Autobiography of Wentsun Wu (1919–2017)

Wentsun Wu won the 2006 Shaw Prize in Mathematical Sciences for his contributions to the new interdisciplinary field of mathematics mechanization.

EDITOR'S NOTE. The Shaw Prize Foundation kindly provided this autobiography of Wu from their website shawprize.org, which recognizes Wu's "outstanding contributions [to] topology, automatic reasoning, machine proof, algebraic geometry, Chinese mathematics history, game theory," including the "Wu formula," "Wu Class," and "Wu method." According to the prize citation, "Wu introduced a powerful mechanical method that transforms a problem in elementary geometry into an algebraic statement which lends itself to effective computation. This method of Wu completely revolutionized the field, effectively provoking a paradigm shift."

I was born in Shanghai, China, on May 12, 1919. I received my BS degree in mathematics from Jiaotong University, Shanghai, in 1940 during the war against Japan (1937–1945). On graduating from university, because of the war, I had to teach for years in junior middle schools bringing to a halt my further learning of mathematics.

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In 1946 I met the great geometer Chern Shiing-Shen. Chern is particularly renowned for the introduction of CHERN Classes and CHERN numbers of unitary bundles which are of extreme importance among the various kinds of characteristic classes of fiber bundles. At that time Chern was in charge of the newly established Institute of Mathematics belonging to Academia Sinica. This meeting with Chern was decisive for the future of my career in mathematics.

Chern admitted me as one of the young students in his institute, all learning algebraic topology under his guidance. One year later I brought out my first paper about a simple proof of the product formula of sphere bundles discovered by H. Whitney for which his original proof was extremely complicated and had never been published.

In 1946 I also passed the national examination for sending students abroad, and in 1947 I was sent to study mathematics in France as part of a Sino-France Exchange Program. I went to Strasbourg to study under Professor Ch. Ehresmann. In 1949 I passed my doctor thesis and then went to Paris to study under Professor H. Cartan. During my stay in Strasbourg I made the acquaintance of R. Thom who was also a student of Cartan but who while at Strasbourg, had much contact with Ehresmann too. The collaboration was a very fruitful one. In 1950 Thom discovered the topological invariance of Stiefel-Whitney classes, while I, with the aid of Cartan, discovered the classes and formulas now bearing my name.

In 1951 I returned to China, and in 1953 became a researcher in the Chinese Academy of Sciences (CAS) where I remain to the present day. From 1953 onwards I made a somewhat systematic investigation of classical topological but non-homotopic problems which were being ignored at that time owing to the rapid development of homotopy theory. I introduced the notion of imbedding classes, and established a theory of imbedding, immersion, and isotopy of polyhedra in Euclidean spaces which was published in book form later in 1965. In 1965, I was awarded one of the three national first prizes for natural sciences for my work on characteristic classes and imbedding classes.

During the cultural revolution I was sent to a factory manufacturing computers. I was initially struck by the power of the computer. I was also devoted to the study of Chinese ancient mathematics and began to understand

what Chinese ancient mathematics really was. I was greatly struck by the depth and powerfulness of its thought and its methods. It was under such influence that I investigated the possibility of proving geometry theorems in a mechanical way. In 1977 I ultimately succeeded in developing a method of proving mechanical geometry theorems. This method has been applied to prove or even discover hundreds of non-trivial difficult theorems in elementary geometries on a computer in a simplistic way and was henceforth called WU's method in the literature. The discovery of WU's method marks the second turning point in my scientific life, the first one being my meeting with Chern. Since that time I have completely changed my direction of research and concentrated my efforts on extending the method in various directions, both theoretical and practical, aiming at what I have called "mechanization of mathematics."

Among the honors I have received for my research we may cite:

In 1991 I received the mathematics award from and became a member of the Academy of Sciences for the Developing World (previously called The Third World Academy of Sciences). In 1997 I received the Herbrand Award on automated deduction for my mechanical geometry theorem-proving. In 2001 I was awarded the first State Supreme Science and Technology Award of the Chinese government in recognition of my achievements in mathematics research, both in pure mathematics and in mathematics mechanization.

Finally, Mumford and I together were named as winners of the 2006 Shaw Prize in Mathematical Sciences for our research in pure mathematics, especially with regard to computer applications to mathematics which represents a new role model for mathematicians of the future.

12 September 2006, Hong Kong.

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Photo of Wentsun Wu courtesy of the Shaw Prize Foundation.

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