# PREFACE

It is a truism in astronomy that new spectral windows and new techniques open new eras of discovery; the solar infrared is no exception. The infrared window to the Sun is scarcely "new", of course – its first scientific exploration dates from 1800, when William Herschel discovered invisible solar radiation redward of what our eyes can see. But the complete opening of this window is just now going on. The opacity of the Earth's atmosphere has been surmounted by going to space, and on the ground new detectors and spectrographic techniques have made observations possible that were only a dream a decade ago. This volume, and the Symposium it records, show what has been accomplished in the past few years, but equally importantly, they point the way to what can be done in the next.

A fair question at the outset is, "Why do we care?" After all, we already have many windows through which to examine the Sun, that most-studied of all astronomical objects. In some respects our view is more precise through the infrared window; for example, we can observe spectral lines with Zeeman sensitivity several times greater than any line in the visible. We can also see slightly different solar regions than through other windows; for example, our line of sight penetrates deepest into the solar photosphere in the near infrared. And the physical conditions where the solar infrared radiation is formed make for a different perspective; thus, the near-linear weighting of the Planck function with temperature, or the fact that the continuum and many spectral lines are formed essentially in local thermodynamic equilibrium, give a contrasting and complementary view to that at shorter wavelengths. There are drawbacks of course – notably the loss of angular resolution as we observe at longer wavelength. But the net advantages of the new window have amply rewarded the effort of opening it to our view.

Solar researchers often describe their field as "mature" – a shorthand for explaining why it is such hard work to make major advances in solar research, compared to the abundant flow of discoveries in less thoroughly studied areas. The opening of the infrared window makes solar research, for a while at least, a little less mature, and pleasantly so, since the joy of discovery is what motivates all science. For solar research there is added pleasure in relating the new discoveries to an already detailed picture of the Sun that has been built up over the years, so that very specific hypotheses can be formulated and critically tested by the new data.

The Symposium came at a good time. First, there was the fortuitous circumstance of the 1991 solar eclipse, which occurred over one of the world's best infrared sites. Second, there is the remarkable progress in infrared instrumentation and detectors, which has been gathering momentum over the past few years and shows no signs of slowing down. And third, recent theoretical advances – in radiative transfer, in convection and magnetohydrodynamics, in atomic physics – have led to exciting interactions between infrared observations and theory. The excitement that pervades the newly young field of infrared solar physics is evident in this record of its first IAU Symposium.

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