

Similarities in Surveying – Past & Present

The following two short pieces were submitted by Ron Robertson, OLS of Sarnia with the following introduction.

In this day and age of advanced technology in our profession I have endeavoured to pass on to our members what the ancients were doing at the onset of technology in our field. Perhaps the data I have garnered will pique the interest of the members of our association.

Trigonometry

It has been determined that mathematical and astronomical computations were in use between 1000 and 2000 B.C. in ancient Mesopotamia (land between two rivers) and Sumeria. The following would indicate that what we know today as trigonometry was a not uncommon form of this type of mathematics practiced in the far past.

As surveyors we are all familiar with Pythagoras' proven truths of right angle triangles as well as Euclidian geometry, both which occurred some 2400 years ago. Yet about 1000 years prior aspiring mathematicians and surveyors studied this early science.

At Tell Harmal, Babylonia a clay tablet dated about 3850 years old was found adja-

cent to the Tigris River near modern Baghdad, Iraq. The tablet tells us that students practiced their math by finding solutions to right-angled triangles. A reed on soft clay was used to draw the diagram while just below the diagram were the mathematical tables also inscribed in the same soft clay. The tablet was then left out in the sun to dry and harden. All numbers and any words were usually in the Akkadian cuneiform (wedge) script. Akkadian was the prime language of the time such as Latin during the Roman era or English of this period.

Another similar exercise tablet was one presumably also used by students and was for the calculations of areas of subdivisions of a square. This tablet is reputed to be about 3700 years old.

Familiarity was important to the early Mesopotamians and Sumerians in order for them to calculate grain yields, find solutions

in astronomy, and presumably survey land.

The third reason is not a stretch of the imagination, as we factually know that boundary markers and deeds of land existed at this time in history. Boundary stones have been found as well clay tablet type deeds. Someone had to lay out the lands as described in the deeds, as well as setting the locations of buildings, presumably using trigonometric knowledge not dissimilar to our use of today.

Early Mesoamericans (central America) and Egyptians were also quite involved in numbers, mathematics and astronomy however, this short narrative was not intended to compare all of the ancient cultures pertaining to the creation and evolution of early mathematics, but merely to show interest in some Babylonian and Sumerian artifacts tied in with their knowledge of math then, and ours of the surveying profession now.

The Agora

The main square and focal point of ancient towns known as the agora was a public square similar to today's downtown or town square. It was the meeting and market place for the legal and commercial functions of the day.

The agora in Athens was below the Parthenon of this city's acropolis. It was an on-going development dating back some 3000 years but reached it's zenith during the classical period about 2400 years ago.

The agora housed the law courts, the senate, a prison, and commercial establishments either as separate small buildings or as shops within larger buildings known as stoas.

Stoas were usually long, narrow buildings within the agora which housed commercial enterprises. The stoas were also used to merely pass the time of day or hang out, as it were, with friends. The open air

section in front of the stores was also used by speakers, who became known as stoics, to expound theories and teach in a relaxed manner those that would listen. Picture a long section of mall with shops only on one side of the interior walkway and with two rows of columns in front of the stores. Long and narrow as they were, they functioned very similar to today's malls.

It was in a small cobbler's shop adjacent to the agora, and monumented to mark the common boundary, that Socrates taught those under the age of admission to the agora. He propounded his thoughts on truth both here and at the stoas within the agora.

The stoa of Attalos, circa 150BC, was two storied with twenty- one units on each floor. The shops were boutique in size. The total building was 150 meters long and 20 meters wide (4501 X 601) with a row of columns in front of the stores and another row along the face of the building creating two way pedestrian traffic.

The law courts were also large sized

buildings primarily to house large juries. Socrates was tried and convicted on trumped-up charges at one of these courts by a jury of five hundred and one persons- some juries were larger.

The agora was monumented about 500 BC. Thirty of the original stones have been found in situ, and so remain. Some were inscribed with the words "I AM THE BOUNDARY OF THE AGORA".

The agora was a quasi-religious centre with basins of holy water at the entrances and an occasional shrine within its boundaries. Because of it's religious aspects certain persons were not entitled entry, such as traitors, those that mistreated their parents, those who avoided military service, cowards, deserters, and those under age.

There were two reasons for monumenting the agora. The main reason was to keep out those aforementioned. The second was to prevent building encroachments onto the agora and to mark the limits of roadways.

Two and one half millennia ago and yet the similarities are obvious.