INTERNATIONAL ELECTRONIC JOURNAL OF GEOMETRY
VOLUME 17 NO. 1 PAGE 1–5 (2024)
DOI: HTTPS://DOI.ORG/10.36890/IEJG.1464739
RESEARCH ARTICLE

Professor Bang-Yen Chen: His Life and His Works

Bogdan D. Suceavă*

(Dedicated to Professor Bang-Yen CHEN on the occasion of his 80th birthday)

ABSTRACT

We recall several pieces of information about Professor Bang-Yen Chen's life, works, as well as the lasting impact of his creative outcome. Our essay could prove useful to anyone interested in the history of differential geometry in the recent six decades. With over 36,000 citations (as presently recorded by ResearchGate), the body of work created by Bang-Yen Chen yields a meaningful impact to the mathematical community, especially in the area of differential geometry.

Keywords: *Bang-Yen Chen, differential geometry, Chen invariants.*

AMS Subject Classification (2020): *Primary: 01A60 ; Secondary: 01A61; 01A65; 01A70.*

The present issue of the *International Electronic Journal of Geometry* is dedicated to Professor Bang-Yen Chen, in the academic year when we are celebrating his Eightieth birthday. Professor Chen was born on October 3, 1943, in Toucheng township, Yilan county, Taiwan. Bang-Yen Chen studied mathematics at the Department of Mathematics, Tamkang University in Tamsui, Taiwan, from August 1961 to May 1965, when he received his B.S. degree. At the same time he passed the examination for entering in the graduate school of National Tsing Hua University in Hsinchu, Taiwan. It is of historical interest to recall that his teacher of differential geometry at Tamkang University was Professor Tsing-Houa Teng.

Figure 1. Tsing-Houa Teng, Tadashi Nagano, and Bang-Yen Chen, at Tamkang University, in 1966.

Received : *04–April-2024,* ***Accepted :*** *06–April-2024*
*** Corresponding author***

Of particular importance is the intellectual environment at the Institute of Mathematics, National Tsing Hua University in the 1960s, which ushered the perspective for what will become an internationally recognised research career in differential geometry. At that time, the graduate schools of mathematics in Taiwan had only master programs, and in this historical context Bang-Yen Chen enrolled in August 1965 in the master program at the Institute of Mathematics, National Tsing Hua University. Although National Tsing Hua University had very few graduate students in mathematics, the University had resources to invite famous professors from the United States and Japan to teach graduate courses for one or two semesters. His first teacher in differential geometry at National Tsing Hua University was Professor Tominosuke Otsuki from Tokyo Institute of Technology, in the Fall semester of 1965.

Figure 2. Professor and Mrs. Otsuki, with Professor and Mrs. Chen, on December 31, 2001, in Yokohama.

The other teacher of differential geometry was Professor Tadashi Nagano from the University of Tokyo. While Professor Nagano stayed at National Tsing Hua University for the Fall semester of 1966, Bang-Yen Chen wrote his master thesis under Nagano's guidance. Before he left Taiwan, Tadashi Nagano informed Bang-Yen Chen that he would be teaching at the University of Notre Dame starting with the Fall semester of 1967.

Figure 3. Bang-Yen Chen and Tadashi Nagano, on December 17, 2001, in Tokyo.

Prior to his departure for the United States, Bang-Yen Chen taught in Taiwan. During the academic year 1967-1968, he taught the senior course *Differential Geometry* at the National Tsing-Hua University, and in the academic year 1966-1968 he also taught the course *Topology* to senior students at Tamkang University.

In September of 1968, Bang-Yen Chen enrolled in the program at the Department of Mathematics, the University of Notre Dame, and received his Ph.D. degree in May 1970 under the supervision of Professor Nagano, with his doctoral dissertation titled *On the G-total Curvature and Topology of Immersed Manifolds*.

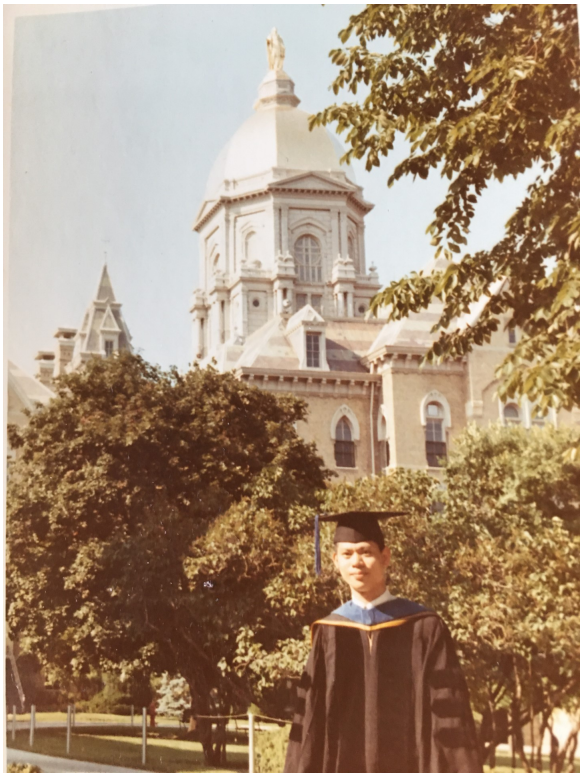

Figure 4. Bang-Yen Chen at University of Notre Dame, in 1970, receiving his Ph.D. degree.

After his doctoral years (1968–1970) at Notre Dame, Bang-Yen Chen joined the faculty at Michigan State University as a research associate from 1970 to 1972. He became associate professor in 1972, and full professor in 1976. In June 1990, he was presented with the title of University Distinguished Professor. After his retirement in June 2012, he became University Distinguished Professor Emeritus. While at Michigan State University, he was the doctoral adviser of a series of scholars: Yhuji Shibuya (1979), Young Ho Kim (1988), Ivko Dimitrić (1989), Yoshihiko Tazawa (1989), Jie Yang (1997), Yun Myung Oh (2000), and Bogdan Suceavă (2002).

Professor Chen has visited many universities of the world. He was a Fulbright Fellow at the University of Leuven, Belgium, from September 1978 to January 1979. He has also been visiting professor at various universities, including Science University of Tokyo, Japan; University of Notre Dame, USA; University of Lyon, France; University of Rome, Italy; National Tsing Hua University, Taiwan; Tokyo Denki University, Japan; University of Bilbao; University of Sevilla; University of Granada, Spain; as well as National Kyungpook University, South Korea.

In 1989, Professor Chen became an elected corresponding member of Academia Peloritana del Periconlanti, Italy. He received the First Simon Stevin Prize in 2008 from the Simon Stevin Institute for Geometry, Netherlands; was presented the Golden Eagle Award in 1991 from Tamkang University; received the Albert Nelson Marquis Lifetime Achievement Award from the Marquis Who's Who Publication Board, USA, in 2020. In June 2003, University of Leuven, Belgium, and University of Valenciennes, France, co-organized a four-days *Workshop on Submanifold Theory* at Valenciennes and Leuven (two days each) in honor of Bang-Yen's 60th birthday. A special issue of Soochow Journal of Mathematics, dedicated to Bang-Yen's 60th birthday, was published in October 2004 consisting of many contributions presented at this Workshop. During July 8-11, 2008, the University of Bucharest and Transilvania University of Braşov, Romania, co-organized the conference *Riemannian Geometry and Applications RIGA 2008* dedicated to Bang-Yen's 65th birthday. Many contributions from this conference were published in volume 1(50) of the *Bulletin of the Transilvania University*

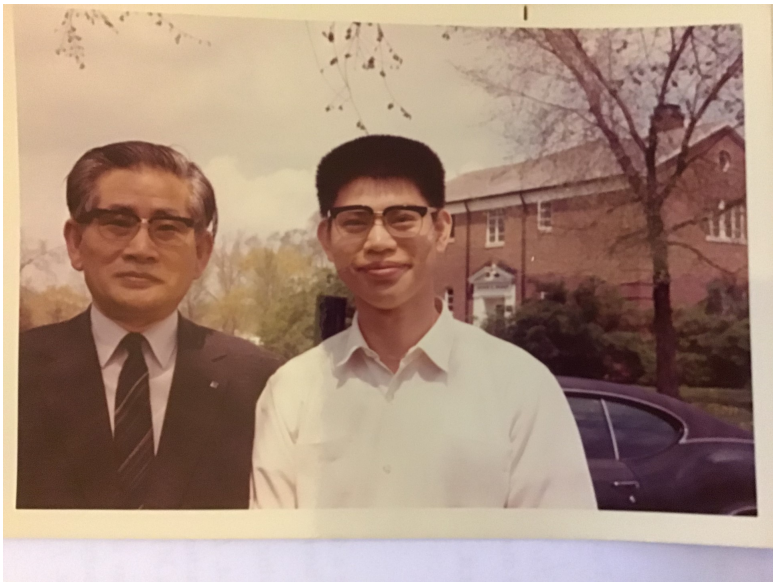

Figure 5. Bang-Yen Chen and Kentaro Yano, on May 14, 1972, when Professor Yano visited Michigan State University.

of Braşov. Series III. Mathematics, Informatics, Physics. On October 20-21, 2018, at the 1143rd Meeting of the American Mathematical Society held at Ann Arbor, Michigan, one of the special sessions was dedicated to Bang-Yen's 75th birthday. The volume 756 in the *Contemporary Mathematics* series, published by the American Mathematical Society, is dedicated to Bang-Yen Chen, and it includes many contributions presented at the Ann Arbor event. The volume is edited by Joeri Van der Veken, Alfonso Carriazo, Ivko Dimitrić, Yun Myung Oh, Bogdan Suceavă, and Luc Vrancken. The 9th European Congress of Mathematics, which will be held in Sevilla, Spain, July 15-19, 2024, includes in its program a mini symposium on *Geometry of Submanifolds. Celebrating Bang-Yen Chen's 80th Anniversary*.

***

One of the earliest works authored by Bang-Yen Chen that received massive attention worldwide was the volume *Geometry of Submanifolds*, published in 1973. It is a happy coincidence that this academic year we are also celebrating half of century since the publication of this important volume, which today, in a revised version, is available as a Dover paperback. That volume was just the beginning of a very successful career, which attracted the interest and attention of many geometers around the world. Every time when Bang-Yen Chen proposed to the scientific community a new idea, the interest of many geometers sparked a plethora of papers pursuing the flux of concepts to their last mathematical consequences. All these works share as their common roots the original seed of an idea that was either introduced first, or investigated first, in a paper by Bang-Yen Chen.

What made Bang-Yen Chen's work so successful was a combination of stellar characteristics: the profound geometric imagination, intertwined with a very effective expository style, of a rare quality. Bang-Yen Chen is known today for several fundamental ideas in differential geometry, including Chen invariants (which he called originally $\delta-$invariants), Chen inequalities, Chen surfaces, Chen-Ricci inequality, Chen conjectures, Chen submanifolds, Chen equality, Chen's flow, ideal immersions, slant submanifolds and submanifolds of finite type. He also co-developed the (M_+, M_-)-theory with Tadashi Nagano.

This is a body of work that inspires and attracts attention today, and very likely will do so in the future as well.

Acknowledgements

The author would like to extend the expression of his gratitude to Professor Bang-Yen Chen for helping with several biographical details, as well as in providing the photographic documents included in the present material.

Funding

There is no funding for this work.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author's contributions

All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

References

[1] Chen, B.-Y.: Geometry of submanifolds, Marcel Dekker, New York (1973).
[2] Chen, B.-Y.: Geometry of submanifolds and its applications. Science University of Tokyo (1981).
[3] Chen, B.-Y.: Total mean curvature and submanifolds of finite type. Series in Pure Mathematics. 1. Singapore: World Scientific Publishing Co. XI (1984).
[4] Chen, B.-Y.: Geometry of slant submanifolds. Leuven: Kath. Univ. Leuven, Dept. of Mathematics (1990).
[5] Chen, B.-Y.: *Some open problems and conjectures on submanifolds of finite type*. Soochow J. Math. 17 (2) 169–188 (1991).
[6] Chen, B.-Y.: *Some pinching and classification theorems for minimal submanifolds.* Arch. Math. 60 (6), 568–578 (1993). https://doi.org/10.1007/BF01236084
[7] Chen, B.-Y.: *Relations between Ricci curvature and shape operator for submanifolds with arbitrary codimensions*. Glasg. Math. J. 41 (1), 33–41 (1999).
[8] Chen, B.-Y.: Pseudo-Riemannian submanifolds, δ-invariants and Applications. World Scientific (2011).
[9] Chen, B.-Y.: Total mean curvature and submanifolds of finite type. 2nd ed. Series in Pure Mathematics 27. World Scientific (2015).
[10] Chen, B.-Y.: Differential geometry of warped product manifolds and submanifolds. World Scientific (2017).
[11] Chen, B.-Y.: Geometry of submanifolds. Corrected reprint of the 1973 edition. Dover Publications (2019).
[12] Ou, Y.-L., Chen, B.-Y.: Biharmonic submanifolds and biharmonic maps in Riemannian geometry. World Scientific (2020).
[13] Van der Veken, J., Carriazo, A., Dimitrić, I., Oh, Y. M., Suceavă, B. D., Vrancken, L. (eds.): Geometry of submanifolds. AMS special session in honor of Bang-Yen Chen's 75th birthday, University of Michigan, Ann Arbor, Michigan, October 20–21, 2018. Providence, RI: American Mathematical Society (AMS). Contemporary Mathematics 756 (2020).
[14] Van der Veken, J., Carriazo, A., Dimitrić, I., Oh, Y. M., Suceavă, B. D., Vrancken, L.: Reflections on some research work of Bang-Yen Chen. In: Van der Veken, Joeri (ed.) et al., Geometry of submanifolds. AMS special session in honor of Bang-Yen Chen's 75th birthday, University of Michigan, Ann Arbor, Michigan, October 20–21, 2018. Providence, RI: American Mathematical Society (AMS). Contemporary Mathematics 756, 1–12 (2020).

Affiliations

BOGDAN D. SUCEAVĂ
ADDRESS: Department of Mathematics, California State University at Fullerton, Fullerton, CA 92834-6850, U.S.A.
E-MAIL: bsuceava@fullerton.edu **ORCID ID:** 0000-0003-3361-3201