A. Manifesto

MESA was developed through the concerted efforts of the lead author over a six year period with the engagement and deep involvement of many theoretical and computational astrophysicists. The public availability of MESA will serve education, scientific research, and outreach. This appendix describes the scientific motivation for MESA, the philosophy and rules of use for MESA, and the path forward on stewardship of MESA and advanced development of future research and education tools. We make MESA openly available with the hope that it will grow into a community resource. We therefore consider it important to explain the guiding principles for using and contributing to MESA. Our goal is to assure the greatest usefulness for the largest number of research and educational projects.

A.1. Motivation for a new tool

Stellar evolution calculations (i.e. stellar evolution tracks and detailed information about the evolution of internal and global properties) are a basic tool that enable a broad range of research in astrophysics. Areas that critically depend on high-fidelity and modern stellar evolution include asteroseismology, nuclear astrophysics, galactic chemical evolution and population synthesis, compact objects, supernovae, stellar populations, stellar hydrodynamics, and stellar activity. New observational capabilities are emerging in these fields that place a high demand on exploration of stellar dependencies on metallicity and age. So, even though one dimensional stellar evolution is a mature discipline, we continue to ask new questions of stars. The emergence of demand requires the construction of a general, modern stellar evolution code that combines the following advantages:

- **Openess:** should be open to any researcher, both to advance the pace of scientific discovery, but also to share the load of updating physics, fine-tuning, and further development.

- **Modularity:** should provide independent, reusable modules.

- **Wide Applicability:** should be capable of calculating the evolution of stars in a wide range of environments, including low- and massive stars, binaries, accreting, mass-losing stars, early and advanced phases of evolution etc. This will enable multi-problem, multi-object physics validation.

- **Modern techniques:** should employ modern numerical approaches, including high-order interpolation schemes, advanced AMR, simultaneous operator solution; should

support well defined interfaces for related applications, e.g. atmospheres, wind simulations, nucleosynthesis simulations, and hydrodynamics.

- **Microphysics:** should allow for up-to-date, wide-ranging, flexible and modular microphysics.

- **Performance:** should parallelize on present and future shared-memory, multi-core/thread and possibly hybrid architectures so that performance continues to grow within the new computational paradigm.

A tool that combines the above features is a significant research and education resource for stellar astrophysics. We acknowledge that some important aspects of stars are truly three-dimensional, such as convection, rotation, and magnetism. Those applications remain in the realm of research frontiers with evolving understanding and insights, quite often profound. However, much remains to be gained scientifically (and pedagogically) by accurate one-dimensional calculations, and this is the present focus of MESA.

A.2. MESA philosophy

The MESA code library project is open. It explicitly invites participation from anybody (researchers, students, interested amateurs). Participation in MESA can take a wide range of forms, from just using a MESA release for a science project, to testing and debugging (i.e. report bugs, find fixes and submit them for inclusion into the next release) as well as taking on responsibility for the continued stewardship of certain aspects (modules) of the code. The participation of experienced stellar evolution experts is very welcome.

Users are encouraged to add to the capabilities of MESA, which will remain a community resource. However, use of MESA requires adherence to the "MESA code of conduct":

- That all publications and presentations (research, educational, or outreach) deriving from the use of MESA acknowledge the Paxton et al. (2010) publication and MESA website.

- That user modifications and additions are given back to the community.

- That users alert the MESA Council (see below) about their publications, either pre-release or at the time of publication.

- That users make available in a timely fashion (e.g., online at the MESA website) all information needed for others to recreate their MESA results – "open know how" to match "open source."

- That users agree to help others learn MESA, giving back as the project progresses.

Users are requested to identify themselves by name, email contact, and home location.

A.3.   Establishment of the MESA council

The MESA project began as an initiative to construct a reliable computational tool for stellar structure and evolution that takes full advantage of modern processor architectures, algorithms and community engagement. The release of MESA has forced some explicit thinking of what structure is needed so as to achieve the mission of stewarding MESA in its use for scientific research, education and outreach, while also enabling the development of new tools and ideas. The MESA operating principles are simple: be open in your scientific discussions, give credit to all contributors, and be prepared to give back to the community of users. We hope that this creates an environment where the young are encouraged to become engaged in a career-enhancing manner.

We have established the MESA Council that consists of those engaged in working towards the shared missions outlined here:

- **Steward MESA** There are many ways this will be done: supporting the contributors, maintaining the web access and web page updates, seeking enabling funding, holding yearly working groups that allow for continued engagement, documenting MESA development in the refereed literature, and sustaining advanced development.

- **Interface with the User Community** This starts with answering questions from users, developing a way to accept new code in an integrated fashion, maintain a user registry, and identify new MESA Council members from those most active and engaged in the intelligent use of MESA.

- **Enable Scientific Research and Education with MESA** Promote MESA and its goals, e.g., through scientific contributions at relevant conferences. Identify science opportunities that match MESA capabilities and facilitate and encourage appropriate collaborative activities. Track the science carried out by the community with MESA.