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Preface

The aim of high energy heavy ion collisions is to produce and study a medium of deconfined quarks and gluons in the laboratory. Deconfinement occurs when the density of quarks and gluons becomes so high that long range confining forces cease to be effective. It is thus intimately connected to short spatial scales, and to resolve and study phenomena at such scales, hard probes are essential and have to be developed into as precise tools as possible. Hence it is necessary to study the production of heavy flavours and quarkonia, of jets, and of photons and dileptons in strongly interacting media.

With this in mind, a small group of interested theorists came together in 1994 at CERN to form the "Hard Probe Cafe". Soon some experimentalists joined in, and the Cafe continued to meet at 6–12 month intervals at different institutions. The first results of the collaboration were published as a special issue of the International Journal of Modern Physics (Int. J. Mod. Phys. A 10 (1995) 2881–3087). It soon became an essential tool for the planning of RHIC and LHC experiments and today has more than 300 citations.

CERN, Geneva 1994
LBL, Berkeley 1994
ECT*, Trento 1995
INT, Seattle 1996
CFIF, Lisbon 1997
INT, Seattle 1998
JYFL, Jyväskylä 1999
BNL, New York 2000
NBI, Copenhagen 2001

The start of RHIC in the year 2000 greatly increased the role of hard probes, and the planning of LHC experiments continued to push developments in this direction. After the last meeting of the "Hard Probe Cafe", at the Niels Bohr Institute in Copenhagen, a large effort went into the preparation of the CERN Yellow Report "Hard Probes in Heavy Ion Collisions at the LHC" (CERN-2004-009), which compiled a comprehensive survey for the LHC program. It became clear that future meetings on the topic would have to accommodate a significant increase in the number of participants.

Together with Jorge Dias de Deus and João Seixas, we therefore started plans for an "International Conference on Hard Probes of High Energy Nuclear Collisions", to be held near Lisbon in the year 2004. The idea found an immediate and strong resonance in the community, and an international advisory committee of leading scientists in the field agreed to help in the further planning. Its members were J.-P. Blaizot (Saclay), P. Braun-Munzinger (GSI), B. Jacak (Stony Brook), F. Karsch (Bielefeld), D. Kharzeev (BNL), L. Kluberg (Palaiseau), M. Mangano (CERN), L. McLerran (BNL), B. Müller (Duke), J. Schukraft (CERN), E. Scomparin (Torino), H. Specht (Heidelberg), Th. Ullrich (BNL) and X.-N. Wang (LBNL).

The meeting was held from November 4 to 10, 2004, in the charming resort and fishing town of Ericeira, on the Portuguese Atlantic coast. It brought together some 120 participants from all over the world for the presentation of recent theoretical developments and new experimental results. This volume contains essentially all the contributions. It was unanimously agreed that this meeting should be the first of a new series and the second has, in the meantime, been announced to be jointly organized by LBNL and BNL, at Asilomar, California from June 9 to 16, 2006.

The organization of "Hard Probes 2004" would not have been possible without the intensive help of a number of people and institutions. We would therefore like to express our sincere gratitude to Dulce Conceição, André David, Sandra Oliveira, Pedro Ramalhete, Susette von Reder and Hermine Wöhri. The list of institutions is considerably larger: Câmara Municipal de Mafra; Centro de Física Teórica de Partículas (CFTP); Centro Multidisciplinar de Astrofísica (CENTRA); CERN; Fundação Calouste Gulbenkian; Fundação para a Ciência e Tecnologia; Fundação Luso-Americana para o Desenvolvimento; Institut Franco-Portugais; Instituto Superior Técnico; Junta de Freguesia da Ericeira; and PT Comunicações. We are very grateful to all of them for their contribution to the meeting.

July 2005

Carlos Lourenço and *Helmut Satz*
Jochen Bartels as Editor-in-Chief/TH