

Tributes to Solomon W Golomb

Rochelle Kronzek

Is the measure of a man his intellect and all that he accomplishes during his lifetime or in how he treats his fellow human beings and those less fortunate or with less opportunities? Sol Golomb was a polymath and a man of humility and integrity.

May 1, 2016 marked the passing of a brilliant, accomplished applied mathematician and the kindest of souls - Dr. Solomon Wolf Golomb, Distinguished Professor of Mathematics and Electrical Engineering at the University of Southern California (USC) where he had been an active member of the faculty for more than fifty years. He specialised in combinatorial analysis, number theory, coding theory and communications and became famous for the mathematical puzzles and games he created (including Polyominos which inspired the game Tetris). Only ten days prior to his passing, Dr. Golomb had been awarded the prestigious Franklin Medal 2016 in Electrical Engineering for his revolutionary work on **shift register sequences** and their applications to space communications, satellite communications and cellular communications. Marie Curie, Thomas Edison, Nikola Tesla, Bill Gates, Albert Einstein and Stephen Hawking are but a few of the visionaries whose work has been honoured by the organisation previously.



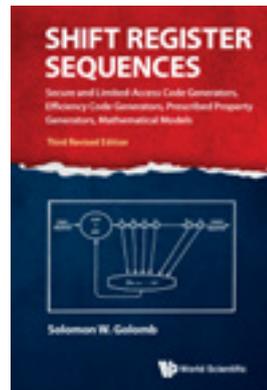
Dr. Golomb had accumulated many such honours and awards during his career including the National Medal of Science given by former US President Barack Obama in 2011.

I first met Dr. Golomb in March 2010 during a **Gathering for Gardner** recreational mathematics Conference held in Atlanta. I was walking down a busy downtown street returning to the conference hotel from lunch and found Dr. Golomb kneeling outside giving a homeless person the hot lunch he had purchased for them from a nearby restaurant.



Solomon Wolf Golomb similarly walked across the USC campus, greeting many students and colleagues along the way each day for the more than five decades that he was a beloved professor.

Before USC, Sol conducted and supervised research in communications at the Caltech/NASA Jet Propulsion Laboratory (JPL) from 1956 through 1963 during the dawn of the Space Age. He went on to author or coauthor more than 200 journal articles and seven books and was particularly well known for his pioneering and extensive work since 1953 on **Shift Register Sequences** and their applications to cryptography, radar & coded, spread-spectrum and wireless communications. Originally published in 1967, World Scientific has produced a reprint of this classic work © 2017.



Several tributes were held in Dr. Golomb's honour during the latter half of 2016 and in 2017.

Sequences and Their Applications (SETA) is the leading international conference in the areas of sequences and their applications to communication and cryptography. It has been held in various locations around the world starting on 1998 biannually.

A special feature of SETA 2016, which was held in Chengdu (October 9–14, 2016), China, was a memorial session in honour of Solomon W. Golomb. This event was held on October 10. Drs. Gong and Hellesteth were the organisers for this event and there are six invited speakers in this event, each gives a 50-minute talk for sharing their experience about their working or inspired by Dr. Golomb.

The featured speakers for the SETA memorial and their talks were as follows:

1. **Tor Hellesteth**, University of Bergen, Norway, *Cross-correlation of Sequences and Golomb's Norwegian Connection*.
2. **Steven Wolfram** (video talk), Mathematica, GB, Cellular Automata and Shift Registers, or *How Sol Golomb Almost Made My Favourite Discovery Before I Was Born*.
3. **Songyeop Song**, Yonsei University, Korea, *Prof. Golomb was my Advisor*.
4. **Pingzhi Fan**, Southwest Jiao Tong University, China,

Solomon W Golomb and Sequence Design at SWJTU.

5. **Vijay Kumar** (video talk), IISC, India, *Some Facets of Sol Golomb*.
6. **Guang Gong**, University of Waterloo, Canada, *Golomb's Shift Register Sequences for Wireless Communication, Cryptography and Radar — Work with a Great Mind*.

On January 31st, a day-long event entitled “**The Life & Legacy of Sol Golomb**” celebrated Professor Golomb's great contributions to the electrical engineering department, the University of Southern California (USC) and the campus Hillel.

The morning portion was held in the Viterbi School of Engineering within department of electrical engineering that Sol called home for more than five decades. Dr. Andrew Viterbi, a longtime friend of Dr. Golomb attended and spoke at the memorial event. Viterbi, co-founder of Qualcomm Inc. and the namesake for the Viterbi School of Engineering at USC met Golomb on his very first day at JPL, in 1957. Together they worked on NASA's earliest satellite programs.

“My friendship with Sol lasted nearly six decades, during which time he grew from the brightest kid in the room to the wisest man on campus,” said Viterbi.

Several of Dr. Golomb's former PhD students and frequent research collaborators attended the USC symposium. Colleagues flew in from Norway, Canada, India, Korea and Israel to participate. Albums and posters containing pictures of Dr. Golomb were shared by his two daughters Beatrice and Astrid.

After the morning symposium, the attendees then gathered in the Hughes Aircraft Electrical Engineering Center lobby, where Dean Yannis Yortsos spoke and a bronze relief of Golomb was unveiled.



Being the granddaughter of a rabbi myself, I appreciate that Dr. Golomb was both the son and grandson of rabbis. A portion of the afternoon's memorial service was given by the campus Hillel rabbi, Hebrew songs were sung by children and Bailey London, Executive Director of USC Hillel also paid tribute to Dr Golomb. The office of the President of USC co-sponsored the afternoon tribute and held a private reception in Dr. Golomb's honour.

UC San Diego's **Information Theory and Applications** (ITA) Center, at its 2017 Workshop in February, devoted an afternoon memorial session to "Remembering Sol Golomb". It was organised by Tuvi Etzion (Israel), with the following speakers:

- 1) Guang Gong (Canada), "**Golomb's Invariants and Modern Cryptology**";
- 2) Tor Hellesteth (Norway), "**Shift Register Sequences and Golomb's Norwegian Connections**";

- 3) Hong-Yeop Song (Korea), "**Existence of cyclic Hadamard difference sets and some memories of Prof. SW. Golomb**"; and
- 4) Andrew Viterbi (USA), "**Celebrating the Life of Solomon Wolf Golomb**".

That evening an interactive puzzle session (with prizes) in Sol's honour was also held, organised by Joe Buhler, Paul Cuff, Al Hales and Richard Stong.

Dr. Golomb will be missed but his legacy lives through his 50 years of teaching at USC, how he revolutionised digital communications with his book on **shift register sequences** and his kindness that touched me deeply after being with him just a handful of times. I was honoured to have been his editor.



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