

## Quantum Field Theory under the Influence of External Conditions

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2006 J. Phys. A: Math. Gen. 39

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## PREFACE

## Quantum Field Theory under the Influence of External Conditions

By kind agreement of the participants of the workshop QFEXT03, which took place in Oklahoma, USA in September 2003, I was commissioned to organize the seventh workshop on ‘Quantum Field Theory under the Influence of External Conditions’ (QFEXT05), in Barcelona, Spain. This was the follow-up meeting of a series of international workshops that started in 1989 in Leipzig [1]. This workshop provided a unique opportunity to bring together scientists from eastern and western Europe, in numbers necessary to initiate serious collaborative work. Its success was due as much to the appropriateness of the location as to the friendly atmosphere generated. During the intervening years we witnessed the sudden changes experienced in eastern Europe with the fall of the Berlin wall and the emergence of a new European conscience and scientific society.

I would like to recall that the subject of these meetings has always had much to do with the seminal contributions of the late Professor Hendrik Casimir to physics, in particular with the increasingly important Casimir effect (observable manifestations of the fluctuations of the quantum vacuum). Professor Casimir himself participated in some of the meetings, the last time just before his death. I had been corresponding with him during those last months about the possibility of him coming to Barcelona, but unfortunately there was no time to realize this visit. Now that finally the workshop took place here I felt I owed him this remembrance. I keep as a treasure a dedicated copy of one of his books.

Both at terrestrial and at cosmological level the importance of quantum vacuum fluctuations is growing at a very fast pace. Over the last few years measurements of the Casimir force have attained high precision and applications in nanotechnology—hybrid devices integrating carbon nanotubes and their mass production, for instance—are important tasks for the near future. Actual progress in these fields is quickly reaching the standard of technological applications. The state of the art in these subjects is covered in the present proceedings, as reported at large at the Barcelona meeting QFEXT05. Moreover, at the cosmological scale, vacuum fluctuations have the potential to give rise to a simple and most natural explanation of the recently observed acceleration in the expansion of the Universe. More results, both at the theoretical and observational level, are needed in order to confirm such a possibility, which is explored in some of the papers here.

The workshop was quite successful, with a record number of around 125 participants from 27 different countries coming to Barcelona. This was certainly a source of pride for us but it posed serious challenges for the organization of the meeting, and to some extent we suffered from long schedules, parallel sessions, etc. I sincerely apologize here for any shortcomings the participants experienced. There were many subjects presented at the workshop from several different disciplines of a theoretical and experimental nature, a very good mixture indeed, not so common to other more influential fields of modern theoretical physics. Participants were positively surprised to see so many experimental works presented at the workshop, and also by the nice atmosphere, which was both lively and extremely participative. Controversy, and more than one strong discussion, arose at different instances, but this is the lifeblood of science. I myself was particularly impressed to observe that some 80% of us participated in

the final-day sessions, up to the very last one. This is definitely unusual in week-long meetings of any sort, and somewhat unexpected during a glorious sunny morning in Barcelona.

I wish to thank the International Advisory Committee, in particular Michael Bordag, University of Leipzig, Robert Jaffe, MIT, Cambridge, Kimball Milton, University of Oklahoma (the previous organizer), and Vladimir Mostepanenko, St. Petersburg, for their invaluable help, and also Ephraim Fischbach, Purdue University, Umar Mohideen, University of California Riverside, Peter van Nieuwenhuizen, SUNY Stony Brook, and Serge Reynaud, CNRS Paris, for their constant support. Many thanks also go to the Local Organizing Committee, which included Sergei Odintsov of ICREA/IEEC (also an Editor of these Proceedings) and Joan Soto of the University of Barcelona, and to our efficient secretaries and other collaborators, including Eva Notario, Isabel Moltó, Anna Bertolín, Pilar Montes, Gloria Garcia Cuadrado, Roger Oliva and Aleix Elizalde. I am also grateful to Ramon Blanch from CM Sant Jordi, Paquita Ciller, Begoña Navarro and Juan Bayona from CosmoCaixa, and to Ana Ucero and Claudia Kattan from Apple Computers. Thanks to their efforts, personal dedication, and the time graciously spent, every single euro we managed to secure from different sources was effectively converted into two at least. This was clearly perceived by a large number of participants. I would like to use this opportunity to thank the senders of the very many messages I got on these matters, some of them particularly moving.

We are especially proud of the financial help we were able to distribute among students and other colleagues in need of it. An important part of the budget went to cover expenses from participants from eastern and south eastern Europe, from those in America's South Cone and other (sometimes quite distant) countries, and to young scientists from any location. In particular, we continued with the tradition to pay local expenses to a number of colleagues who did not have funds to attend. (Unfortunately, we were unable to pay for any excursions, as I would have liked to have done.) Specifically, accommodation was provided free of charge to 36 participants, and over 50 of them had their workshop fee waived. Funding came from Ministerio de Educación y Ciencia, Generalitat de Catalunya, Consejo Superior de Investigaciones Científicas, Obra Social Fundació 'La Caixa', Universitat de Barcelona, Apple Computers, and last but not least the Institute of Physics, UK, as Publishers of these Proceedings, free of charge. As for any special volume of *Journal of Physics A: Mathematical and General*, all contributions have been refereed in to the usual standards of the journal.

Finally, I want to thank my family, in particular my wife Maria Carne for her constant patience, support and understanding during all the long months I was so deeply involved in this challenging but extremely gratifying project.

**Emilio Elizalde**

**Guest Editor**

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