

How Surveyors Have Changed the World Part II!

By **John F. Brock**

Keywords: Surveyors, great achievements, World changing contributions, other areas of eminence, edifices and mountains towards the sky.

Abstract

Hot on the heels of the blockbusting presentation given at the Young Surveyors Conference in Accra, Ghana at the FIG Working Week in May this year, this follow up paper continues to give exaltation to the incredible contributions made by the surveyors of our World!

With equal homage I portray for you all an added monumental inventory of genius and determination, while also including a brief reminder of some of the previous stars of the Hall of Survey Greatness mentioned in Part I of this amazing collection. While we are at the top of the World in Nepal it is timely to remind everyone that this Himalayan nation contains the highest mountain on the planet, which is proudly named after a Surveyor-General, Sir George Everest. Also taking their place in this list of heroes are the super spy surveyors of Tibet who risked a penalty of death as foreigners, to complete the highest measurements of Everest's Great Triangulation Survey of India from 1802-1852. You will see charismatic characters of history intertwine their surveying exploits with other universally acclaimed constructions and explorations, with modern erections of the world's tallest buildings and even how the sci-fi cult legend of Star Trek was born from the creator's obsession with the World's greatest explorer/surveyor, James Cook! The accurate maps of the World to which we are all accustomed did not exist before Flemish Surveyor Gerhard Mercator modelled his famous projection which was named after him.

Famous historical figures will be placed as Surveyors of Legend, along with the notable attributions accorded to them. You will be surprised to know that individuals such as Wyatt Earp, Walt Disney and Robbie Burns were surveyors, along with those well identified with great surveys and expeditions such as Lewis and Clark, Mason and Dixon, and Japan's greatest surveyor, Ino Tadataka. Come and hear how Tom Cruise jumps between the then planet's tallest buildings, surveyed by two Aussie Surveyors, in one of the Mission Impossible movies – the Petronas Twin Towers in Kuala Lumpur, Malaysia! Finally, be mesmerized by the superstars playing surveyors in Hollywood movies and TV shows in an ever-growing feast of cinematic delights, starting right back in 1912 with some silent film specials, particular note made of the movie: “Seven Years in Tibet”, in which Brad Pitt plays the lead role as a surveyor and personal friend of the Dalai Lama.

This presentation combined with its first hero-packed list will engender a sense of pride in being included as a member of a profession without which the entire World could not sustainably exist – The Surveying Profession!

INTRODUCTION



Fig. 1 God shown surveying his recently created world on a 13th century illuminated manuscript.

Whether your religious teachings bestow the origins of the Earth on your God or instead your leanings favour scientific theories of the beginnings of the Cosmos, there is one certainty which takes prominence once humans started to record history, and that is the essential contributions made by the thousands of years of work carried out by land surveyors. In the Christian account of the creation of the world, God is even said to survey the world in the Book of Genesis shortly after he created it, while his son, Jesus Christ, is even credited by a Vatican priest historian to be the equivalent of a Chartered Surveyor with quite a sizeable staff, rather than the popularly accepted description of him as a carpenter!

Join me for a walk through a genuine Hall of Surveying Fame, as you are hypnotized by the amazing characters of World history who have catalysed and created changes to our ever developing planet, and see just how revered they and their incredible actions have been as well as being truly instrumental in changing the World for what can be seen in a progressive and sustainable way..

Egyptians, Greeks and Romans

Although it is certain that techniques of surveying originated with very simple tools and setting out techniques it has been present for over 3,000 years at the time when the ancient Egyptians first made mention of an active Survey Administration on the Palermo Stone. Surveyor Scribes were an essential component of the Temple Bureaucracy throughout the great civilization but were recorded with particular prominence during the New Kingdom, the Dynastic Period which featured Nefertiti and Akhenaten as well as this Pharaoh's son, Tutankhmun. Four Surveyor Scribes are known from the art and hieroglyphic inscriptions on their tombs in Cemetery of the Nobles called Dr Abdl Qurna, near to the Valleys of the Queens and Kings in Thebes. Their names are Djeserkereseneb, Khaemhet, Amenhotep-si-se and Menna whose tomb art depicts these scribes carrying out surveying during their lives

From the ancient Greeks we can see a further development in surveying methods, equipment and calculations demonstrated by Surveyor/Engineer Eupalinos during the construction of an aqueduct through Mount Castro excavating from both ends to meet in the middle over a period

of time years in 540 BC. This incredible project was described by the Greek historian Herodotus as the greatest engineering feat in antiquity!
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Advancing surveying skill levels to an even higher echelon, the Roman surveyors left many monuments to their superior ability in surveying through the many viaducts, aqueducts and monuments erected to a precise level of accuracy. Four Roman Surveyors were said to be ordered by Julius Caesar to go out and “Survey the World!” in about 42 BC, just before his assassination on the Ides of march in 44 BC. The last of these four Greek Surveyors returned over 32 years after setting off to carry out this monumental undertaking to present his work to project supervisor, Marcus Agrippa. Their names were Polyclitus, Nicodoxus, Theodocus and Didymus, and three of these men are depicted on the Hereford Mappa Mundi (c.1290) which proudly hangs in the Cathedral of the same name in Hereford, UK.

Moses and Joshua

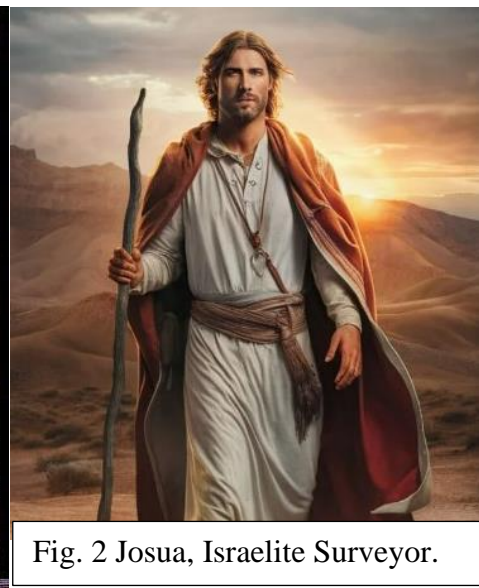
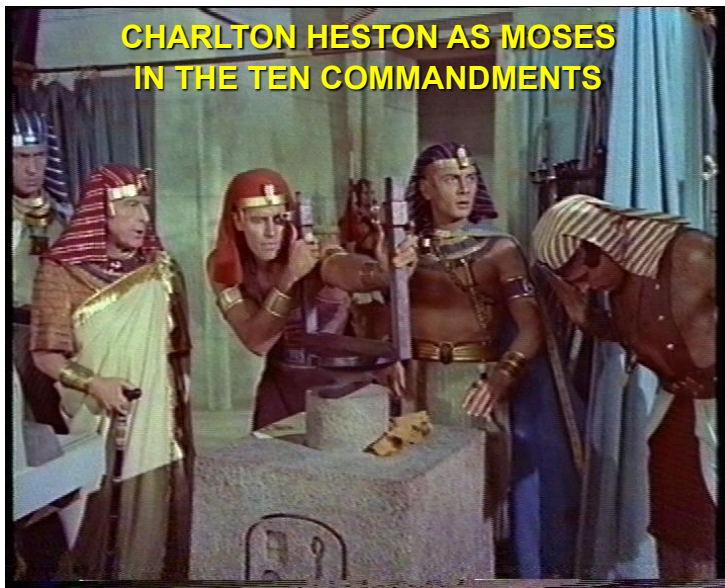


Fig. 2 Josua, Israelite Surveyor.

The Bible has many allusions to surveys and those engaged in the them. In Cecil B. DeMille’s epic movie “The Ten Commandments”, actor Charlton Heston plays the role of Moses, and is shown carrying out a survey on some construction work. Joshua, who closely followed Moses historically, was the leader of his people from 40 years in the wilderness, with many examples of him initiating surveys to divide the country up for their occupation.

Gerardus Mercator

Gerardus (or Gerhard) Mercator was a Flemish Surveyor/Cartographer who was born in 1512 in Rupelmonde, Belgium. Before his creation of his namesake map projection, charts and maps were a haphazard, uncoordinated mess of non-scale drawings with no standard orientation or suitable correlation.

By wrapping the globe shaped earth in a cylinder he created a universal projection with the Equator at the middle line of the map. As the land masses further to the north and south were promoted onto the map the distortions increased with increasing latitude, but at least the world could be represented on one sheet with the regions at the extremities shown on inset diagrams.

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Fig. 3 Gerardus Mercator.

James Cook

When it comes to the title of greatest explorer, it is pretty hard to surpass James Cook, whose three World explorations revealed and opened up more places than any other navigator. From the perspective of a Surveyor like me it is even more thrilling to know that he was first taught to be a land surveyor by the first Surveyor-General of Canada,



Figure 4. Captain James Kirk and Captain James Cook.

Samuel Holland, while he was working along the St. Lawrence River in Northern America. He was given his first theodolite by the Governor of Newfoundland, Thomas Graves, in 1762. He even declared himself to be a "Surveyor" in copper-plate engraving on some of his charts, so it not surprising that his maps and charts are considered to be the most accurate ever made due to his employment of the theodolite and Gunter's chain to measure between his sextant sighted stations to tie his network together.

The creator of the sci-fi cult series Star Trek, Gene Roddenberry, even used James Cook as the inspiration for his Commander James Kirk with the starship "Enterprise" bearing a stark similarity to the "Endeavour", Cook's first ship. However, the similarities are confirmed when the mission of the star fleet is disclosed: "To boldly go where no man has gone before", which is what James Cook is said to have done on Earth.



William Roy

Scottish Surveyor-General William Roy was born in Carlisle, Scotland in 1726. He is regarded as an innovator who employed new scientific discoveries and applied new technology for the purposes of the accurate mapping of Great Britain. He founded the British Ordnance Survey in 1763 to facilitate the precise measurement and charting of all of Great Britain, while still devoting time to the retracement and location of the remains of the Roman Antonine Wall which had been erected in 138AD by Antoninus Pius to segregate the Caledonian north from Roman Britannia in the south. In 1784 he surveyed the Hounslow Heath baseline which would form the basis to link the Paris and London observatories by triangulation to form an accurate geodetic network between across the English Channel.

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Figure 5. William Roy

Matthew Flinders

Throughout Australian maritime history one name stands out with more brightness than others, Matthew Flinders. He was born in 1774 just five years before his later hero model, James Cook, had been killed in the Sandwich Islands (now Hawaii). MF's life was quite brief, but his contribution to the knowledge and ultimate description of Australia were remarkable. In 1798-99 he and his expeditionary partner, George Bass, along with the Aboriginal man Bungaree, proved that Van Dieman's Land (later named Tasmania) was separate from mainland Australia in the vessel Norfolk, which had been mad on Norfolk Island. His next major voyage was to circumnavigate the whole of Australia between 1801-03 during which he had chance encounter with the French captain Nicolas Baudin off the coast of South Australia at, you guessed it, Encounter Bay on 2 April, 1802, while the French boat was passing in the opposite direction. Unfortunately for MF, on his return journey to England in 1803, he was placed under house arrest for espionage on the Ile de France (now Mauritius) by the Governor De Caen, not being released until 1810. During his incarceration he plotted the first Map of Australia showing Van



Figure 6. Matthew Flinders.

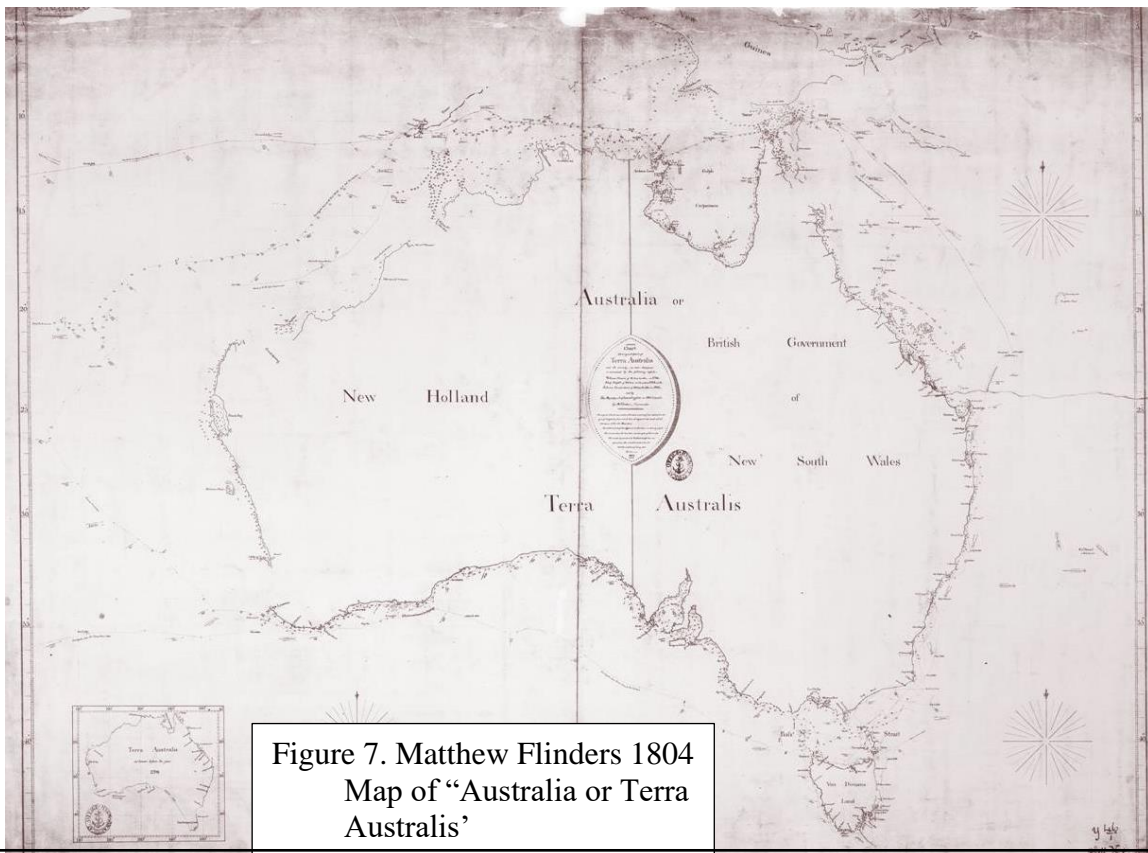


Figure 7. Matthew Flinders 1804 Map of "Australia or Terra Australis"

How ~~Demarcation~~ ~~Separated~~ ~~the~~ ~~World~~ ~~The~~ ~~Mainland~~ ~~in~~ ~~1804~~, but the French cartographer Lapie beat Flinders' publication with his map of 1811, because MF's published map did not make it until 1814. Not only did Flinders chart and draw the first accurate Map of Australia, he was

instrumental, along with the then NSW Governor Lachlan Macquarie, of having the name “Australia” accepted as the formal name for the country/continent.

Robbie Burns

Robert Burns was born in Alloway, Scotland in 1759 and became one of the greatest poets in the world. He was also trained and worked as a surveyor which culminated in the Royal Institute of Chartered Surveyors (RICS) honouring him as the first person to be awarded a posthumous membership of the RICS in 2012. He earlier in 2009 was voted as the greatest Scot in a competition. The Postal Service of the United Kingdom issued a PNC in his tribute in 2020 which is a philatelic/numismatic First Day Cover which bears a stamp and coin in his honour.



Figure 8. Robert Burns – Poet and Surveyor.

Thaddeus Kosciuszko

The great Polish patriot and freedom fighter Thaddeus Kosciuszko was born in 1746 at Myerachowshyna near Kosow in Lithuania. He was one of the foreign generals who assisted General George Washington in winning the War of Independence and expelling the British oppressor from their homeland in the 1770's. Through my research I have discovered that he was also a military Surveyor, which was an exciting revelation. The Polish explorer, Sir Pawel De Strzelecki, was the first European to climb Australia's highest mainland mountain in 1839, and due its similarity to the tumultuous mound monument Kopiec Kosciuszki in Krakow along with TK's indisputable association with freedom he named this peak in his honour.



Figure 9. Thaddeus Kosciuszko

Ino Tadataka

Japan's greatest surveyor is most certainly Ino (or Inoh) Tadakata who was born in 1745 at Kujukuri, Chiba, Japan. His family owned 35 breweries at the time he decided to carry out the first accurate survey of Japan in 1800. He had begun his training as an astronomer five years earlier with the legendary Sensei Takahashi at the age of 50. At this time of human history 50 was the expected age of death for a male! Along with his survey teams he walked the entire surface of Japan making measurements with survey equipment made by himself of wood to

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replicate the instrumentation contained within Dutch technical manuals, as this nation was the only foreign land with which Japan was permitted to make communication. His theodolites were magnetic, but at that time Ino had determined, correctly, that the magnetic declination between True North and Magnetic was close to zero, so his observations were a real reflection of the azimuths observed. There are many statues and plaques dedicated to Ino as well as a museum at. A play was composed in his honour by the famed Japanese playwright Inoue Hisashi called “The Man Who Walked 40 Million Steps”, first performed in 1986. The Japanese Postal Service issued a stamp in 1995 as a commemoration to him and his survey work. There are also paintings of Ino and his teams at work.

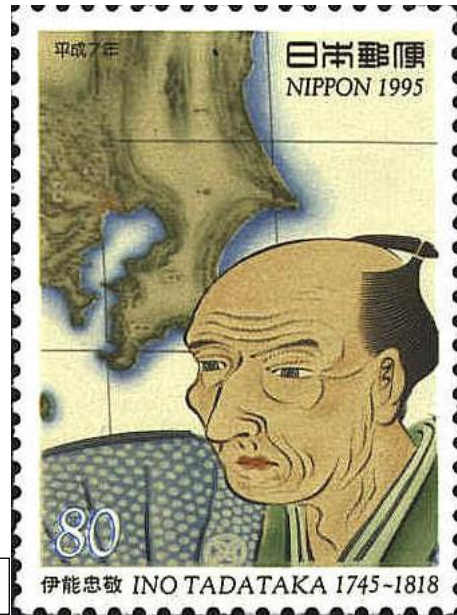


Figure 10. Japanese 80 yen postage with Ino Tadataka

Lewis and Clark

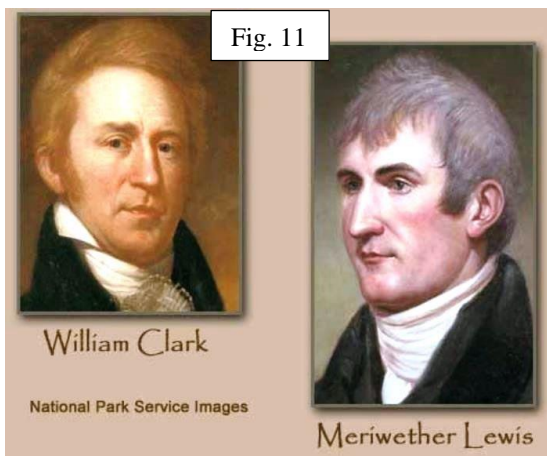


Fig. 11

In 1803 US president Thomas Jefferson pulled off the greatest land swindle in real estate history when he doubled the size of the 13 existing US states by purchasing the Territories west of the Mississippi from Napoleon Bonaparte in what has become known as the Louisiana Purchase for the paltry sum of \$ 15 million for 827,000 square miles of territory which equates to be the pittance of 4 cents per acre! Around the same time the President wanted to know more about the land he had just acquired so he conscripted the services of Army Surveyors Meriwether Lewis and William

Clark forming the Corps of Discovery to explore the land by cruising along the Mississippi/Missouri Rivers and to the north west as far as the Pacific coast in what is now the state of Oregon. Along part of the course of their momentous journey assistance and directions were gratefully afforded to the exploration party by the lady Native American Sacagawea, who was also of notable distinction



Fig. 12. Thomas Jefferson looks towards the area of western lands explored by Lewis & Clark 1804-06.

in coming as a go-between the various tribes of First Americans met at different sections of the Western area

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Mason and Dixon

While Charles Mason and Jeremiah Dixon were making observations of the Transit of Venus in Cape Town, South Africa in 1761, Lord Baltimore had heard of their expert surveying skills in the US colonies. The Lord had been engaged in a fierce struggle to establish the boundary between his state, Maryland and the State of Pennsylvania to the south, which was owned by



Fig. 13. Map of the Mason-Dixon Line the borderline dividing the US States of Pennsylvania and Maryland.

William Penn. They were contracted initially for 18 months to lay out the correct boundary line separating the two states, commencing their line on 15 April 1763. However, after four years working on the boundary line monumentation Lord B had worn out his patience and ordered them out with still about 160 miles left to mark. The borderline they had established became known as the Mason-Dixon Line, still

retaining this name today. It had been mistakenly referred to as the dividing line between pro and anti slavery states during the US Civil War which did not take place until almost exactly 100 years later, between 1863-1866, but its original demarcation was merely the settlement of very angry boundary dispute which itself simmered for around 40 years with violent and deadly confrontations between the opposing state owners before the warring parties agreed on the newly surveyed position.

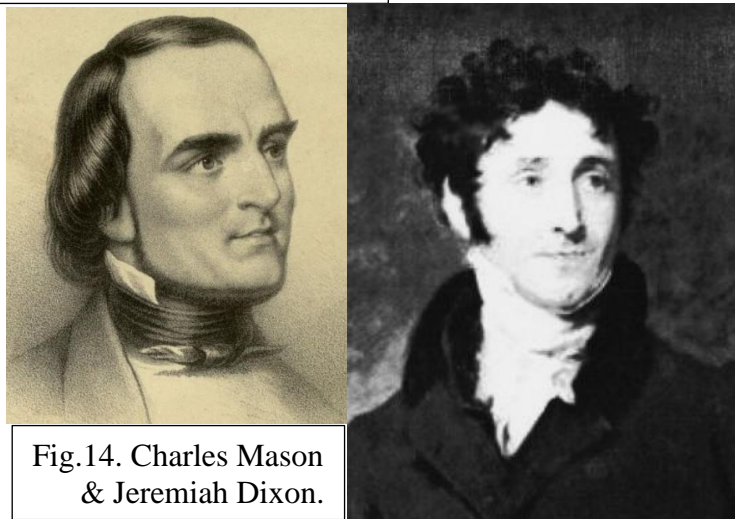
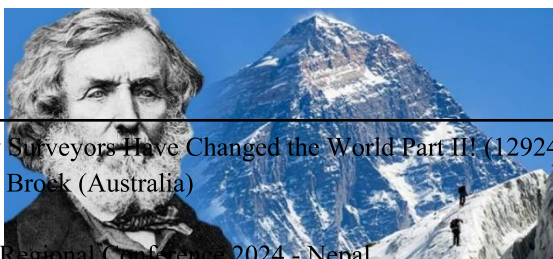


Fig.14. Charles Mason & Jeremiah Dixon.

Tibetan Spy Surveyors



At the time of the Great Triangulation Survey of India, under Surveyor-General George Everest, it was forbidden for foreigners to enter the territory of Tibet by penalty of death. So the British sought the assistance of brave Indian

Fig. 15. George Everest and his mountain.

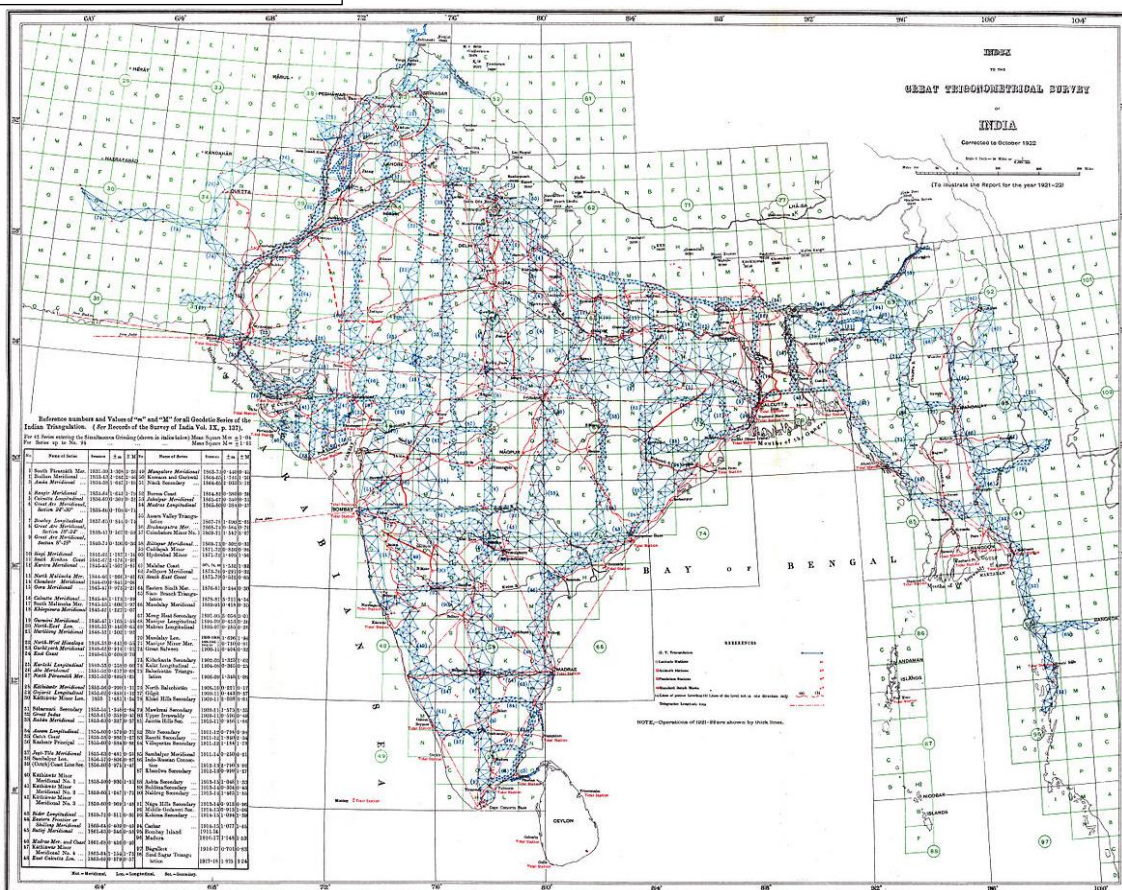
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teachers to carry out measurements in this high area of the Himalayas using pacing and prayer wheels to store their data. These two courageous surveyors were Rai Bahadur Nain Singh Rawat and Radhanath Sikdar and their epic achievements were honoured by the country of India in 2004 with a commemorative stamp mini-sheet issued. With the World's tallest mountain located within our host nation, it is appropriate to pay tribute these fearless alpine surveyors who risked their lives in nearby terrain to enable the completion of the Great Triangulation of India in 1850's

Fig.16 Nain Singh Rawat and Radhanath Sikdar on stamps above the Map of the Great Survey of India.



The World's Tallest Buildings

How Surveyors Have Changed the World-Part II! (12924) When the fifth Mission Impossible movie: "Rogue Nation" aired in 2015 it featured a cameo John Brock (Australia) stunt spectacular scene moving between the Petronas Twin Towers in Kuala Lumpur, the



Figure 17. (above) Ian Sparks, Tall Tower Surveyor.
 Figure 18. (left) Architects drawing of the Burj Khalifa in Dubai, UAE.

capital city of Malaysia, located around the connecting tower bridge at the 42nd floor, which allowed pedestrian access from one tower to the other at this high elevation.

The twin towers were surveyed by two Australian surveyors, Ian Sparks and Rob Fulloon, and during the 5th South East Asian Surveyors Conference held in KL in 1995 Rob organized for some of the conference attendees to go up to the 66th floor of the unfinished towers to have a group photograph which nearly had us blown from the top of the structure. Then when the next assignment for an even taller building came up in Dubai, Ian was given the contract to survey the Burj

Khalifa, which is currently the World's tallest building at 830 metres in height equivalent to over 200 storeys with 160 habitable levels. There are some contenders in planning to usurp this current title holder, but, as yet, they have not come to completion (that is even if they commenced erecting them?).

CONCLUSION

From this amazing collage of surveying achievements and colourful characters exhibiting the genius of their professional backgrounds, it is not hard to acknowledge that the World has been changed in many vast and wonderful ways as a result of the excellent and remarkable feats of all those individuals who claim Surveying as their chosen Profession.

BIOGRAPHY

Private land surveyor since 1973, **Bachelor of Surveying** (UNSW 1978), **MA** (Egyptology) from Macquarie Uni., Sydney (2000), **Registered Surveyor NSW** 1981. Now Director of Brock Surveys at Parramatta (near Sydney). Papers presented on six continents including Brunei, Nigeria, Morocco, Papua New Guinea, Hawaii, Bulgaria, Finland, Colombia, Ghana and all states/territories of Australia as well as Norfolk Island. Stalwart of FIG International Institution for the History of Surveying & Measurement awarded **FIG Article of the Month March 2005, January 2012, June 2014, April 2017 and April 2023**. Institution of Surveyors NSW Awards – **Halloran Award 1996** for Contributions to Surveying History, **Fellow ISNSW 1999 & 2002 Professional Surveyor of the Year**. First international **Life Member** of the Surveyors Historical Society (USA), Rundle Foundation for Egyptian Archaeology, Parramatta & District Historical Society, Friends of Linnwood (House), **Foundation Member** Australian National Maritime Museum & Friends of National Museum of Australia. **Member** of Bradman Crest, International Map Collectors Society, Royal Australian Historical Society, National Trust of Australia, Hills District Historical Society, **Friends** of May's Hill Cemetery St. John's Cemetery and St. Patrick's Cemetery.

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