Preface

The way a star-disk system launches and collimates jets is one of the yet unsolved problems in contemporary astrophysics. This problem is relevant in active galactic nuclei, micro-quasars, gamma-ray bursts, planetary nebulae and young stars. Although there is agreement in that magnetic fields mediate the process, the exact details still remain elusive.

The larger angular size of the jet engines in young stars makes them important laboratories for direct observational model testing. In parallel, the recent advent of high-energy density facilities has added experimental control to jet studies.

Testing models for jet launching and collimation requires a high degree of interdisciplinary and sophistication. Indeed, closing the circle between pure MHD, thermo-chemical evolution, high angular resolution spectro-imaging and laboratory experiments is not trivial. This volume of Lecture Notes in Physics aims at bridging these gaps by providing a series of lectures bridging the foundations of the discipline.

The first two lectures by Rob Coker and Andrea Ciardi address studies of jets physics in the laboratory. Then the lecture by Nektarios Vlahakis introduces the magnetohydrodynamic theory of stationary jets. The heating mechanisms in these magnetohydrodynamic jets are largely unknown and the lecture on the coronal heating in the Sun presented by Alan Hood addresses physical aspects very relevant for jets. Another heating mechanism at work is shocks propagating along the jet. The lecture by David Flower addresses them with an emphasis on molecular material and chemistry. An atomic perspective on the microphysics of the shocked material in the jets is presented by Alex Raga. This book closes with the presentation of series of diagnostics allowing to recover basic physical quantities from jet emission lines by Catherine Dougados, Francesca Bacciotti, Sylvie Cabrit and Brunella Nisini.

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