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Introductory Remarks

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Abstract. Welcome to IAU Colloquium 187.

I believe that when Spanish explorers first gave the name Florida to a part of North America that they visited, the territory stretched from Massachusetts to Texas. It may have lost a little in geopolitical status since then, but its stature in astrophysics, and particularly in stellar astrophysics, has only grown larger. Long may it continue to increase.

I am happy to think that I was present at the very genesis of this conference, which occurred in a restaurant in Cambridge while Bob Wilson was on sabbatical there. It sprang from a conversation between Bob and Andreas Burkert, and so led to the support from the Max-Planck-Institut für Astronomie, Heidelberg, for which we are very grateful, along with our other sponsors, the International Astronomical Union and Florida International University.

The title of the conference was originally "Bizarre Stars." When at some point I learned that a web-site had been set up, but I didn't have its address, I typed that title into my search engine. You would be amazed at what I saw; and I must say I was relieved when the title was changed. I did not have to search similarly for "Exotic Stars," because by then I had the address, but I imagine that the emphasis might have switched towards ostrich feathers and away from brass-studded leather.

I can see from the schedule that we are going to have some very interesting and challenging talks. Some of you who came here for a holiday by the beach may find it difficult to drag yourselves away from the lecture hall. I have little doubt that after several talks we shall hear a plea that, "We need more data." I sometimes think that we would be more confident of our understanding if we had *less* data: only kidding! But I hope we will be able to press our funding bodies to support not just the acquisition of data but the personnel necessary to analyse and interpret it. Computers may be able to store and process vast quantities of data, and other computers may be occupied in constructing more and more sophisticated models that attempt to explain it, but we can never do without the human intellect that is able to comprehend the underlying ideas, and write them on the back of the proverbial envelope. I believe it will still be some time before either hardware or software will be available to undertake this process.

I was sorry to learn last year of the death of my Ph.D. Supervisor Professor Sir Fred Hoyle. I was reminded by it of a salutary lesson that I learned in my first few years of research. I attended lectures by Fred on Stellar Structure and Evolution, in about 1963. At some point in this course, discussing the evolution

of red giants, he remarked that the density $\rho_{\rm shell}$ in the hydrogen-burning shell would scale with growing core mass $M_{\rm core}$ according to $\rho_{\rm shell} \propto M_{\rm core}^{-2}$. I was quite unable to follow his reasoning. In the next five years I developed a code that evolved stars in what I believe was a particularly efficient way, especially if they developed thin burning shells as in red giants. The first thing I checked was the way in which $\rho_{\rm shell}$ scales with $M_{\rm core}$, and it was almost exactly the way that Fred had predicted. Evidently computers are not the only way to achieve insight into quite complex problems.

One of the unusual and attractive things about stars, and stellar evolution, that distinguishes the study of them from the study of say physiology or weather, is that we are fortunate to have a remarkably well-defined initial condition. Despite all the complexity of the star-formation process, which is still a very difficult and challenging problem, there seems reasonably little doubt that stars do settle into a state of both hydrostatic and thermal equilibrium in which the earlier complexity is largely forgotten. This Zero-Age Main-Sequence structure is not quite unique, but the various models of it are little different from each other. This allows us a certain confidence in predicting later stages, and many of these predictions are well supported by comparison with observational data. But this also makes it all the more interesting that some stars, possibly quite a small minority, seem to be doing things that are entirely unexpected. This is I suppose the defining characteristic of the class of exotic stars. Our job is to learn from these the circumstances in which our usual simplifications break down. Whether we shall achieve such understanding in the course of our conference, or whether we will learn only that much remains to be understood, is still to be seen, but either outcome will be good for us.

But perhaps I should, at least for the benefit of our younger colleagues, urge some caution in the interpretation of odd results. Many years ago, Mirek Plavec explained to me the following circumstance: astronomers, when they die, do not go straight to Heaven, but their souls are first taken on a journey past all the objects that they have written about. Although Mirek did not say so in so many words, he left me with the feeling that whether the journey ended in Heaven, or elsewhere, might depend crucially on this experience. I doubt if one would have had to be right every time, but I am sure it would be important whether one was wrong but sincere in one's attempt to understand confusing evidence, or whether on the other hand one had studiously ignored some of the evidence in order to reach a spuriously convincing explanation. Fortunately the judgment will be made by much wiser entities than us. In the lesser role of a referee of astronomical papers, I have sometimes been torn by a feeling that the author's conclusion was right despite the fact that the evidence was not strong, and also sometimes by the opposite feeling.

I would not be true to myself if I did not seize this opportunity to advertise the project with which I am currently involved. It is called DJEHUTY, after the Egyptian god of astronomy and also of the world beyond death. We are attempting to model whole stars in three dimensions, including hydrodynamics, thermal physics and nuclear physics. We intend to model some kinds of binary stars as well as single stars. We do not expect to follow such a model through 10^{10} yr of evolution, but would rather expect that we could follow some interesting phases, such as the helium flash, Cepheid pulsations, or Roche-lobe overflow,

for a year or two of star time, and use this to improve our understanding to the extent that we can better model, in more conventional one-dimensional simulations, the longer stretches of evolution in between. If any of you have ideas that you think might be clarified by such 3-D modeling, I hope very much that you will get in touch with me. We are very anxious to pursue collaborations.

Acknowledgments. We are all enormously grateful to the Local Organising Committee for the arrangements that they have made on our behalf. There has been an enormous commitment by them of time and effort, but I am sure we all agree that it has been worthwhile.

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