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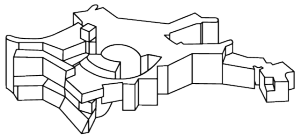

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Review of the doctoral thesis of Camille Landri:
"Theory and observations of two stars undergoing strong interaction"
as submitted to Charles University, Prague.

Dear members of the thesis committee,

I am pleased to have read the accomplished thesis submitted by Camille Landri. To me, the thesis clearly provides evidence that the author is able to perform creative scientific work, leading to novel and worthwhile results, as I explain further below. On the basis of my review I strongly support the award of a PhD degree to Camille Landri.

Firstly, I would like to highlight the diversity displayed in this research. I sometimes see PhD theses for which I could easily argue that, across the chapters, the candidate has performed variations on approximately the same thing. That doesn't make those other theses bad, but this thesis by Camille Landri stands out to me as exceptionally impressive in that each chapter of results addresses significantly different physical situations from each other, achieved by applying truly different techniques and tools in each case. Nonetheless the thesis work constitutes a coherent picture, studying difficult unsolved problems in binary-star interactions, and achieving admirable results.

Chapter 2 analyses observational data (both photometric and spectroscopic) of a recently-identified and unusual interacting binary system. The work presents thoughtful interpretation regarding the unusual properties of the system, including proposing explanations for the spectral features seen in emission during outburst, and for the photometric evolution. The work further argues that this binary is member of a particular class of systems, despite being an extreme outlier (see Figures 2.6 and 2.7), and discusses how the extreme nature of the binary could help us to understand more about the physical processes going on in this class of system.

Chapter 3 presents results from smoothed-particle hydrodynamics simulations, for which the the candidate also needed to modify the code to implement treatments of relevant additional physics. This investigates a novel scenario to explain the surprising

immediate environment of a particular star. I find both the idea and the simulations interesting and impressive. If the imaginative proposed scenario turns out to be correct then this will clearly be important work, but the paper anyway seems valuable to me for the modelling. This text is again enjoyably thoughtful, firstly in expressing likely consequences of the limitations of the physics approximations, and ***especially*** in the lengthy "Discussions" (section 3.4; note the unusual but appropriate plural title).

Chapter 4 describes simulations performed using a different type of hydrodynamics code, in order to model an instance of a "common-envelope" phase with properties which are thought to be relevant for producing mergers of neutron stars (and so, e.g., gravitational-wave sources and r-process enrichment). These are the first such simulations which investigate the consequences of adopting initial conditions that are more realistic in a particular way, which takes into account the previous evolution of the binary system. Although the conclusions are somewhat limited by available numerical resolution, the work nonetheless finds fascinating and significant differences between the simulations with the standard and improved initial conditions.

I also note that the candidate's advisor is not a co-author of the work in Chapter 4. I see this only rarely in PhD theses, especially outside the USA.[1] To me this provides extra evidence of the candidate's development as an independent scientist, and further supports the idea that Camille Landri clearly deserves the status of a PhD.

The apparent display of expertise in the introductory chapter further impressed me, not only by the clear pedagogical figures and explanations of the fundamental points, but also by the way the text places the introductory content in the context of more recent literature.[2] I find it particularly notable that the author achieved this high quality despite the fact that the chapter covered a lot of ground – which is, in turn, a consequence of the unusually broad sweep of work in this thesis.

The research presented in this thesis has appeared so recently that I cannot yet tell you for *sure* how much this work will change the field. But I would not be at all surprised if especially the papers from chapters 3 and 4 go on to be well-cited, and influential, and to be the starting point for simulations which build on these innovative studies.

I congratulate the author on their work. I commend this thesis to you as displaying more than sufficient evidence, in both depth and breadth, that the author deserves to proceed to a defence in order to be awarded their PhD degree.

I regret that I had previously made other commitments at the time when I understand the defence is expected to be scheduled.

Yours sincerely,

Dr Stephen Justham

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[1] I also applaud the advisor for apparently encouraging this independence and experience. Not all advisors would allow their student such freedom, even when it would clearly benefit the development of the student.

[2] I think there are even only relatively rare and small typographical errors (e.g., at the top of page 15 I suspect the author meant "stopped burning hydrogen," not "stopped burning helium").