?"

In 1946 the committee presented such a standard in the form of a three-page document to the ACSM, which approved its adoption as the official pronouncement of the criteria and requirements of a land survey properly performed in the United States.

Briefly, that document sets up standards with reference to land titles and locations as follows:

Every parcel of land whose boundaries are surveyed should be made conformable with the record title boundaries of such land.

The surveyor, prior to making such a survey, shall acquire all necessary data, including deeds, maps, certificates of title, and data on centerline and other boundary line locations in the vicinity. He shall compare and analyze all of the data obtained, and make the most nearly correct legal determination possible of the position of the boundaries of such parcel, as an office solution. He shall then make a field survey, traversing and connecting all available monuments appropriate or necessary for the location, and coordinate the facts of such survey with the predetermined analysis. Not until then shall the monuments marking the corners of such parcel be set, and such monuments shall be set in accordance with the full and most satisfactory analysis obtainable.

In reference to maps, the standards are as follows:

Every land survey requires a map properly drawn, to a convenient scale, showing *all* the information developed by the survey; also a proper caption, proper dimensions and bearings or angles, and references to all deeds and other matters of record pertinent to such survey, including monuments found and set.

SURVEYING COSTS

Along with other costs, the cost of property surveys has risen very materially since the last war. This is in part due to the fact that salaries of competent men have increased greatly, probably three times. Traffic has become so congested that survey work in city streets is greatly slowed down. In addition, surveying accuracies and the requirements of clients and title companies have increased and there is a rapidly growing problem of street monuments being destroyed. The ravages of time alone account for destruction of many monuments. The installation of utilities and building construction destroy many more monuments, but, of late, the destruction of street monuments has been going on at a wholesale rate. In blacktopping city streets, it is standard practice to lay down a uniform thickness of asphaltic concrete upon an old pavement, covering manholes, valve boxes, and monument boxes impartially. It is part of the accepted program that the paving contractor will come back, dig up the various manholes and valve and monument boxes, and raise them to the level of the new blacktop. In spite of the fact that most contracts provide for extra payment for the raising of these structures, many times they are left buried under several inches of blacktop. Often when they are raised, the process of moving shatters the old stone monuments which they covered. In that way we lose many of our oldest street monuments. The cost of reestablishing a lost monument can add very greatly to the cost of a property survey.

It is an erroneous assumption that the cost of a property survey can be materially reduced by keeping the observational accuracies within what some people like to call "practical limitations." Actually, the only way materially to cut down the cost of property surveys is to short cut the job, i.e., to cut down on the amount of investigation, field and office, the checking of deeds and titles, the running out of lines, and the elimination of a full conformity to the calls of the deeds and titles, or, in other words, to perform in a manner short of that recommended for good practice. Such short cutting is a dangerous procedure and is the basic cause of most of our badly involved survey title problems.

DESCRIPTIONS

The practicing surveyor has many problems that cause him to age rapidly. One such problem is the matter of the legal description that ends with the statement: "According to a survey made for ..... by ..... on the date of ....." There is nothing wrong with that statement if the description which it follows has been prepared by the surveyor to whom it refers. Too often, however, the description is prepared by someone other than the surveyor. The words attached lead others to believe that the entire description and survey are the work of the surveyor. It is the opinion of this writer that it is an improper procedure for someone other than the surveyor to draw up a description and use such an ending, though it would seem that an acceptable modification might be as follows: "The bearings and distances contained in this description are taken from a survey made . . ." The latter phraseology provides the information without the implication that the surveyor worded the legal description.

REWARDS

There are many other problems in the life of the practicing surveyor into which we need not go at the present time. It is a highly-detailed, painstaking job if done properly, and with small financial rewards. It has often been said that the surveyor's principal function on a construction job is to take the blame for whatever goes wrong with the job.

However, land surveying does have its rewards. Difficult surveys, if and when successfully completed, often have the fascination of a difficult puzzle, and there always remains the possible satisfaction of a job well done, because occassionally we are appreciated.

Professional Status Of Land Surveyors

By TRACY B. SLACK

Tracy B. Slack * — I write in answer to Curtis M. Brown's article appearing in the March (1960) issue of the Quarterly Journal of the American Congress on Surveying and Mapping, "The Professional Status of Land Surveyors."

While I must assume that Mr. Brown's desire is to "Lift up the fallen (or falling)" I am considerably irked by his opening remarks which include: "First, he can have subprofessional standing with low educational requirements and minor areas of practice, or second, he can bring himself up to the standards of the *better professions* (italics mine) and assert himself in a larger area of practice."

In his paragraph which begins "Without doubt the educators are the most severe critics of our reputation, and their criticism has justifiable merit," I say "Merit be hanged!" since engineering professors have failed miserably to teach land surveying properly and by contrast have graded land surveying down and sometimes out. Mr. Brown moralizes with regard to low fees on the one hand and working as a public-spirited citizen with less regard to fees on the other.

I deduce from Mr. Brown's reference to a "better profession" an apology for the land surveyor, suggesting that a land surveyor is in some sort of competition with a doctor, lawyer, clergyman, or perhaps a civil engineer!

I do not hold with the idea that the American Society of Civil Engineers is altogether capable of deciding whether land surveying is or is not a branch of civil engineering. Their wavering tactics suggest a fear for the security of their own positions. Their attitude smacks of the old bromides about "being careful of the company you keep," " one cannot be too careful," etc. Another conclusion to be drawn is smugness. A pity.

The engineering schools have little more to offer as "educational requirements" to a student in land surveying than the mechanics they offer the student of civil engineering. During my forty years as a practicing land surveyor (and somewhat of a civil engineer) I have seen but one major effort as text for the land surveyor, and that from the pen of Mr. Brown and his coauthor Fred H. Landgraf, though I do not take lightly my T. Baker, C.E.'s "Land and Engineering Surveying," published in London. I gather that a land surveyor would be accepted if he should emerge as somewhat of a civil-engineer, or, in other words, "Can't we dress him up in some sort of way so that he will look good enough not to embarrass the civil engineering profession which has rather hesitantly included land surveying as a branch of civil engineering?"

That "professional stature cannot be attained by self proclamation" is another fallacy. If a land surveyor has a complex about "being left behind," would this not parallel the seeming complex of the dentist who refers to himself as "doctor?" It is true that it is too easy in some States to practice or register as a land surveyor and a great deal of harm is done permanently to both the profession and to land records. I also fail to grasp Mr. Brown's concern as to "What others think of us" since, if we feel secure in our skills and integrity, we have "professional stature."

There are many new, fascinating, mechanical devices—all the way from photogrammetry to license numbers on monuments—suggested as ways of improving the grade of a land surveyor. I contend that these new and revolutionary methods available to the land surveyor are important mechanical devices, but nevertheless to a great extent as much an affection as the would-be orator's use of high-flown language, when he would do well to emulate one W. S. Churchill. Contemporaries

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have been exercising their mechanical skills for years; setting beautifully monumented, exceptionally well closed, and artistically delineated property plans, where property bounds do not now, nor never did, exist. I still find myself hypnotized by these things.

Appropriate to the seeming thread of a combination of sincere alarm, apology, a few homiletics about fees, work for the greater glory—regardless of fees, ethics, behavior, etc. and a complex about the land surveyor's "professional stature" that runs through Mr. Brown's undoubtedly dedicated article, I am reminded of the saying "He who pleads his own case has a fool for a client" and another about the native of ancient Scotland, a chieftain, who arrived at the banquet late and sat in the nearest chair he could find, whereupon a nervous flunkey whispered "Mr. MacGregor, you're supposed to sit at the head of the table," at which MacGregor boomed out "Wherever MacGregor Sits is the Head of the Table!" Professional stature" is attained through achievement and pride in a demand for one's skills.

I contend that the correction lies not in these window-dressing attempts and homiletics that tend to show a need of pulling ourselves up by our bootstraps, but in the need of real land surveying courses taught by accomplished land surveyors who have no complexes about how they would grade as civil engineers, and these courses augumented by a thorough course in all that a land surveyor (and a civil engineer) should know about real estate law and conveyancing, to be taught by eminent real estate attorneys who, again, have no complexes about real estate law as opposed to more remunerative civil and criminal cases.

I do not prescribe the above through any complex about "professional stature" but to correct the thesis that land surveying is second-rate civil engineering—that did the practicing land surveyor have degrees in civil engineering there would be no question about his work, regardless of how little he knew about land surveying. Therein lies the whole fallacy for many civil engineers and land surveyors have a wholesome respect for what they do not know about the other's field. The first-rate land surveyor is a superior person who is ethical and has the intelligence to appreciate the importance of his role as sometimes judge and jury—acting for both his client and the "adjoiner". So many times not dishonesty but ignorance, that may prevail despite a college degree, can account for much poor handling of boundary or property problems. These are quite distinct from the problems that attend the mechanics of the purely technical questions which call for more of a "pattern treatment" than the accumulated resourcefulness of an experienced practicing land surveyor. The so-called "woodlot surveyor," whose experience and interpretive abilities are quite superior, is apt to have a complex about these elusive mechanics a little out of his reach, while in reality he should command a wholesome respect for his basic knowledge of land surveying. Just as the medical "specialist" who looks down his nose at the "general practitioner" who plugs away at the homely ailments that may be less spectacular but equally vital, so does the land surveyor plug away at the solution of properties problems that are less spectacular and less remunerative than the more purely technical problems that confront Civil engineer.

Excepting forestry schools, which treat the subject earnestly, if inadequately, there do not seem to be any solid courses in land surveying taught anywhere, currently.

With due respect for the need to examine and employ existing and improved land surveying mechanics, I submit there are no more important attributes than that a land surveyor faithfully interpret, faithfully establish or reestablish and record property monuments without prejudice. An important mechanical feature of land surveying, much neglected, is the establishment of controls, if previously established grids and benches are not economically available.

I have attempted to point out that it is both futile and meaningless to try to equate professions since their importance must derive from a demand and an achievement resulting from the exercise of separate and varying skills.

It should be added that the moral and ethical code prescribed by Mr. Brown should be the usual pattern for all men in all endeavour.

Teaching Geodetic Science In College

By SHUH-CHAI LEE
Institute of Geodesy, Photogrammetry and Cartography, Ohio State University

The General Term, geodetic science, includes geodesy, photogrammetry, cartography, and surveying and mapping; all of which are concerned with measurements of the earth, measurements on the earth, or the representation of these measurements.

Geodesy is one of the oldest sciences in the world and it involves the measurement of the size and shape of the earth. This determination is a fundamental problem of geodetic science, and it is closely related to astronomy, physics and mathematics.

The art of map projection and map construction is called cartography. Maps and charts show the configuration, physiographical and cultural features of the earth's surface. Such maps have been made and used by geographers, navigators, geologists, and military men for centuries.

The work of land surveyors, engineers, topographers, and foresters involves the collection of data for maps. This branch of the geodetic science is called surveying and mapping. Photogrammetry is a type of mapping that is carried out with limited field work. Photogrammetric maps are constructed faster and easier by making measurements on photographs.

Geodetic science has a common scientific background with many fields of study, but only a few universities have an independent and comprehensive curriculum for training students. In the United States, Ohio State University has an Institute of Geodesy, Photogrammetry and Cartography. In Europe, the motherland of geodetic science, the mathematical and physical aspects of geodesy have been emphasized. Other countries of the world have independent geodetic institutions which have professional training programs. However, some of these are for military purposes. Such is the case in China.

In this country, civil engineering graduates are usually considered the only source of technical people trained in surveying and photogrammetry. Ofter cartography, mapping, and surveying are supplementary or elective courses of other fields of study such as geography, geology, forestry, architecture, mining, horticulture, and agricultural engineering. In most cases, extensive study in the civil engineering field is not stressed.

The present status of geodetic science being taught in colleges varies greatly to meet many training requirements. Other technical training is emphasized at the expense of scientific background. In recent years the number of surveying courses in the civil engineering curriculum has diminished. This may be due to the expansion of other areas of study or the assignment of young, inexperienced, or reluctant instructors to the teaching task. The worst fact is that engineering students dislike the tedious computation and drawing, and the manual work of field surveying. At any rate, geodetic science is losing its position of significance in the minds of both students and teachers.

The teaching of this science in colleges needs a cooperative plan and a sound program. These are needed, not only because of the increasing demand for geodetic scientists in this age of space exploration and resources development, but also for the effective use of the facilities and personnel of the modern university. In these respects, Ohio State University's Institute of Geodesy, Photogrammetry and Cartography is a good example. This Institute is well organized in relation to faculty, laboratories, and the departments of Mathematics, Physics and Astronomy, Geology, Geography, and Civil Engineering. The curriculum of this Institute is comprehensive and suitable for the training of undergraduate and graduate students who are preparing themselves as high-quality professional men or future college teachers.

Not all universities would have to offer or could present the graduate-level instruction in geodetic science mentioned above. But if a university has the departments of civil engineering, geography, geology and, of course, mathematics and physics, the curriculum of geodetic science for a Bachelor's degree can be arranged in accordance with the needs of the community or the country. This should be the direction of development of surveying and mapping education in future years.

If some courses in geodetic science are offered but a degree program is not present at a university, as is often the case, the contents of the courses still have to be well planned and organized. For example, surveying and photogrammetry are two basic courses in civil engineering. But some teachers emphasize the technical and engineering phase with few words about the geodetic and mapping significance. Cartography teachers sometimes do not mention the surveying background in the construction of maps. An over-all point of view is necessary to help students attain a thorough knowledge of this science.

Tables I, II, and III show the writer's schedules of lectures and laboratories for courses in Elementary Surveying. Advanced Surveying, and Photogrammetry in the National Taiwan University, Taiwan (Formosa), China, in the years 1951-1957. The writer does not think it is sound for every case, but it was, he believes, satisfactory for the circumstances of that university. The students came from the departments of agricultural engineering, hydraulic engineering, civil engineering, geography, geology, forestry, agronomy, and horticulture and were at different levels of undergraduate and graduate study.

The contents of lectures and laboratories are the backbone of instruction of geodetic science. Classroom techniques also contribute substantially to successful study. Schedules should be well planned and distributed to the students at the beginning of the course. This will impress the students of the course and be helpful in its administration. The other pedagogy responsible for carrying on the schedule; stimulation of students' interest, communication of ideas, assignment of home work, handling of the students in laboratory work, examination and grading, affects the success of the teaching as a whole

In any case, good teachers are the real agent of successful programs of geodetic science in college. They should have been trained wisely when they were in school. The curriculum for those choosing teaching as a career may not be substantially different from a professional curriculum, but future teachers must take the courses related to education and teaching techniques. Later they will carry on good teaching habits to their students.

Whether college education should be general and cultural, or intensive and specialized, has been a controversial topic for many years. In the writer's opinion, this does not constitute a problem because humanities and sciences are well offered and balanced in the curriculums of today's universities. The formulation of a good theme is up to the teacher. A good teacher should not concentrate his efforts completely in his own field, but should also pay attention to developments in other fields. If he can see beyond his own area of interest the similitude and generalization of disciplines and methods prevailing in different fields of knowledge will be appreciated and recognized.

The classroom is only one of the areas of expression for a college professor. For the good of the profession and for his own good too, research should be another facet of his activities. This is especially true in science. In geodetic science, a library with ample references and maps is indispensable. His activities should also extend to participation in local, national, and international professional societies. Exchange of information and ideas is an important part of international cooperation. To an individual, map collecting may not be as easy and popular as stamp collecting, but map appreciation can be interesting, colorful, pleasant, and historical.

The rewards of a teacher in geodetic science are the academic atmosphere of a university and the opportunity for adventure in modern developments. This is more than a title or high salary, even though the teacher is entitled to fair treatment and rewards comparable to industry. The college teacher should have the faith Chinese

scholars have by the Confucian discipline: "The great pleasure of a teacher is being with intelligent students in an intellectual atmosphere.

TABLE I. Schedule for Elementary Surveying

Week	Lecture	Laboratory
1	Introduction and Taping	Distance Measurement
2		Taping Surveys
3	Compass Surveying	Compass Traversing
4		Traverse Computations
5	Plane Table Surveying	Plane Table Traversing
6		Problems of Intersection and Resection
7		Plane Table Surveys
8	Transit Surveying	Plane Table Surveys
9		Introduction to Transit
10		Angle Measurements
11		Azimuth Traversing
12		Deflection Angle Traversing
13	Leveling	Differential Leveling
14		Profile Leveling
15		Hand Level Cross-sectioning

TABLE II. Schedule for Advanced Surveying

Week	Lecture	Laboratory
1	Control Surveys	Reconnaissance for Triangulation
2		Base Line Measurement
3		Triangulation Angle Measurement
4		Adjustment of Triangulation
5		Computation of Triangulation
6		Astronomical Determination
7		Precise Traversing
8		Precise Leveling
9	Detail Surveys	Tacheometric Surveying
10		Topographic Surveying I
11		Topographic Surveying II
12	Map Making	Hydrographic Surveying
13		Map Construction
14	Engineering Surveys	Flow Measurement
15		Engineering Curves

TABLE III. Schedule for Photogrammetry

Week	Lecture	Laboratory
1	Introduction	Cameras
2	Optics and Photography	Photography
3	Photo-geometry	Perspective Drawing
4	Terrestrial Photogrammetry	Terrestrial Photogrammetry
5	Aerial Photography	Flight Planning
6	Vertical Photographs	Vertical Photograph Analysis
7	Ground and Photo Controls	Radial Triangulation
8	Photoplanimetry	Map Compilation
9	Titled Photographs	Titled Photo Analysis
10	Rectification	Rectification
11	Mosaics	Mosaic Assembly
12	Oblique and Composite Photos	Oblique Photogrammetry
13	Stereophotogrammetry	Stereophotogrammetry
14	Photo Interpretation	Photo Interpretation
15	Engineering Applications	Engineering Photogrammetry

CIS STUDENT LOAN FUND

WHEREAS the Executive Council of the Canadian Institute of Surveying is concerned about the status of survey education, as evidenced particularly by the recent colloquium on survey education.

BE IT RESOLVED therefore that the Canadian Institute of Surveying set up a loan fund to assist selected students desiring to major in survey subjects while completing their university course.

THE ABOVE MOTION was passed at the fifty-fourth annual meeting of the Canadian Institute of Surveying.

ITS PASSAGE commits the Institute to the establishment of a fund to assist students of surveying, either at the undergraduate or the graduate level.

THE CIS STUDENT LOAN FUND COMMITTEE has been formed and is carrying out a campaign to raise the necessary money to establish the fund.

AT PRESENT the only Canadian university not having a loan fund for survey students and yet giving a degree in surveying is the University of New Brunswick.

THE PRESENT CAMPAIGN, therefore, will be directed toward assisting students of surveying at the University of New Brunswick.

IT IS EXPECTED that when a similar need arises at another university action will be taken to meet that need.

AT THE COLLOQUIUM on survey education in 1959, Professor S. H. deJong said this: "The fact that present efforts of all Canadian universities are not producing an adequate number of educated men properly prepared for the surveying profession constitutes a challenge to the profession and to the universities to evolve a solution."

YOU CAN HELP to meet this challenge by contributing to the CIS Student Loan Fund.

CONTRIBUTIONS ARE DEDUCTIBLE for income tax purposes.

CONTRIBUTIONS MAY BE MAILED to Mr. R. J. Parlee, Secretary-Treasurer, Canadian Institute of Surveying, P. O. Box 3151, Postal Station C, Ottawa, Ontario, Canada.

CHEQUES SHOULD BE PAYABLE to the CIS Student Loan Fund, not to the Canadian Institute of Surveying.

Endorsement By The President

Surveying as a profession is at the crossroads; either it must stand on its own feet and go forward or it will degenerate to the detriment of all.

Educational standards are the simplest and best yardstick for the public to use in assessing a professional group. To survive, surveying must take its rightful place in university ranks.

To establish it there the support of all of us is needed.

Support in the form of student loan funds was approved by the membership at the last annual meeting.

There is a need, now, for funds. Fill in your cheque and mail to the Treasurer, C.I.S., or give it to the canvasser from your Branch.

G. W. LESTER, President

DEED OF AWARD

Bausch & Lomb Photogrammetric Award

For the Best Paper on Photogrammetry by a College Student

ARTICLE 1. NAME AND PURPOSE.

A. The name of the award is to be The Bausch & Lomb Photogrammetric Award.

B. The purpose of the award is to stimulate an interest in photogrammetry in college students in Canada to recognize meritorius students who display outstanding ability and interest in photogrammetry.

ARTICLE II. VALUE.

A. The award shall consist of a prize of $100 and a year's paid-up membership in the Institute. The award is to be made annually.

B. Bausch & Lomb shall provide for the annual award of the prize and also shall underwrite the incidental expenses of providing each recipient a scroll suitable for framing and of presenting the award.

ARTICLE III. BASIS OF AWARD.

A. Competition for the award shall be open to any regular student (undergraduate or graduate) in a recognized college, university, or academic institution in Canada.

B. The awards shall be made on the basis of papers of not more than 4,000 words in length submitted to the Institute by contestants. Such papers shall describe a new use of photogrammetry or photogrammetric equipment or an adaptation or improvement in the use of photogrammetry or of photogrammetric equipment to any field of study.

C. The papers shall be judged 40 per cent on the basis of originality, 40 percent on the basis of a demonstration of adequate comprehension of the photogrammetric principles involved, and 20 percent on the basis of the organization and English or French used in the paper.

D. The deadline for submission of papers each year shall be October 31.

ARTICLE IV. JUDGES.

A. The papers shall be judged by a committee of at least three members of the Institute, whose decision shall be final. Members shall be appointed by the President of the Institute.

ARTICLE V. PRESENTATION OF AWARD.

A. The presentation of the cash award and of a suitable scroll shall take place at the Annual Meeting of the Canadian Institute of Surveying.

ARTICLE VI. AMENDMENTS.

A. At such time as the terms of this award may become inapplicable to conditions as they exist, the Donor will, upon request, consider suggested changes.

ARTICLE VII. TERM OF AWARD.

A. Award to continue indefinitely subject to agreement of officers of the Institute and Bausch & Lomb.

REGULATIONS GOVERNING

THE SPARTAN AWARD

(Revised, 1958)

1. The name of the award shall be "The Spartan Award."
2. Full responsibility shall rest with the Canadian Institute of Surveying with respect to the administration, selection of recipient and presentation of the award.
3. Presentation of the award shall be made each year at the annual meeting of the Canadian Institute of Surveying.
4. The award shall consist of fifty dollars cash, donated by Spartan Air Services, Ltd., and shall have for its purpose the stimulation of authorship in fields relating to surveying and mapping, including photogrammetry.
5. The winner of the award in any year shall be the author of that article published in The Canadian Surveyor during that year and chosen by the Selection Committee as being the best among those that, in the opinion of the Committee, conform to the intent of the donors as shown by regulation 4.
6. Articles shall be rated upon the following basis:
   (a) Originality
   (b) Practical value
   (c) Conciseness and clarity of expression.
   (d) General interest
7. The Selection Committee shall consist of the Chairman of the Editorial Committee and such other members as may be appointed by the Executive Council of the Institute.
8. The decision of the Selection Committee shall be final.

THINGS ARE TOUGH ALL OVER

TITLE NEWS VOL. XXXVII NO. 12, DECEMBER 1958

In reply to your request to send a cheque for my dues, I wish to inform you that the present condition of my bank account makes it almost impossible. My shattered financial condition is due to Federal laws, State laws, county laws, city laws, corporation laws, liquor laws, mother-in-laws, brother-in-laws, sister-in-laws, and outlaws.

Through these laws I am expected to pay a business tax, amusement tax, head tax, school tax, gas tax, food tax, furniture tax,, and excise tax, and even my brains are taxed. I am required to get a business license, hunting and fishing license, car license, and truck license, not to mention a marriage license and a dog license.

I am also required to contribute to every society and organization which the genius of man is capable of bringing to life: to Women's Relief, the Unemployment Relief, and the Gold Diggers' Relief. Also to every hospital and charitable organization in the city.

For my own safety, I am required to carry life insurance, property insurance, liability insurance, burglary insurance, accident insurance, business insurance, earthquake insurance, unemployment insurance, old age and fire insurance.

My business is so governed that it is no easy matter for me to find out who owns it. I am inspected, expected, disrespected, rejected, dejected, examined, reexamined, informed, required, summoned, commanded and compelled until I provide an inexhaustible supply of money for every known need of the human race.

Simply because I refuse to donate to something or other, I am boycotted, talked about, lied about, held up, held down, and robbed, until I am almost ruined.

The only reason I am clinging to life at all is to see what the hell is coming next!

I can tell you honestly that except for a miracle that happened I could not enclose this check. The wolf that comes to many doors nowadays just had pups in my kitchen. I sold them and here is the money.