



Peregrinations from physics to phylogeny: essays on the occasion of Hao Bailin's 80th birthday, edited by K. K. Phua and M. Ge

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BOOK REVIEW

Peregrinations from physics to phylogeny: essays on the occasion of Hao Bailin's 80th birthday, edited by K. K. Phua and M. Ge, Singapore, World Scientific Publishing, 2016, 388 pp., £78 (hardback), ISBN 978-981-4759-08-3. Scope: general interest, edited book. Level: general readership, undergraduate, advanced undergraduate, postgraduate, researcher, scientist.

Major social and political events in China during the twentieth century have eclipsed the development of physics and science there for a long period of time. A special role in this decline was played by the break of bilateral relations with the Soviet Union and the international isolation that occurred during the so-called cultural revolution (1966–1976). Many scientists were sent to work in the countryside to be 're-educated' by farmers. Some had emigrated to the West, but many remained. One of them was the theoretical physicist Professor Hao Bailin.

In the last decades, we have seen many rapid and constructive changes in the scientific panorama in China, and now we observe a flourishing situation that is putting China at the forefront of research in Physics. For a recent special report on physics in China, revealing some of the challenges and opportunities facing physicists, see the *Physics World Special Report: China* (<http://bit.ly/2pKxIzu>).

But who is Hao Bailin? 'Professor Hao Bailin is one of China's most talented and most versatile theoretical physicists.' With these words, the 1957 Physics Nobel laureate Chen-NingYang starts his contribution to this collection of essays written to commemorate his 80th birthday. He has played an important role in the physics development in China. He was one of the last students of the legendary Soviet physicist Lev Landau, though due to the break of relations between China and the Soviet Union, he had to return back to China before completing his PhD thesis. Once back, he has been fundamental in the organisation of Theoretical Physics in China. For many years, he has been affiliated with the Institute of Theoretical Physics of the Chinese Academy of Sciences. He has organised many international meetings and been instrumental in the education of a generation of Chinese theoretical physicists working nowadays in many different places both in China and elsewhere.

He has explored a rich variety of fields within physics, such as statistical physics, chaotic dynamics, and computational

physics. Furthermore, in the most recent period of his life he has been interested in biology, mainly in theoretical life sciences and genomics. The book contains a collection of essays and mini-reviews by well-known researchers on topics where Hao Bailin has carried out research during his scientific career. Some of them are devoted to personal reminiscences of his life, and others include parts to explain the role played by him in research and teaching. A nice foreword written by Ge Molin, one of the editors of the book, briefly describes his scientific path. In one of the articles, Hao Bailin describes the 40+ year old story of the work done on critical exponents and the renormalisation group. He was following ideas closely related to the Wilson–Fisher ϵ -expansion of critical exponents and was published in *Acta Physica Sinica* in 1975 in Chinese, where not even an abstract or an English title were allowed to appear.

The book contains an excellent review on chaos in the Belousov–Zhabotinsky chemical reaction by Richard Field. Both the history and many other interesting details associated with non-linear chemical dynamics, chemical oscillations, deterministic chaos, and periodicity are described, including different dynamical models such as the Brusselator and the Oregonator. Hao Bailin was interested in this kind of problems over a large period of his scientific career. Other essays are related to Hamiltonian chaos and bidimensional turbulence, and a new interpretation of the virial expansion. There is also a large article on the cognitive network for oracle-bone characters related to animals, where the authors acknowledge the interest of Hao Bailin on Chinese culture and history. Of special interest, an excellent review by Jason A.C. Gallas describes periodic oscillations of the forced Brusselator. The organisation of periodic oscillations of this well-known model of the Belousov-Zhabotinsky chemical reaction is thoroughly explained, including historical notes and many results on the organisation of periodicity of the system. At the end, we can find some personal reminiscences by the author of the essay and from Hao Bailin. Among the articles related to statistical physics, there is an article by Giorgio Parisi on low temperature glassy systems. And on topics related to biology, there are a couple of articles, one of them on genomes, the edge of chaos and information theory and finally by Hao Bailin related to phylogeny. The book ends with a couple of essays. One of them by Mingzhou Ding remembering his days as a student of Hao Bailin in the early eighties in Beijing, and a final one by Yong-Shi Wu on the role of Professor Hao Bailin as teacher and friend.

The book can be read by a general audience with a keen interest in science, especially to learn about the prominent role played by the physicist to whom the book is dedicated in the development of physics in China in the years after the 1949 Chinese revolution. It can be of interest to those physicists interested in statistical physics, non-linear chemical dynamics and history of physics. In any case, I believe it can be a very informative and enjoyable read for scientists with interdisciplinary interests.

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