

## PREFACE

We have the pleasure of presenting to the reader the proceedings of the conference *Operator Algebras and Quantum Groups* which took place from September 19 through September 23, 2011.

The field of quantum groups is a relatively new topic. The topological point of view on quantum groups is immensely influenced by the theory of operator algebras. Thus the leitmotif of the conference was the work of Professor Stanisław Lech Woronowicz whose contributions to the foundations of quantum group theory and operator algebras cannot be overestimated and whose seventieth birthday we wished to celebrate during the event. This was reflected by the topics of the meeting which included von Neumann algebras,  $K$ -theory of  $C^*$ -algebras, non-commutative geometry, quantum groups and quantum groupoids. Most of these subjects were at some points influenced by the work of S. L. Woronowicz.

The conference was the third one of a series of meetings devoted to operator algebras and quantum groups hosted by Banach Center. The first one was held in 1995 (*Quantum Groups and Quantum Spaces*) and the next one in 2001 (*Noncommutative Geometry and Quantum Groups*). They helped to lay foundations for new developments in the general field of noncommutative geometry. To continue the program, the scope of the conference encompassed four main topics:

- Operator algebras
- Topological quantum groups
- Hopf algebras
- Non-commutative geometry

and relations between these fields of research.

The theory of operator algebras is the oldest topic in the list above. It spans areas as distant as  $K$ -theory and index theory on one hand through representation theory to ergodic theory and applications to models of theoretical physics on the other. It shapes also the language and methods of the remaining three fields of research.

The purely algebraic topic of Hopf algebras connects to the analytic (or topological) theory of quantum groups through the work of S. L. Woronowicz and A. Van Daele on compact quantum groups and so called algebraic quantum groups. The striking feature of this theory is that several approaches, like the purely algebraic approach, the  $C^*$ -algebraic approach or one through the theory of von Neumann algebras, yield equivalent theories. Moreover, the interplay between different aspects of the theory of quantum groups has

profound implications, for example in the theory of actions of quantum groups. Hopf algebras and Van Daele's multiplier Hopf algebras are invaluable tools and a laboratory for quantum groups.

Quantum groups are particular examples of quantum spaces or noncommutative spaces which are the object of study of noncommutative geometry. This new yet by now vast branch of mathematics began in the 1980s with the seminal work of A. Connes, but its origins may be traced back to the work of J. von Neumann, J. Dixmier and I. M. Gelfand as well as many others. Soon afterward the work of S. L. Woronowicz made a connection between noncommutative geometry and quantum groups via the theory of differential calculi on quantum groups and Hopf algebras. Later the development of so called spectral triples or noncommutative manifolds strengthened the ties between quantum groups and the project of A. Connes.

The conference featured several lectures of a survey character by some of the outstanding scientists of our time supplemented by reports on the most recent developments by other leading researchers. Special thanks are due to members of the Scientific Committee especially S. Vaes, K. Schmüdgen and A. Van Daele, who helped to shape the conference.

The program of the conference was optimized to merge the three main currents in the recent developments of quantum groups and noncommutative geometry, namely the purely algebraic,  $C^*$ -algebraic and  $W^*$ -algebraic approaches.

The Organizers gratefully acknowledge financial support of the Department of Mathematical Methods in Physics, the Faculty of Physics of University of Warsaw and the Stefan Banach International Mathematical Center which was crucial for the success of the meeting. The Stefan Banach International Mathematical Center played also a key role in providing ample opportunities for the participants to discuss their research. The availability of the library and other facilities at the Banach Center was certainly helpful in achieving this goal.

Let us conclude with the following complete list of eighty three conference participants who came from nineteen different countries:

L. Arambašić (Croatia), M. Aukhadiev (Russia), G. A. Bagheri Bardi (Iran),  
 D. Bakić (Croatia), T. Banica (France), P. F. Baum (USA), J. Bhowmick (Norway),  
 M. Bożejko (Poland), T. Brzeziński (UK), D. Chruściński (Poland),  
 J. Cuntz (Germany), K. De Commer (Italy), J. Dereziński (Poland),  
 S. Doplicher (Italy), M. Eckstein (Poland), M. Enock (France), K. Gawędzki (France),  
 K. Grabowska (Poland), J. Grabowski (Poland), P. M. Hajac (Poland),  
 A. Helemskii (Russia), N. Higson (USA), M. Hilsum (France), J. Jezierski (Poland),  
 B.-J. Kahng (USA), P. Kasprzak (Poland), Y. Kawahigashi (Japan),  
 R. Kerner (France), J. Kijowski (Poland), M. Kalinowski (Poland),  
 E. Koelink (The Netherlands), U. Krähmer (UK), P. Kruszyński (The Netherlands),  
 J. Kuznetsova (Luxembourg), D. Kyed (Germany), M. B. Landstad (Norway),  
 R. Lenczewski (Poland), J. Liszka-Dalecki (Poland), J. Lukierski (Poland),  
 W. Majewski (Poland), P. Majewski (Poland), A. A. Mamon (Jordan),  
 T. Maszczyk (Poland), Y. Nakagami (Japan), M. Napiórkowski (Poland),

S. Neshveyev (Norway), R. Nest (Denmark), P. Olczykowski (Poland),  
V. Ostrovskiy (Ukraine), A. Paszkiewicz (Poland), P. Podleś (Poland),  
D. Proskurin (Ukraine), W. Pusz (Poland), L. Pysiak (Poland), S. Roy (Germany),  
J. Rudnik (Poland), G. Rudolph (Germany), P. Salmi (Canada),  
Y. Savchuk (Germany), K. Schmüdgen (Germany), A. Sitarz (Poland),  
A. Skalski (Poland), P. M. Sołtan (Poland), A. Sliżewska (Poland),  
P. Stachura (Poland), E. Störmer (Norway), A. Strasburger (Poland),  
M. Takesaki (USA), T. Timmermann (Germany), P. Urbański (Poland),  
S. Vaes (Belgium), L. Vainerman (France), J.-M. Vallin (France),  
A. Van Daele (Belgium), C. Voigt (Germany), E. Wagner (Mexico), S. Wang (USA),  
M. Wodzicki (USA), W. Wojtyński (Poland), S. L. Woronowicz (Poland),  
J. Zacharias (UK), A. Zając (Poland), L. Zsidó (Italy).

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