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### KHRISTO NONEV BOYADZHIEV

### IN MEMORIAM

The Bulgarian mathematician Khristo Nonev Boyadzhiev passed away on June 28, 2023. The following are reminiscences by Mihai Caragiu, Chair of the Math Department at Ohio Northern University, and his friend, physicist Dimitar Bakalov.

## Memories of Mihai Caragiu, Ohio Northern University



The passing of our dear colleague and friend, Emeritus Professor Dr. Khristo Boyadzhiev, on June 28, 2023, brought deep sadness to all of us who had the privilege of knowing and working with him. Khristo earned his PhD in Mathematics from Sofia University "St. Kliment Ohridski," Bulgaria, in 1978 and joined ONU in 1990, where he became a Professor of Mathematics in 2000.

During his years at ONU, he was the heart and intellectual power engine of our Mathematics community, including the Mathematics and Statistics Department, and, more recently, the Mathematics Program. Khristo was a dedicated and prolific scholar, authoring 108 publications in peer-reviewed journals. He also wrote two books published by World Scientific, a distinguished academic publisher: "Notes on the Binomial Transform" (2018) and "Special Techniques for Solving Integrals" (2022). He served ONU for an impressive 32 years, teaching from 1990 to 2022. Among his professional recognitions while an ONU faculty member, one can mention:

- The 2013 Carl B. Allendoerfer Award (national recognition granted by the Mathematical Association of America MAA) for the article *Close Encounters with the Stirling Numbers of the Second Kind*, Math. Mag. 85 (2012) 252–266 (See the online Supplement).
- Mary Reichelderfer Chair in Mathematics for 2013–2014, 2006–2007, 1995–1996, 1994–1995, and 1993–1994.
- Faculty Research and Scholarship Award: Recognition of Achievement 2019.





**Figure 1.** Khristo Boyadzhiev at a conference at Miami University with Mihai Caragiu, October 2006 (left panel), and with his ONU colleagues and students for a Pi Day celebration in 2003 (right panel).

- ONU Summer Research Stipend 2014.
- Presented numerous conference talks and gave seven invited talks.
- He was recognized more than 40 times for his excellent solutions submitted to mainstream Mathematics journals, including the American Mathematical Monthly, Mathematics Magazine, College Mathematics Journal, and Fibonacci Quarterly. Moreover, eight of his solutions have been featured in the respective journals.
- Khristo initiated the Mathematics Seminar at ONU and served as its coordinator for many years. The Seminar has been, and continues to be, one of the central mathematical activities at ONU, and will be forever linked to the name of Khristo Boyadzhiev.

For all his activity and kind spirit, Khristo will be deeply missed. He will live forever in our hearts!

# Memories of Dimitar Bakalov, Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences

Friendships formed during our student years are often the most enduring, as they take us back to the times when we discovered the world through our own eyes. Khristo and I became friends during our first years at Sofia University. As physics and mathematics students in the early courses, we studied some common subjects

and came across each other often. For many of us physicists, Tagamlitski and Skordev's analysis lectures were a revelation. Khristo was a year or two ahead of us in this discipline, and we admired his knowledge of the subject and friendly demeanor. His appearance was also striking: tall, athletic, and with long blond hair, he immediately stood out.

I no longer remember what mathematics we talked about during our student years, but how many other common interests we discovered! Chess comes to mind first. It was a very popular hobby back then; we played chess at home, at work, everywhere. When we visited each other, we would first set up the pieces. During the Spassky-Fischer match in the summer of 1972, Khristo and I were with friends at the beach. All day long, we replayed Spassky-Fischer games. Khristo approached chess methodically: he studied openings and solved problems. Even in recent years, he followed championship matches and often sent me beautiful games over the internet.

We loved cycling around Sofia and its surroundings, feeling a wonderful sense of independence and freedom. We often visited Pancharevo, where we would row a boat together on the lake. At times, we went mushroom picking – a passion of his that he knew well. Before leaving for America, he gave me his treasured copy of a unique book about mushrooms in Bulgaria, complete with a personal dedication inside. Khristo and I visited the mountains less frequently; he was always more drawn to the sea. He was an exceptional swimmer—crossing from Primorsko to Kiten was effortless for him. A cherished memory for me is one of his paintings: a seascape from the coast, created in his unique naive style. During those days, painting captivated him immensely.

With his departure, our regular, sometimes daily communication was interrupted for a long time. Khristo had thought about leaving the country for years, perhaps even since his student days, no matter how impossible it seemed at the time. Toward the end of 1989, borders began to "crack," and we all watched with bated breath as, first in Hungary and then in East Germany, crossing them became a reality. With his excellent English, which he had already taught to his eldest daughter, Khristo was better prepared for the coming change than many of us. Much later, I learned from him that this did not spare him from the effort needed to establish himself in the unfamiliar and highly competitive academic environment across the ocean. Unfortunately, during the early years after his departure, due to his heavy workload in the new place and the turbulent events that almost completely absorbed our attention here, our connection diminished to a few letters each year. In 1996, for the first time in many years, we managed to have a proper conversation, although only by phone, when I, too, found myself across the ocean. Although he was busy teaching at the time, he continued publishing with co-authors with whom

he had built relationships over the years. In 2000, during my extended stay in America, I needed competent consultation for studying the asymptotic behavior of the scattering amplitude of a given process, and Khristo provided invaluable help from a distance. We had planned a seminar for me at his university, but unfortunately, the idea could not be realized.

After a long separation, we saw each other again in 1999. From that point on, his family visited Bulgaria every summer, and we again had the chance to enjoy long, uninterrupted conversations about everything. Over the years and through many memorable events, our worldviews underwent significant changes. We were pleased to find that many of these changes had been in the same direction. During the remaining months, we frequently emailed each other. There were numerous topics to discuss. Khristo closely followed political and cultural events in our country, along with developments at the Academy of Science, and I enjoyed sharing the latest news with him. I loved sending him photos from art exhibitions here, and it often turned out that he knew more about the artists than I did. We discussed in detail the upheavals in the Bulgarian Academy of Sciences and the Science Research Fund around 2010; his assessments were quite accurate. We exchanged opinions on new books and films and reminisced about hits from years past, which he recalled with remarkable clarity.

Despite our professional fields growing quite distant, we often shared updates about our current activities and the issues that interested us. Through these conversations, I learned that one of his passions was researching and discovering new explicit integral and algebraic relationships, as well as explicit expressions for sums of series, among other areas—a field in which he had accumulated considerable knowledge and remarkable intuition. Several times, his advice on problems that arose in my research proved helpful. Particularly valuable was his assistance with a 2023 project summarizing the results of the international FAMU collaboration on mathematical modeling of the muon exchange reaction in the inelastic scattering of exotic atoms. For the project, it was essential to approximate the experimental data with functions for which explicit expressions exist for their Laplace transforms, and Khristo's insights were extremely timely. The preparation of the article for publication took more than a year; I am grateful that he was able to share in our common satisfaction when the article appeared in Physical Review.

COVID-19 caused considerable confusion in our lives. The pandemic prevented Khristo and his family from returning to Bulgaria in 2020 and 2021, and by 2022, his health had already declined too much for such a journey. As a result, for the past four years, we could only communicate remotely again. We exchanged interesting news articles found online, photos, and jokes (the absurdity of the COVID era gave rise to masterpieces of satire). We wrote to each other almost every day –

sometimes only a few lines, just enough to remind ourselves that we were still there – and somehow, those small exchanges lifted both of our spirits. Despite his declining health, this difficult period was productive for Khristo: he managed to complete some long-delayed works, including fourteen papers and his monograph "Special Techniques for Solving Integrals: Examples and Problems," which has yet to receive its well-deserved recognition.

Professor Khristo Boyadzhiev left us on June 28, 2023. We, his friends and colleagues in Bulgaria, will hold on to everlasting memories of him.

# Publications by Dr. Khristo Boyadzhiev

### **Books**

- [1] 1 Notes on the Binomial Transform, World Scientific, Singapore 2018.
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