

SPECIAL ARTICLETHE SURVEYING REVOLUTION AND THE ONTARIO LAND SURVEYOR *

by R. R. Cuthill

I hope some of you won't be too disappointed but I have decided to entitle my paper the Surveying Revolution and the Ontario Land Surveyor, because when I sat down to prepare it and began to consider the number of computer applications currently in use or under development in the survey field, and the extent to which we intend to go, I came to realize that the computer in conjunction with electronic measuring devices, photogrammetric techniques and control surveys, is destined to become the focal point of a complete revolution in our approach to surveying.

As I considered the problems, however, it became disturbingly evident that the gap between the existing knowledge that could be used by us and that actually being used by us, widens continually.

This evening, therefore, rather than talk about specific applications in detail, I would like to reflect upon the implications that this challenge poses to us as a professional group and in so doing, hopefully provide some perspective on our role within this new technology and some illumination on our attitudes.

I believe it would be true to say that the first problem to contend with is attitude, or perhaps more precisely our ability to readjust ourselves psychologically to the changes in our professional environment. As we are all aware, until the last few years the techniques and principles of performing surveys has remained relatively unchanged over the last two hundred years. The introduction in the last decade of an incredible proliferation of equipment with which the surveyor has had to keep abreast, has been so great and the pace of change in methods resulting from the use of such equipment so rapid, that I suspect the demand is beginning to strain the individual surveyor's capacity to adapt. And therein lies a dilemma. To realize the full potential of such equipment a deeper penetration into the knowledge which made them possible is needed and a deeper comprehension of the knowledge they produce is required. Currently this is beyond the sophistication of the average land surveying user and yet without that sophistication there is no means by which he can absorb this knowledge and translate it into operating rules and methods so essential to the full utilization of the potential afforded him.

Over the years we have spoken at great lengths on the subject of professionalism in the performance of our duties, but is not professionalism more profoundly the ability to envision and create new ways of solving old problems in a manner which benefits the society as a whole? It would appear to me that there has been no reluctance on the part of surveyors to adopt new tools within the context of traditional methods. The development, however, of entirely new methods and principles as a by-product of such tools and which could offer improvement through different procedure and therefore require different patterns of behaviour, or new roles, has had considerable difficulty in penetrating the established order, because of the necessity to demonstrate the desirability of the effects and the fear that changes will favour some members of the organization over others, upset hierarchies, introduce entirely novel skills and demand relearning.

Thus I contend this matter lies on an entirely different plane from that which we have been considering, a plane upon which I would suggest the character of a professional society either rises or falls. The need for upgrading and changing personnel in this

* A paper presented to the April, 1969, meeting of the South Central Group of Ontario Land Surveyors.

environment will become great and I admit that the ways in which this can be done within a short time are seldom clear, but to fail to pursue by continuous education, exploration and research, even within our daily professional practice, the possibilities that are inherent in the new technology is to concede that we are not professionals but merely technicians who must leave the creativity to other disciplines.

I do not think it needs much elaboration on my part to illustrate our shortcomings in this respect. How many land surveyors are there involved in geodesy, photogrammetry, planning, computer programming and engineering surveys? How many land surveyors can articulate the value to society as a whole of co-ordinate systems in their application to legal surveys, engineering, mapping, land inventories, resource studies, registry and land title systems and the development of urban and rural data banks? How many in fact have any working knowledge of these fields, or are prepared to examine the possibility that the application of the knowledge of certain of these fields could not only materially improve the efficiency and quality of their work, but provide them with the means to develop new concepts? Regrettably I put it to you that there are very few, because it inevitably means they must transcend the bonds of tradition established over two hundred years.

Therein lies another dilemma for the computer alone imposes not only new systems with accompanying changes in methods, but goes well beyond the possibilities so far conceived and carried out.

There is under development at this time in several agencies in North America the capability to quite literally predesign and precalculate by computer entire cities, from the basic surveys to the construction of the roads, sewers, bridges up to and including even the last nut and bolt or reinforced bar in the structures of the buildings. More over the possibility to provide not only all the intimate technical details but to simulate alternative schemes, optimize project costs and provide complete project control and management is becoming entirely feasible.

I can assure you gentlemen this is not the flight of a fanciful imagination. Within the next five to ten years this type of capability will become a concrete reality and indeed it must, if we are ever going to cope with the man made artificial environment which is threatening to overwhelm us.

And now comes the crux of the problem. Wherein lies the basic integrating and co-ordinating mechanism to relate all the computer activities which affect the physical growth and development of the society? It lies gentlemen in the implementation, establishment and maintenance of a fully monumented horizontal and vertical control system.

I appreciate that I may appear to be merely reiterating a statement which has been made many times before. I would, however, ask you to consider carefully the context within which it is being made. Our enthusiasm and interest, if it has existed at all, in pursuing this need has been influenced by our continuous preoccupation with the problem of relating legal surveys to a co-ordinate system, a problem in which we heartily engage in polemics and which I do not deny is important to us as a professional group with the responsibilities to ensure the accurate definition of boundaries on sound legal principles, but nevertheless, a problem which from the viewpoint of the sociologist, planner, economist, engineer and computer analyst struggling to control the exponential growth of urban centres and the vast rapidly changing environment man has created seems trivial if not absurd. And why? Because all the information in our social system

is related directly or indirectly to the land parcel and without having at their disposal sound techniques by which they can use computers to store, retrieve, manipulate and accurately correlate and integrate this information and attain compatibility between data files in data banks, their endeavours to obtain a fuller understanding of our complex problems essential to the production of creative solutions, will be frustrated and impaired, if not on occasions economically prohibitive.

Another facet of this problem is evident in the private sector, where we are witnessing the realization that the development of satellite or new cities is contingent upon the existence of accurate horizontal and vertical control as a prerequisite to the computer predesign, pre-calculation and pre-coordination of every feature in the entire development. The irrefutable logic of the approach which enables flexibility of analysis in the practical feasibility of projects and efficiency in their production thus incurring enormous savings in time and money, has already convinced certain large development corporations that a total engineering computing ability should be an essential part of their organizational structure. And how do they view the land surveyor in this mass production system? They view him, if they view him at all, as superfluous, except that they might have to employ him in certain categories of work requiring the definition of legal boundaries because by law they need his signature on a plan. They equate his services for the most part with the very limited function of establishing lot lines and relating houses thereto, not infrequently in a manner more in accord with the eighteenth century than the computer technology of the latter part of the twentieth century.

The implications are alarming, not simply because of the possibility of redundancy, but because of the possibility that these enormous projects may be carried out by computer under very limited professional surveying supervision, implemented by the engineering profession, who have little interest or knowledge of legal surveying, as a purely mechanical stakeout operation and perhaps more important established on the basis of arbitrary co-ordinate systems totally unrelated to an overall Province wide control network.

I do not believe it requires much imagination to recognize the financial loss to the community as a whole caused by the lack of integration. The development of any future automated land registration system using co-ordinate identification would, alone, face insurmountable problems, or a very great expense, in attempting to reconcile title descriptions within incompatible networks.

In this regard the problems of the absence of control systems is no less alarming at government levels. In their frustration to find adequate identification systems and in many instances in their complete ignorance of the surveyor's function, several agencies at various levels of government have embarked upon computer schemes using a variety of arbitrarily digitized co-ordinate systems, which although they are valid for their particular requirements, are totally incompatible with data files in any other system.

I shudder to imagine at the present time the amount of money that will be spent by all the agencies of the various levels of government over the next few years in pursuing the development of totally independent and highly specialized techniques for the storage and retrieval of information. I would judge that it would pay for the establishment of a horizontal control survey system for the Province of Ontario several times over.

I expect some of you may feel at this point that I have strayed rather far afield,

but I contend the subject matter I am presenting is germane to our future role within the professional community as a whole. As our society becomes more complex, mobile and demanding so the planning of its future communities will require the particular knowledge of an ever increasing range of experts working together as a team. A collaborative interdisciplinary effort to develop more effective tools for the management of our precious land resources will be essential. The question then, is not only, will we be able to take our place on this team? But will we be able to provide the leadership to promote the concept and explain the value of that common denominator the co-ordinate system? That framework upon which the computer can structure among many applications, engineering predesign and construction systems, digital or automatic mapping systems, land registration systems and comprehensive interrelated environmental data banks.

I believe that it is well within the perspective of the immediate future of surveying to say that it is the survey profession which must determine how the job can be done best, which must initiate the necessary legislation and which must establish the professional standards and technologies needed to relate every land position mathematically to every other. I do not believe, however, that we can accomplish this task effectively unless we broaden our charter to include those categories of surveying which we currently refer to as scientific. Apart from our need of the knowledge and skills of the scientific surveyor, it would appear more important to recognize that if we do not attain professional unity and widen our horizons we are as a group unlikely to retain our exclusive privilege of defining boundaries of land. Many of the other professions and indeed many of our colleagues in the related surveying fields have, as I believe I have more or less indicated, little appreciation of the laws of evidence assessment and consider our prerogative an unnecessary anachronism, especially when they compare it with the successful co-ordinate cadastral systems in existence in European countries like Sweden, Austria, Germany and Poland and the extent to which those countries have successfully applied their system to the general needs of their communities.

We have been much too complacent in assuming that the current changes in survey education and our higher standards of recruitment will fulfill the needs of our Association in regard to the specialized skills which may become necessary in the immediate future. I fear, however, that the number of university students interested in entering the legal survey field, per se, will be insufficient to provide the necessary leavening in academic standards, because they observe within the majority of survey practices, the perpetuation of unsatisfactory apprenticeship systems with their attendant inequalities in standards, the inculcation of old and outmoded methods and principles, the limited growth potential due to the fractionalization of the legal surveying community and the lack of diversity of surveying interests.

In apposition to this situation, I note further a disturbing trend in the acceptance by an increasing number that any problems of recruitment at a University level can be alleviated by recruitment from the technical colleges, which brings me right back again to the problem of our role in the professional community. If technologists are going to fulfill our needs the implication is obviously that we are not a professional society, in which case our ideas and thoughts on the development of communities will not receive acceptance on a professional level by other professional bodies.

It might appear that I am making an unduly harsh assessment of our situation, but I would not be presenting it, if I did not believe as a Surveyor, that the legal surveyor has a valuable contribution to make to the improvement of our environment and that

in fact, he has a major responsibility to the community to ensure that any automated system of defining boundaries does not set aside the Principles of Common Law and perpetrate a greater chaos on the community than presently exists.

What then is necessary to my mind is a more definitive analysis of our ultimate professional objectives, a more critical examination of our future role and more adequate vehicles of communication, both private and public, to provide the necessary diffusion of ideas. A valiant effort is being made by a few firms and certain members in various government departments to work towards the type of total surveying technology briefly outlined, but they still represent a small minority for whom the significance of the new technology is more intuitive than tangible.

In conclusion I must apologize to those of you who came to hear me discourse specifically on the subject of computers, but the computer is only one tool, albeit a critical one, in a large battery of tools which are complicating our existence and tending to obscure a coherent perception of the total problem.

In stressing the need for a much greater awareness of our relationship to the burgeoning technology I hope I have not given offence in my rather blunt analysis. It does seem to me though, a subject which has been singularly neglected and to rely primarily, as many are doing, on the change in generations is to provide a very weak answer.

We may hope the ability to simulate and compute will enable a more tangible demonstration of the superiority of new methods which will match the power of exhibiting a new tool which is clearly superior to an existing one.

It is also to be hoped that recognition will be given to the fact that in order to induce change it is often necessary to go outside the organization for help and that there is nothing fundamentally demeaning in this, it is a common practice in business and industry. All these possibilities, however, must occur to our membership and leadership powerful enough to carry out the necessary steps must be forthcoming. An inherent circularity has to be broken, if it is not, our competition will accomplish it for us.

-o|s-

THE SECRETARY'S PAGE

CHANGES IN THE OFFICIAL REGISTER

Date 1969

July 2	HALINEN, Eero	1240	New Registration
July 25	HANSON, Robert Thomas	1241	New Registration
Sept. 8	DUNCAN, John Stuart	1242	New Registration
Sept. 16	BARICH, Edward	1243	New Registration
Sept. 26	REDDY, Charles Francis	1244	New Registration
Oct. 3	LANSKY, Theodore Edward	988	Re-joined active list

Admission to Articles

Date 1969

April 1	SIT, Hung Kwan	to	Eathel Welbanks Petzold
May 1	MULDER, Berend	to	Lawrence Tomkins
May 21	OSBORNE, Terry Spencer		
	Albert	to	Michael J.M. Maughan