Obituary

Professor Duzheng Ye, 1916–2013

Professor Duzheng Ye, an Honorary Fellow of the Royal Meteorological Society, died on 16 October 2013 at the age of 97. In his long life and his career as an atmospheric scientist he spanned an amazing period for his subject and for China, and he was hugely influential in both. He was probably the last direct contact with Rossby, shaped many aspects of our science and laid the ground for Chinese meteorological and climate research to take its place at the top level in the world. He was also an inspiring and warm person.

In 1935 Tu-Cheng Yeh (the earlier form of his name) went to Tsinghua University and moved with it to southwest China after the Japanese invasion. After starting in physics he changed to meteorology during his course, and graduated in 1940. Following a Masters in atmospheric electricity in 1943 he entered the Meteorological Institute, Academia Sinica in Chongqing, the war-time capital of China. In the spring of 1945, however, he travelled to the USA to pursue a PhD. His original destination was CalTech, but, after being advised by a former class-mate that the best meteorology department in the USA was at Chicago, he soon moved there to study atmospheric dynamics under Professor Carl-Gustaf Rossby. This advice and move was clearly critical for Ye then and for his subsequent career.

Rossby's school at Chicago was the centre of new thinking and activity on large-scale weather and climate using observational data for the 3-dimensional atmosphere and soundly based theoretical concepts. In contrast to the frontal focus of the Bergen School, Rossby had shown the relevance for the larger scale of the barotropic vorticity equation and the importance of the β-effect in making the waves retrogress relative to the ambient westerly flow in mid-latitudes. Rossby gave his new PhD student the opportunity to study the zonal group velocity and dispersion of energy. Ye published the results from his detailed exploration of the topic in a seminal paper in the Journal of Meteorology in 1949. The main application in Ye's mind was the understanding that his work gave to the formation of troughs and ridges downstream of an initial disturbance – an observed phenomenon that was clearly of interest to many associated with the Chicago School. Rossby also saw the importance of this work for the weather forecasting project being led by Jule Charney at the Institute for Advanced Studies in Princeton, in that it showed the extent of the upstream initial data that would be required for a weather forecast at a given location. In her book, Harper (2008) writes that *Rossby wanted Charney to write a brief note – based on the project's work on signal velocities…to accompany a paper on energy dispersion by Rossby's 'academic son'… Tu-cheng Yeh*. Charney actually discussed this aspect as part of his major paper on a physical basis for numerical weather prediction in the same journal later in 1949.

After his five years as a student and researcher at Chicago, Ye clearly wanted to return to post-revolution China, but the Korean War and the lack of diplomatic relations between the USA and China made this difficult. In 1950 he did manage to return making use of a boat from San Francisco to Hong Kong, and took up a position in the Institute of Geophysics in the Chinese Academy of Sciences. His research after his PhD owed much to the influence of his time in Chicago. Before leaving the USA he had submitted a paper on the maintenance of the zonal circulation from a vorticity perspective, emphasising the importance of the up-gradient vorticity transport in middle and higher latitudes by large-scale eddies. Many of the ideas Ye developed in this period just before and soon after he returned to China were recorded in a book published in 1958 with his colleague Paochen Chu, entitled *Some fundamental problems of the general circulation of the atmosphere*. The text was in Chinese but it contained 16 pages of chapter abstracts in English. The chapter headings give an idea of the broad sweep and ground-breaking nature of his ideas at this time: Chapter 1, The observational facts of the general circulation of the atmosphere (GCA) over the Northern Hemisphere; Chapter 2, The fundamental factors controlling the GCA; Chapter 3, The quasi-geostrophic motion; Chapter 4, The formation of the planetary wind belt, the mean meridional circulation and the jet stream; Chapter 5, the formation of mean troughs and ridges in the westerlies; Chapter 6, Theory of formation of the temperature field; Chapter 7, Long waves and their instability; Chapter 8, Balance of angular momentum in the atmosphere; Chapter 9, Balance of kinetic energy in the atmosphere; Chapter 10, Balance of heat and water vapour in the atmosphere; Chapter 11, The general circulation: an internally consistent picture.

During this period Ye also started his thinking about the role of the Tibetan Plateau, a major topic for the rest of his life. He showed how it split the westerly jet, and later he discussed the abrupt transition of the jet in spring from south to north of the Plateau and the reverse in autumn. The likely importance of the summer heat source over the Plateau became clear to him. The determination of the magnitude of this source from hugely challenging *in situ* measurements and its role in the onset and nature of the Asian Summer Monsoon became a theme for his own work and for the Chinese and world meteorological community.

Ye was a pioneer in understanding that human development was leading to a rapid deterioration in many aspects of the environment and that this environment was itself crucial in supporting human life. He developed a framework of 'orderly human activities' and espoused the necessity for the mitigation of global environmental change.

In recognition of his scientific eminence, Ye received many international and national honours. Internationally he was awarded the 2003 IMO Prize, Foreign Membership of the Finnish Academy and Honorary Membership of the American as well as the Royal Meteorological Society. In China he received the National Medal of Science and Technology in 2005, and became a Senior Academician in the Chinese Academy of Sciences.

His scientific work was performed in the context of the major changes and events that occurred in China. In 1966 the Institute of Atmospheric Physics (IAP) was formed from part of the Institute of Geophysics and Ye was made Director. However, soon after this the Cultural Revolution started and he was criticised as being a *bourgeois antirevolutionary academic authority* and *secret agent of the Kuo-Ming-Dang*. He was imprisoned and on his release was sent to the countryside to be reformed through hard labour. He was allowed to return to the IAP after two years, and in 1978 when the turmoil was over Ye took up the mantle of IAP Director, a role that became an honorary one later in his life. Prestigious positions followed as Vice-Chair and Special Advisor of the Chinese Academy of Sciences and member of the Standing Committees of the

6th and 7th National People's Congress. Despite these positions he maintained his rapport with students, even in difficult times.

Ye's broad perspective and warm personality enabled him to lead the rapid post-Cultural Revolution development of the IAP and Chinese Meteorology in general. As soon as this was possible he renewed contact with US and UK scientists. Some top students were encouraged to pursue PhD research abroad as he had done. In the UK the first such students were Guoxiong Wu and Yuankhan Wu, who came to Imperial and Reading, respectively, in 1979 and 1980. Wu obtained his PhD, spent two years at the ECMWF, and returned to China to follow in Ye's footsteps in his scientific and leadership roles.

Duzheng Ye was married to his wife Hui Feng for 70 years until his death. She was a food researcher and they had met when Ye was doing his Masters degree. Feng took teaching associate positions in a number of universities as Ye moved in China. She did not travel to the USA until 1947 when she studied at Wyoming and subsequently moved to Chicago to be with him. She took the long and difficult journey back to China with him in 1950. There she had associate professorship positions in Beijing before she took up a position in the Institute of Zoology. Fang and Ye had three children who all now live in the USA.

Duzheng Ye was a delight to meet on his first visit to the UK in 1981 and on many occasions in the UK and China after that. There was no hint of pomposity in him; his greeting was always warm and his shrewd scientific comments were always accompanied by a smile. In the 1990s my wife and I had the great honour of being entertained to tea at the Ye's home with them, a delightful and memorable experience. With the passing of Duzheng Ye, the meteorological world has lost one of its towering figures, but the flourishing of the IAP and the meteorological scene in China is a fitting memorial to him.

Acknowledgements

In writing this obituary I have relied heavily on the material supplied to me by Guoxiong Wu and his answers to my questions, for which I thank him. I am also very pleased to acknowledge the material provided to me by Professor Ye's son, Wei Jiang Yeh. Finally, Jinhua Lu provided the reference to the material in Harper's book.

Reference

Harper KC. 2008. *Weather by the Numbers*. MIT Press, pp. 126–127.

Brian Hoskins

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Book reviews

The White Planet: The Evolution and Future of our Frozen World

J. Jouzel, C. Lorius and D. Raynaud
Princeton University Press, 2013
Hardcover rrp £19.95
316 pp
ISBN 978-0691144993

A translation from the original French text *Planet blanche, les glaces, le climate et l'environment* published in 2008, this book is more of a conversation between the authors and the reader than a source of reference for the researcher. The style is engaging and at times quite emotive, and is typified by the final words in the conclusion, which refer to the polar regions as *sentinels of our environment*. Understandably, much of the research to which reference is made is French in origin, with a touch of international seasoning in the meal provided by an obvious commitment to the conclusions reached by the Intergovernmental Panel on Climate Change (IPCC). The 275 pages of text are divided into four parts. Part 1 provides the reader with a broad-brush background in cryosphere research. As such, it is loaded heavily with factual information, including inventories of global ice deposits, exploration and research. Part 2 has the title of 'Polar Ice: Amazing Archives' and takes us on a journey through the formulation of geochronologies from ice cores, leaving us with questions relating to the mechanisms driving short- and long-term changes in the cryosphere. Part 3 attempts to address some of these questions, but climatologists will probably be disappointed with the depth of treatment. Climate is limited to radiative forcing and there is little here on the complex feedback mechanisms between, for example, cryosphere and atmosphere. References to climate as such are almost exclusively based on IPCC reports. Taking this limitation aside, the authors take their readers through from anthropogenic changes in greenhouse gases to some of the key questions, such as 'What will become of our glaciers?' and 'What if the Gulf Stream halts?' Part 4 is a little bit of a rag-bag but is a plea for polar research, followed by an ill-fitting chapter on the use of ice-core research in detecting atmospheric pollution by, for example, heavy metals and radioactivity. A conclusion leaves us considering the 'Anthropocene' marked by increasing atmospheric content of greenhouse gases derived directly from human activity. I found the book an easy read but one that could do without some slightly quaint language and the strange sketches used to break up the text.

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