J. Fluid Mech. (1989) *vol.* 201, *pp.* 566–567
Printed in Great Britain

REVIEW

Selected Papers of C. C. Lin. Vol. 1, Fluid Mechanics and Applied Mathematics; Vol. 2, Astrophysics. Edited by DAVID J. BENNEY, FRANK H. SHU and CHI YUAN. World Scientific Publishing, 1987. 560 pp; 557 pp. £133.

Symposium to Honor C. C. Lin. Edited by DAVID J. BENNEY, FRANK H. SHU and CHI YUAN. World Scientific Publishing, 1988. 438 pp.

Lin's career was celebrated at a symposium at MIT in 1987 on his retirement. The book of his selected papers was presented to him then in honour of his productive and long scientific career. It is a selection from his 113 publications (including a checklist). There are 31 papers (a few only in summary) reproduced in Volume 1, mostly on fluid mechanics, and 20 papers in Volume 2, on astrophysics.

As is appropriate to this journal and my experience, this review emphasizes the first of the two volumes of papers and his contributions to fluid mechanics. However, he is best known today for his later work, on the structure of galaxies, and especially for his application of continuum models thereto, so the review is a retrospect of his work in one field while he continues to be active in another.

The article Lin and Reid wrote for the *Handbuch der Physik* (1963) is included in the book, but Lin's pamphlet *On the Motion of Vortices in Two Dimensions* (1943), which is currently winning new esteem on account of the modern renaissance of the theory of vorticity dynamics, his classic monograph *The Theory of Hydrodynamic Stability* (1955), his article on turbulence in *High Speed Aerodynamics and Jet Propulsion* (1961), and his and Segel's book *Mathematics Applied to Deterministic Problems in Natural Sciences* (1974) are excluded. (It is welcome news that SIAM has just republished that excellent book.) Although the seminal ideas on the stability of parallel flow of a compressible fluid in the paper (1946) that he and Lees wrote justify the reproduction of the paper in entirety, only an abstract is included.

Lin left the field of fluid mechanics for astrophysics in the early 1960s with only the occasional return, although he treats stars as particles of a fluid in his density theory for the spiral structure in galaxies. He published only one paper in the *Journal of Fluid Mechanics* (in 1961). His last paper on fluid mechanics without direct application to astrophysics was published in 1973. Now fluid mechanics has changed a lot in twenty-five years, although not beyond recognition. Fashions have come and gone. Asymptotic methods have improved, understanding of nonlinearity has increased enormously, laser-Doppler anemometry has been developed, and, above all, computers have revolutionized numerical calculations, control of laboratory experiments and data processing. So newcomers to the field may know little of Lin. The publication of his selected papers makes it opportune to recognize his great contribution.

His papers show him as a consummate applied mathematician, a master of a wide range of classical techniques and an inventor of new ones, but with not quite such a deep insight into physical mechanisms of flow. He worked chiefly on the theories of hydrodynamic stability and turbulence, with occasional but influential papers on the dynamics of vortices, compressible flow, variational principles, and the boundary layer on a plate (the classic paper that he and Carrier published in 1948). It is regrettable that perhaps his most original work, that on the flow of helium II, has not endured. Twenty-five years' development of computational and asymptotic methods

has superseded so much of his work that it is easy to forget his contributions which have been subsumed in our present knowledge. His work in the 1940s on the instability of parallel flow forced the world to accept that Tollmien–Schlichting waves do, indeed, mark the onset of instability of flow over a flat plate. It was Lin's asymptotic analysis and advocacy in the 1940s, as well as Schubauer and Skramstad's experiment, that resolved the controversy of the 1930s. Now that a research student may compute the solution of an Orr–Sommerfeld problem in a couple of days it may be hard to understand why a man of Lin's calibre was needed to confirm the instability discovered by Tollmien. Lin was also one of the first to recognize the need to develop the nonlinear theory of hydrodynamic stability; he did not stay long enough to pursue it far, but he influenced others through his personal contacts as well as his publications.

His work on turbulence has suffered more at the hand of time. His contributions to the theories of isotropic turbulence and diffusion were technically difficult and respected. He was, however, one of several bright stars, including three Nobel laureates, whose contributions of the 1940s and 1950s to the theory of turbulence are not used very much today. But how many of the papers in this volume of the *Journal of Fluid Mechanics* will be cited in forty years time?

Lin's work on the role of applied mathematics is represented by two papers in Volume 1. But a better representation is the group of applied mathematicians he built at MIT and many more throughout the world whom he, his work and his philosophy have influenced. This influence is due not only to the excellence of his work but also his articulacy, courtesy and kindness.

The proceedings of the symposium show the affection for him as a man, in various personal comments and anecdotes amid the scientific papers presented by participants. The papers themselves show the widespread respect for him as a leader of fluid mechanics and of astrophysics.

P. G. Drazin