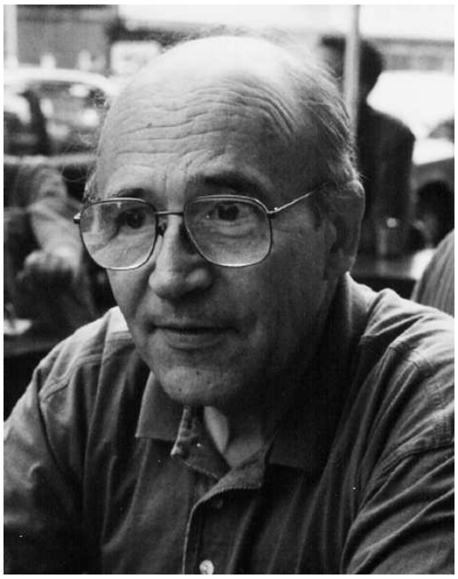

Norman Hodgson Baker Jr (1931 - 2005)

We are sad to announce that Norman Baker (Norm to everybody), one of the founders of the modern stellar pulsation theory, and president of the Variable Star Commission 27 of the International Astronomical Union during the 1982-85 term, died on 11 October 2005.

Norm was born in Fergus Falls, Minnesota, USA on 23 October 1931. He received his BA in 1952 from the University of Minnesota, and his PhD in 1959 from Cornell University, where he worked with Phil Morrison on radiation from particle interactions that create current. Norm was a serious physicist, and remained so throughout his life; but he had time, even as a graduate student, for extracurricular fun. He started a very successful consortium to brew beer, adopting a recipe passed down from his aunt, and which was appreciated as far away as Los Alamos. One of the consortium had covered the vat with an old undershirt, and so they called their establishment The Old Undershirt Brewery, and underneath that name on the labels on the bottles Norm added in small print that the beer was ‘For prevention of disease only’, a statement not uncommon in the US at that time to avert harrassment from certain religious organizations.

After graduating from Cornell, Norm went to work for two years at the Max-Planck-Institut für Physik und Astrophysik in Munich, where Ludwig Biermann and Arnulf Schlüter were directing the new field of cosmic plasma physics. But before he could get started, Rudolf (Rudi) Kippenhahn and Stefan Temesvary, also serious physicists with an eye for fun, dragged him over to work with them in their field of stellar physics, a subject which, thanks to the new generation of modern electronic computers, was enjoying a phase of rapid advancement, and to which Norm subsequently remained faithful. The collaboration with Rudi had a lasting impact on Norm’s scientific career, not just because it pointed him in the direction that he was to pursue for the rest of his life, but also because it influenced the manner in which Norm addressed scientific issues of all kinds. After Munich, Norm was a staff scientist for a short while at Convair Science Research Laboratory in San Diego, USA, and then, from 1961 to 1965, he held research positions at the NASA Goddard Institute for Space Studies in New York, the Institute for Advanced Study at Princeton, the Astronomy Department at Yale and the Physics Department at New York

University. In 1965 he joined the Faculty at Columbia University, where he remained until his retirement. He was promoted from Assistant Professor to Associate Professor in 1967, and to Professor in 1971; he retired in 2002.

Norm's first paper with Rudi was on stellar rotation; but after that Norm's scientific interests were dominated by stellar pulsation. Following on from the pioneering works of Sergey Zhevakin and John Cox, he wrote two papers with Rudi on the excitation of δ Cephei pulsation, which together with the nonlinear studies of Bob Christy, who published at about the same time, laid the foundations for the modern understanding of the subject. Although not perfect, this work convincingly established the κ-mechanism as the principal cause of Cepheid pulsation. The second of the papers, published in 1965, introduced a number of improvements to the linearized theory, and took particular care over the treatment of the atmospheric layers of the star; convective heat transport was included in the equilibrium models, although at this time its perturbation by the pulsations was ignored, a device which is still used by some even today. One of the important outcomes of Norm's coming to understand the meaning of the numerical modelling of the pulsation-excitation mechanism was his invention of the one-zone model of stellar pulsation. It does not seem to be widely read today, yet it has benefitted the thinking of all those who have been fortunate enough to encounter it.

With the computer resources of the time, numerical modelling of the kind adopted by Bob Christy could not accommodate low-amplitude slowly growing modes, because the miniscule movement of the ionization zones through the Lagrangian mesh could not be followed. With Kurt von Sengbusch, Norm developed in 1969 a method for determining the terminal state of pulsation as a nonlinear stable periodic limit cycle which was free from this drawback. Its power was fully demonstrated by Bob Stellingwerf in the late 1970s.

Among the most frequently referenced of Norm's papers are two published jointly with Tjeerd van Albada in 1971 and 1973. They present pioneering efforts to combine the results of stellar-evolution theory and pulsation modelling to infer the properties of horizontal-branch stars. The first paper provides an assessment of the parameters characterizing the RR Lyrae stars in M3. Most interesting were the first constraints on the helium abundance in the envelopes of such stars. The linear fitting formulae for the logarithm of the pulsation periods given in that paper were used for a long time after by followers. The second paper presents an interpretation of the Oosterhoff dichotomy of globular clusters as reflecting different directions of stellar evolution. The interpretation, which is still commonly accepted today, is that in Group I clusters, which are characterized by shorter periods of the fundamental-mode pulsators, evolution proceeds from red to blue, whereas in Group II the opposite is the case. The argument invokes pulsational hysteresis, so that in the intermediate temperature range, where both fundamental and first overtone pulsations are possible, the mode of pulsation experienced by a star depends on its history: if a star has entered this temperature range from the red side, where only fundamental-mode pulsation is possible, it continues to pulsate in that mode to higher effective temperatures, and consequently to shorter periods, than do the fundamental-mode stars that have come from the blue side, and which had remained in their first overtone to lower effective temperatures before switching to their fundamental.

In the Group II clusters, stars appeared to continue to pulsate beyond the red edge of the instability strip. Amongst the potential reasons discussed by Norm and Tjeerd for that was a putative hysteretic interaction with convection, the lack of a theory for which was lamented. Indeed, ever since his seminal work with Rudi Kippenhahn, Norm had appreciated that to ignore the pulsationally induced convective heat and momentum flux perturbations is grossly inadequate. In the 1970s he took years (not unusual for Norm's style of working) helping to implement a time-dependent mixing-length formalism into his computations, the principal result of which was to establish the role of convection in determining the red edge of the instability strip.

By the mid 1980s Norm found himself still working on stellar convection. During a stay at the Max-Planck-Institut für Astrophysik he became involved in a critical study of Roxburgh's criterion of convective overshooting. He worked there also on the pulsational stability of very massive main-sequence stars, a piece of work which – together with numerous others – never made it into press. Norm's swansong in the field of stellar convection was a review discussing the various approaches to modelling time-dependent convection, a paper which he wrote for the occasion of a celebration workshop at the Max-Planck-Institut. In the 1990s Norm revitalized his Generalized Newton-Raphson computer code to solve (nonlinear) differential eigenvalue problems (the origins of which can still be found in action even today in stellar pulsation codes throughout the world), and he devised an efficient procedure for evaluating the so-called Henyey determinant of stellar models. This allowed him to study – on the then already pretty fast personal computers – the secular stability of various types of stellar-model series. All these studies of mostly self-edifying character were not considered by Norm to be original, so they were all kept in his drawer, or at best they made it into his lectures. In the mid 1990s, strange modes caught Norm's fancy. With Hideyuki Saio and Alfred Gautschy he published a paper in which he tried to model the phenomenon, once again with a simple toy system, this time with a two-zone model. Some decent steps towards understanding strange modes could be made; however, Norm was never completely satisfied with the outcome. The final topic into which he delved was the secular stability of thin nuclear-burning shells in stars. Norm found high-energy astrophysics of much interest in his later years, and it was the application of secular stability to X-ray bursts in LMXBs that kept him busy after his retirement in 2002.

We shall remember Norman Baker not only as one of the pioneers of modern stellar pulsation theory, and as the author of many of the seminal papers on that subject, but also as an extremely good friend, a modest man with a unique and enjoyable sense of humour. He was a man of excellent judgement and impeccable honesty, which made him an admirable editor of the Astronomical Journal. Norm maintained and encouraged a high quality of scientific rigour; he was quick to praise good work, in support of which he was not shy in decrying the bad. He was always ready to help and encourage young astronomers, and to guide them onto the straight and narrow path to success. He leaves behind a community of friends, most notably his beloved wife Doris, who, since they married on 16 January 1976, was always with him at conferences wherever they might be. We all send her our heartfelt condolences. Norm will be sorely missed by all those who knew him.

Wojciech Dziembowski, Alfred Gautschy, Douglas Gough