

The PAST, PRESENT and FUTURE

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In the middle of the 11th Century, the Italian poet, Francesco Petrarca wrote:

"Here stand I as though on a frontier between two peoples, looking both to the past and to the future."

Perhaps no other words could so aptly describe the viewpoint of the Land Surveyor, who, like this ancient poet, often finds that he is compelled to consider both the past and the future in dealing with the present. In fact, only when we have failed to adopt this viewpoint in our preoccupation with the present have we failed to satisfy the demands of our profession, for it has never been the right of the conscientious Land Surveyor to be only concerned with the obvious expediences of the present. We have never known success in contemporary accomplishments. We have succeeded only when our work has accurately perpetuated the intentions of our predecessors and has itself endured beyond a following generation.

Interest in Past

It is easy to recognize our interest in the past, as we are constantly involved in the recovery of evidence of earlier land surveys and in the interpretation of statements recorded years, and even centuries, before our birth. And too, we are prone to take pride in the fact that the recorded history of our profession extends back to the earliest writings of man, clearly showing that its followers were competently performing acts of surveying and making involved calculations of irregular fields more than a thousand years before the first, so-called, stepped pyramid was constructed at Saggara in Egypt.

Our interest in the history of our profession is not without meaning. As Associate Justice Cardozo, who served on the U.S. Supreme Court from 1932 to 1938, wrote in *The Nature of the Judicial Process*, ". . . history, in illuminating the past, illuminates the present, and in illuminating the present, illuminates the future". In *Techt v. Hughes*, the Chief Justice of the New York Supreme Court stated, "Let me speak first of those fields where there can be no

progress without history. I think the law of property supplies the readiest example." Justice Holmes, of the U.S. Supreme Court, stated in *N.Y. Trust Co. v. Eisner* that "a page of history is worth a volume of logic".

Early History

Land Surveying began in the earliest communities at the end of the stone age when man first began to cultivate crops and hold certain tracts of land for that purpose. Some writers have stated that surveying began along the Nile, where, according to Strabo, a Greek geographer who settled in Rome following a journey along the Nile in 24 B.C., each flooding of the Nile removed boundaries and landmarks essential to the determination of property rights. It should be noted, however, that Herodotus, who is often referred to as the "Father of History", visited Egypt more than four hundred years before Strabo was born, and his description of surveying along the Nile did not include any reference to the re-establishment of markers. In the George Rawlinson translation of the *History of Herodotus* we find the following account:

Egyptian Law

"Sesostris also, they declared, made a division of the soil of Egypt among the inhabitants, assigning square plots of ground of equal size to all, and obtaining his chief revenue from the rent which the holders were required to pay him year by year. If the river carried away any portion of a man's lot, he appeared before the king, and related what had happened, upon which the king sent persons to examine, and determine by measurement the exact extent of the loss; and thenceforth only such a rent was demanded of him as was proportionate to the reduced size of his land. From this practice, I think, geometry first came to be known in Egypt, whence it passed into Greece. The sun-dial, however, and the gnomon with the divisions of the day into twelve parts, were received by the Greeks from the Babylonians."

Other authorities have stated that the first surveys of the Nile Valley should be

credited to Rameses II (1291-1224 B.C.), who, some historians believe, may have been the legendary Egyptian monarch referred to by Herodotus as Sesostris. The most ancient Egyptian map known to exist, a map depicting the location and plan of a gold mine, is believed to have been drawn in about 1320 B.C., or about the time of that famous warrior king. Nevertheless, we are certain that this map was not the first plat produced in Egypt and that the surveys by Rameses II were not the first surveys made in that land. Many centuries before the dynasty of the Ramesides, or about 1990 B.C., Amenemhat I began a thirty-year reign during which it was recorded that he "personally superintended a new survey of the land." It is also recorded that an important deity, Khonsa, the plan maker, was recognized at a still earlier date.

Survey Ceremony

In *Man Makes Himself*, Professor Childe describes a ceremony of the Old Kingdom (c. 3200 B.C.) termed "stretching the cord". The ceremony, which was performed by the pharaoh, probably as the initial step toward the erection of a temple, is possibly the oldest record of man obtaining the bearing of True North and establishing a line based on that bearing. The traditional formula as recited by the King has been transliterated as follows:

"I have grasped the peg with the handle of the hammer. I took the measuring line with the Goddess Safekhabui. I watched the advancing motion of the stars. My eye was fixed on the (? Bear). I reckon the time, checking the hour, and determine the edges of thy temple . . . I turn my face to the course of the stars. I direct my eyes upon the constellation of the (? Bear). There stands the time pointer with the hour. I determine the edges of thy temple."

At the time of this ceremony, the star designated Draco alpha, which is also known as Thuban, was the Pole Star. It lies between the Big and Little Bear, or as we generally refer to them, the Big and Little Dipper. The precession of the
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pole, often spoken of as the Great Year, caused by an effect similar to the wobbling of a spinning top, requires about 25,800 years to complete a full cycle. For example, when Hipparchus first recorded the position of Polaris in about 156 B.C., it was nearly 12 degrees away from the point of True North. At that time, the star Kochab (Ursa Minor beta) was the nearest visible star to the pole. In 1860 Polaris was still an average of 1° — 26' — 12"7 from the pole. Polaris is now less than a degree from the pole and the distance is being steadily reduced at a rate of less than twenty seconds a year, until early in the 21st Century when Polaris will reach its nearest approach toward the pole, being only about 28 minutes away. Afterwards it will move steadily away from the pole, and about 12,000 years from now the bright star Vega (Lyra alpha) will serve as the North Star, outshining Polaris, but never approaching nearer than about 5 degrees from True North.

5,000 Years

Although the history of land surveying can be traced back more than four thousand years in Egypt, written records of our accomplishments in the fertile valley of the Tigris-Euphrates river system of the land, once known as Mesopotamia, place the beginning of land surveying at a point in time more than a thousand years earlier and offer indisputable evidence that the first significant advancements in the technologies of surveying were made by the Sumerians — the same remarkable people who first invented writing, developed the first calendar (which, I might add, was substantially the same as the present day Jewish calendar), invented the wheel, the sailboat, soldering, cosmetics, and divided the day into two 12-hour parts with each hour divided into 60 minutes, instituted the first formal schools, produced the first poetry and literature and the first codified laws.

Clay tablets unearthed from the ruins of the ancient towns of Sumer, Kish, Ur, Lagash, Nippur, Shuruppak, Erech and Asmar show records of lands being mortgaged, nine-judge court trials of boundary and ownership disputes, and maps of towns and tracts of land and acreage computations. One tablet shows that they had deduced the circumference of a circle to be the product of $6\frac{17}{60}$ times the radius, or 6.2833 times r . This value is very close to the present known value of 2π (6.2832), when carried to the same number of decimal places. Those of you with long slide rules, who use 3.141592653589793238462643383279 50 . . . as the value of π probably will

not agree.

It is also interesting to note that during the Uruk period, in the 4th Millennium B.C., before the invention of writing, the Sumerians introduced the cylinder seal, which, like the land surveyor's seal of today, was engraved (sic) in intaglio so that the design stood out in relief when an impression was made.

The Sumerian culture, which was undoubtedly one of the most progressive and productive civilizations of all times, lasted until 1720 B.C., when the semitic conquerors of Babylon under Hammurabi finally completed their conquest of the entire area. The "Black-Headed-Ones", as the Sumerians were known, had ruled the region now known as Iraq for nearly two thousand years or more. No other important civilization has equalled that record for endurance.

Vested In Gods

Land surveying did not fade away with the fall of Sumer. The Babylonians introduced marked changes in the patterns of land ownership and made further advances in science and mathematics. During the Sumerian period, title to land had been vested in the gods and rent was paid to the priests instead of taxes. Under the Babylonians, however, we find the first examples of land being held in fee simple. In about 1686 B.C., during the reign of Samsuiluna, a house and corner lot was sold in the town of Sippar, resulting in the following deed of conveyance:

"Two sar, 4 gan of house property; next to the house of Ili-awilim-rabi, son of Shamash-natsir, and next the street; one end abutting on the street, the other on the house of Sinidinnam; from the hands of Ili-awilim-rabi, son of Shamash-natsir, Shamash-bani, son of Kishtiningizida hath bought. The full price, 2/3 mina and 9 shekels of silver hath he paid. The transaction is completed; his heart is satisfied. Never shall the one make any claim against the other. In the names of Shamash, Aia, Marduk, and king Samsuiluna have they sworn. 2 sar 4 gan ceded in possession". (This was followed by the names of twelve witnesses and the date).

Stone Monuments

The Babylonian empire did not survive as long as that of their predecessors, and by 1600 B.C. the Kassites were occupying the throne of Babylon. The authority of the Kassite rulers, however, dwindled during their 576-year reign, and the people found that they could not depend on their rulers for protection of their private property. Because of this insecurity, landowners were not satisfied with written titles to land, and they sought the protection of their gods, erecting stone monuments with divine

symbols, inscriptions giving the history of the property, and threats of vengeance against anyone who should alter or move the monuments engraved upon them. Many examples of these boundary stones, or kudurrus, have been preserved in the various museums around the world. One such inscription reads:

"Do not move the boundary-stone from its place, do not set it up in another place, do not set it up in another locality, do not put it in a house of lead, do not break it, do not hide it in the earth, do not cast it into the water, do not cover it with asphalt, do not burn it in the fire, do not erase the writing. The gods whose names are written on this stele, when in war, battle, fight, in sickness, disease, pestilence, plague, you raise your hands, will hear your prayer and will come to your aid. Whoso changes by writing and my name Ashur, Shamash, the pest god Dibbara, and Amurru, the great gods, without limit will be unpropitious."

Moral Code

The importance of the survey to the people of this period is clearly revealed in a "Moral Code" inscribed on a clay tablet during these days. It reads as follows:

- Has he estranged son from father?
- Has he estranged father from son?
- Has he taken the wrong sum, not taken the correct amount?
- Has he drawn a false boundary, not drawn the right boundary?
- Has he removed the limit, mark, or boundary?
- Has he possessed himself of his neighbor's house?
- Did he follow the path of evil?
- Did he overstep the bounds of what was just?

From about 893 to 626 B.C., the Babylonians were ruled by the Assyrians. The clay tablets of that period relate a story of lands being taken from their rightful owners and of problems caused by forgotten boundary lines and destroyed boundary stones when the Assyrian armies devastated the land. On the other hand, the Assyrians introduced a unique system of reviewing titles to land and enacted severe laws dealing with land trespasses. In the city of Assur, a periodic review of land titles was undertaken. Three times each month an official, the nashi, would issue a proclamation identifying certain estates to be reviewed. Anyone who had any claim in support or against the possession of the designated lands was invited to

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appear at the hearing and to bring their tablets and witnesses before an arbitral tribunal composed of a representative of the king, assisted by the town scribe, the nashi himself, governors, the mayor and three notables. Following the hearing and review, a decision was set down in writing and communicated to the interested parties. If no one appeared as a claimant at any one of three sessions, title to the land reverted to the city and the land was advertised by the town crier and auctioned off.

Severe Penalties

If a landholder was found guilty of enlarging his holdings at the expense of an adjoiner, severe penalties were meted out. Upon conviction of the crime of displacing the main boundary of his field, the guilty party was condemned to give up three times the area of the stolen land, to receive one hundred strokes of the rod, to do a month's labor on Royal works, and sometimes suffered the amputation of a finger as well. For displacing a smaller boundary, the penalty was the same, except that the number of strokes with the rod were reduced by one-half and a fine of a talent of lead was substituted for the mutilation.

For fencing in land belonging to a neighbor and building on it, the penalty was fifty strokes of the rod, a month's compulsory labor, confiscation of the bricks and payment for the land at thrice its value. If an orchard were planted on the land of another, two possible penalties were offered. If the true owner lived nearby, he was presumed to have given his consent and merely received an equal block of land as compensation, but if the owner's residence was remote, it was concluded that the planting had been done without his permission, and on his appearance and discovery he was given possession of the orchard.

Present Situation

So many details of the numerous records associated with the practice of land surveying and land titles must be neglected in this brief reflection of our early history, but we cannot face only in one direction. The present is with us momentarily and we are wrapped up in our obligations to our families, to our society, and to our profession, but even so, we cannot afford to neglect our responsibility to face in the direction of the future as well. We have left behind our casual approach to professionalism, our indifference to written descriptions, our generalizations of bearings and distances, our careless references, and our reluctance to charge a reasonable fee for our services, but unless we are cautious in the application of our improving tech-

nology, we will only find that we have entered an age of precise mistakes.

It is only natural that most of our attention is directed to local problems and to the fraternity which strengthens our trust in one another as fellow practitioners. Nevertheless, representation at the national level remains one of the better safeguards of the integrity of our profession, for there are those, in the broader field of surveying and mapping, whose education and experiences in certain specialties, coupled with an impressive understanding of the technical and scientific aspects of surveying, and exceptional capabilities in the production of precise drawings, conceal their lack of knowledge of the intricacies of land surveying, and they often presume to speak for our profession and to relate our goals to their aspirations. These are the seemingly well informed individuals who mistakenly relate the achievements of our profession to the accomplishments of our technology, which at best is a deception, attributable to, but not the intention of, an educational system that has generally limited courses relating to the practice of land surveying to studies of specifics. This tendency has served to place an emphasis on the scientific aspects of land surveying; creating an atmosphere of pseudo-competence, in which many graduates attempt to operate without a full appreciation of the arts of land surveying, or of the legal consequences of their acts.

Assumption of Accuracies

Land Surveying is not an exact science. It is more often the judgment of an individual following an intense consideration of many conflicting bits of evidence. It is a constant repetition of the conflict between the assumed precisions of one age and the obvious carelessness of another. It is an assumption of accuracies today that will be the subject of ridicule in the not too distant future, but underneath it all, it is a transformation of knowledge into more reasonable terms without disturbing the underlying truths.

In an article published a few years ago in "Surveying and Mapping", the Quarterly Journal of the American Congress on Surveying and Mapping, Professor G. G. Blakney — who, through his annual short courses at Auburn University, has contributed magnificently to our programs of continuing education — made the following suggestion: "It may be", he wrote, "that there is not as much that can be taught about land surveying at the university as is implied. After the student has been exposed to the 'order of calls' and 100 legal precedents, the 101st may well observe yet another

combination of points of evidence. Therefore, we have to eventually depend on the judgment of the surveyor, an item not easily taught in the classroom. It is even difficult", he added, "to really convey the idea that evidence could supersede a system of numbers appearing on a deed."

It would seem that any conclusion drawn from the preceding remarks would contain some justification for the apprenticeship system upon which our profession has been compelled to depend. Even such a conclusion, with its own inherent fallacy, however, would not divorce us from the need for every advantage that a formal higher education can provide. The fact that science alone does not completely satisfy our need cannot, in itself, deny a need of that science. Science remains an important and indispensable tool of our profession, and competence in the technologies of surveying and the structure of mathematical models and relationships remain essential ingredients of our performance. Science can fail us only when we ignore its purpose.

Rich In Tradition

As we have seen, the land surveying profession is rich in history and experience. It is also rich in tradition, which, under our present circumstances, may or may not be to our advantage in our competition with other industries engaged in activities overlapping, or just beyond, the statutory definitions of land surveying. We are traditionally conservative and, if this means that we are cautious and considerate, it is well that we are; but, if it means that we are unyielding in our ways, in our methods and in our techniques, it is not good. We are traditionally stubborn and, if this means that we are determined to serve our purposes and to reach our goals, it is also well that we are; but, if it means that we are reluctant to accept new ideas or to consider different ways to reach our objectives, it is not good. We are traditionally rugged individuals and, if that means that we are unafraid of the truth and that we are confident of our ability to cope with adversity, it is well that we are; but, if this description implies that we are bull-headed, or that we cannot be reshaped by our experiences or that we will not adjust to change, again it is not good.

Over a period of time as great as the length of written history, we have established a long list of traditions. The patterns of our way are clearly evidenced by these traditions whenever we view our profession as a whole, although in considering individuals there would be little similarity in our comparison. On the whole, however, we have held closely

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to the conventions of our predecessors and have been slow to adjust to change and to adopt new methods and equipment. This may be partly justified by our obligation to duplicate the past experiences of our profession, our necessary adherence to terms relating present conditions to ancient records of title, and the fact that, like the law, the principles of land surveying are based on experience, not logic. Nevertheless, as a profession, we have suffered from the reluctance to make significant change. And because of this, we have periodically found ourselves out of step with the times and our standing far below that of other important professions. Too often, we have followed in the wake of advancing technologies instead of accompanying the crest.

Connection With Past

To keep the record straight, we must recognize that the present generation of land surveyors had nothing to do with the earlier history of the profession or, for that matter, any part in the development of our long-standing traditions, but we are related to that history through the factors contributing to those traditions, and if they are the same today or if they remain unchanged, we will probably contribute to the extension of that history and to the continuation of those traditions without any significant alteration of the established patterns.

When did our reluctance to change our ways begin? We never know,

but archaeologists have noted that in Mesopotamia, centuries after the round clay tablets had been discarded in favour of the rectangular shaped tablet, surveys were still inscribed on the round. From this it would seem that this particular trait had a fairly early beginning. However, while it cannot be shown that our holding to the round shaped tablet four thousand years ago had an adverse affect on our capabilities or reputation, it can be shown that our failure to keep pace in more recent times has jeopardized our standing and limited the scope of our activities in the development of our communities. We have seen our horizon diminished by a growing encirclement of specialized services. We have seen our opportunities in planning, subdivision development, and small-scale mapping siphoned off by progressive planners, landscape architects, photogrammetrists, and cartographers, who had the foresight to invest in the sophisticated equipment essential to such undertakings.

Keen Competition

The surveyor who scratched his data on the moistened oblate surface of a round clay tablet with a sharpened reed may have had no reason to be concerned about competition, but the land surveyor of today enjoys no such sanctuary. Efficient equipment, innovation and the realities of economics offer the only advantages in this highly competitive society of today. If we are to survive as a profession, we must brush aside our traditional handicaps, retire our obsolete equipment, and adjust our methods to take advantage of the most advanced techniques and modern devices in everything that we do. We cannot afford to

do otherwise. The land surveyor of tomorrow, who attempts to compete with equipment common to today's practice, will have about the same chance as a farmer with a singletree plow and a blind mule. There is absolutely no margin for error in that prediction. In fact, it will vary only to the extent that new advancements and more sophisticated equipment enter the picture to make it necessary to give an even more ridiculous comparison of his chances.

On the surface there may appear to be some consolation in the fact that this is still today and not tomorrow. You may not be faced with this competition when you return to your office on Monday. You may not be faced with it next week, or the week after, or even next month; but, again, it is possible that it already exists — that you have not improved your equipment or methods even to the extent that you are really competitive today. And that is no idle supposition, because we have already seen a small group of specialists, who had little more to offer 20 years ago than recommendations to change some downtown streets to one-way streets, grow into a profession of planners with their hands in almost every major land development in many of our communities today. This did not come about because we were cognizant of the changing needs of our society. It did not come about because we recognized that competition can come from outside the profession as well as from within. It came about only because we failed to recognize that we must always face in two directions. We must give as much attention to our future as to our past — or the present is meaningless.