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PREFACE

Dedication. These Banach Center Proceedings are dedicated to Paul F. Baum in celebration of his 80th birthday. Paul is a superb mathematician and a long-time friend of IMPAN. It is a privilege to mark his many achievements in mathematics, and especially his landmark contributions to noncommutative geometry.

To the mathematicians who have contributed to this volume, Paul is best known for those landmark contributions, and for the Baum–Connes isomorphism conjecture in particular, which is the leading organizing idea in noncommutative geometry. However, Paul began his career as an algebraic topologist. From the vantage point of his 1963 PhD thesis it would have been very difficult to predict everything—or perhaps even anything—that followed in Paul's career: the work with Bott on singular foliations, the work with Fulton and MacPherson on the Riemann–Roch theorem, and then the pioneering collaborations in noncommutative geometry with Douglas on the index theorem and K-homology and with Connes on the isomorphism conjecture. But the view looking backwards through time is of a purposeful journey from a landscape of apparently simple, ideal mathematical objects such as compact homogeneous spaces, to progressively wilder regions, where the usual mathematical approaches become less and less effective, and ever newer skills are demanded.

Paul's trademark approach to mathematics has suited him well during his travels. Wherever he has found himself, he has asked the simplest questions about the simplest objects, and he has never been satisfied with anything but the simplest, most complete, most conceptual and most revealing answers. Those answers have always led him towards a deep understanding of far more than the simple issues with which he began.

The Baum–Connes conjecture perfectly exemplifies Paul's approach, and even if the conjecture turns out to be wrong, there is no doubt that the question that Paul and Alain asked was right! The conjecture was based on the simplest of examples—initially the foliations of tori by lines of irrational slope—and on the determined efforts of Paul and Alain to understand these examples in as fundamental a way as possible. The conjecture that emerged was truly audacious in its scope, and in the early days it might even have been called reckless. But it has withstood nearly 40 years of scrutiny, and there is no doubt that it points to a remarkable new duality between geometry and unitary representation theory that even now we only dimly comprehend. There is plenty to do during the next 40 years.

Meanwhile Paul has ventured further and developed still more wonderful mathematics —in the realm of quantum groups with his friends at IMPAN, in the smooth representation theory of p-adic groups with a steadily growing band of fellow travelers, and in other places, too. He is forever in motion; where will he travel next?

Happy Birthday, Paul! We look forward to many more years of inspiring mathematics and warm friendship!

Nigel Higson
Penn State University

The joy of being with Paul. My adventure with Paul Baum started in 2001, at my Banach Center conference *Noncommutative Geometry and Quantum Groups*. Paul delivered an amazing series of eight lectures, defying the concept of ever getting tired, which made him a hero of the meeting. Time and again, Paul has taught me the meaning of the word "commitment". For him, the principle "my word is my bond" is a way of life.

My next recollection takes me to Sweden, to the Mittag-Leffler Institute, where I completed my first joint work with Paul in 2004. We ventured into the snow of Djursholm, taking lengthy strolls, with me pushing a pram with my newborn daughter Lucy and Paul telling me some awesome stories from the world of big mathematics. Another signature feature of Paul is that he is so much fun to be with—one is never bored in his company.

Paul's fundamental achievements in mathematics require no comment, we hold them as self evident, so let me simply focus on the specific way he plays the game of theorems. His research is always curiosity driven, he has never stopped being a child craving to know what there is behind a closed door. His reasoning is crystal clear, he is never satisfied till he achieves the deepest understanding in the simplest possible terms. Once, I invited him to work with me on a K-theory problem that was dormant for about 15 years because the torsion part cannot be detected by the index pairing. Together, we solved this problem within 15 days. Paul simply stared at the blackboard, repeating clearly true statements over and over again, each time slightly modifying them. To my astonishment, the initial unimpressive statement evolved into an idea solving the problem. The problem was dissolved by the lucidity of Paul's thinking, by his persistent probing of its nature.

I also admire Paul's attitude to life and his sense of humor. He always emanates an enormous amount of positive energy making you smile, making you want to live and do math. I love the way he rebukes me for stating an utter mathematical nonsense. He simply says *it strikes me as unlikely*, and I cannot help laughing at myself. However, if the situation in life turns serious, Paul will faithfully stand by you committing himself and his resources to help you out, proving that a friend in need is a friend indeed. He is not afraid to go beyond his comfort zone both in life and in research. His eagerness to learn new things and to acquire new skills is unabated, and can be envied even by the very young.

It was my great honor and pleasure to organize Paul's 70th and 80th birthday conferences. I still remember a crowd of mathematicians singing him "Happy Birthday" at

the door of IMPAN. I remember changing the name of the neighboring Plac Konstytucji into Plac Bauma. I remember Paul calling his wife from my office to tell her that *it was hard to beat*. It is also impossible to forget an exquisite array of speakers who came to the Fields Institute in Toronto to honor Paul with superb talks, and Paul himself who delivered an outstanding lecture on his actual 80th birthday.

A famous quote from John Templeton says: *It is nice to be important, but it's more important to be nice.* Paul is a prime example of someone important who is also more than nice. We have a natural tendency to hang around people who influence us to become better persons, who not only are great themselves, but also are capable and willing to share their greatness around. After being soaked for about two decades in Paul's way of doing mathematics, after having him as a role model shaping my mathematical life to the great extent comparable only with the influence of my wonderful Ph.D.-supervisor Marc A. Rieffel, I can happily say that I am truly proud of being Paulish...

Piotr M. Hajac
IMPAN

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1. Geometry, Representation Theory and the Baum–Connes Conjecture, Fields Institute, 18–22 July 2016.
2. Noncommutative Geometry and Quantum Groups, Banach Center, 4–17 September 2016.
3. Cyclic Homology, Banach Center, 17–21 October 2016.
4. Noncommutative Index Theory, Banach Center, 24–28 October 2016.
5. Topological Quantum Groups and Hopf Algebras, Banach Center, 14–18 November 2016.
6. Structure and Classification of C*-algebras, Banach Center, 21–25 November 2016.
7. New Geometry of Quantum Dynamics, Banach Center, 15–19 January 2018.
8. Workshop on New Geometry of Quantum Dynamics, Fields Institute, 12–16 August 2019.
9. The Frontier of Quantum Dynamics, Banach Center, 9–13 December 2019.

Piotr M. Hajac
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