Preface

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The seismology of the Sun and stars has come a long way in a short time. The "original" *Global Helioseismology* has reached a level of maturity that allows many internal properties of the Sun to be probed with exquisite precision, although it currently faces a severe challenge to reconcile interior models with helioseismic inversions near the base of the convection zone in the age of the new solar chemical abundances. *Asteroseismology* suffers in comparison by being restricted to very low spherical harmonic degree (ℓ), but it makes up for this by providing many more subjects for study (including solar-like stars) and many cases of well-identified *g* modes. Where once we were restricted to stellar spectra in studying individual stars, asteroseismology now provides a crucial tool with which we may explore their deep structure. Its natural synergy with planet-search programs also invigorates it. *Local Helioseismology* has seen the development of an exciting array of techniques and insights over the two decades since observations of surface oscillations in and around active regions gave the first clues that something different was happening there, and it has been particularly important in mapping flows of various types in shallow subsurface layers. Its current challenge is to take better account of surface magnetism and to illuminate the coupling between interior and atmospheric oscillations where magnetic fields clearly play an important

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role. The crucial search for deep stored magnetic field associated with the solar dynamo also provides a challenge for the coming years to both global and local helioseismologists. *Coronal Helioseismology*, still in its infancy, is making rapid progress driven by the astounding high-resolution data and images from spacecraft such as TRACE and *Hinode*. Helio- and asteroseismology benefit from and inform modern numerical simulations of magnetoconvection and wave propagation through complex media. Testing of inversion techniques in the "numerical laboratory" provided by these models is becoming increasingly valuable.

This volume presents a timely snapshot of the state of helio- and asteroseismology in the era when SOHO/MDI is about to be replaced by SDO/HMI and CoRoT is yielding its first long-duration light curves of thousands of stars. It is inspired by two seminal conferences: HELAS II "Helioseismology, Asteroseismology and MHD Connections" in August 2007 in Göttingen, Germany, and SOHO 19/GONG 2007 "Seismology of Magnetic Activity" held at Monash University in Australia in July 2007.

Many of the papers included here represent work presented at one or other of the meetings, but this Topical Issue was thrown open for general submission on their core topics. All papers were refereed to the usual high standards of *Solar Physics*. Three papers describing the current status of asteroseismology, global helioseismology, and local helioseismology were specially commissioned for the volume, and these set the context for the other contributions.