



BIOMATH 2023 International Conference and School for Young Scientists: A Personal View

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An average person, if asked on the street about the subject of biomathematics, might look a little bewildered: many people, while thinking about biology, in fact think about the respective school subject and just cannot fathom the use of mathematics there. However, even common flowers such as yellow chamomiles or sunflowers show in their middles arrangements described by the Fibonacci numbers, a fact noticed and used since middle ages. That is, studies in mathematical/theoretical biology, or *biomathematics*, actually need to cover *all of biology* and, additionally, such fields of mathematics as stochastics, operations research, and computer science, which enables researchers, for example, to shorten experiments' times from decades to mere minutes with the help of appropriate mathematical models implemented on computers. To this end, scientists in many disciplines need to work together in order to create realistic simulations. The series of annual BIOMATH conferences, held regularly since 1995, helps along this way and connects scientists applying “mathematical and computational tools to the study of phenomena in the broad fields of biology, ecology, medicine, biophysics, biochemistry, pharmacokinetics, chemoinformatics, biotechnology, bioengineering, environmental science” [1] from around the world.

Biomathematics is defined as application of mathematical models to living organisms in order to understand their principles better. This encompasses their structure, growth and development, or their behaviour and includes such diverse areas of life science research as disease/epidemic surveillance, tissue engineering, biomechanics, e-health, and many others. Moreover, concepts developed here can be applied to further areas of science, for example, disaster management or material science. Therefore, it comes as no surprise that BIOMATH 2023, held from June 18 to June 23 in Pomorie, Bulgaria, brought together 73 participants from 19 countries (see Figure 1) and comprised 9 keynote presentations,

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Figure 1: BIOMATH 2023 participants in front of the conference location “Atrium” of the Grand Hotel Pomorie.

51 regular talks and 13 posters. Consequently, the scientific program was excellent, offering interdisciplinary contributions ranging from topic overviews to specialized narrow-field talks.

Most of the conference days were loosely organized in thematic groups, more so on the level of keynote presentations and individual sessions. This is advantageous from the point of view of time management since sessions especially interesting for an individual participant can be easily identified. Additionally, a better depth on the subject can be achieved because later talks can use the information from the earlier ones. Parallel sessions were scheduled on Wednesday afternoon only, making it theoretically possible to listen to the most of the presentations. However, the conference timetable was rather full during the first three days so that participants’ focus might have suffered a bit towards the evening sessions (which were nevertheless attended splendidly!). Stochastic approaches and validation played an important role in the majority of the talks, helping to deal with aleatoric uncertainty inherently present in the BIOMATH subject matter. Personally, I missed the aspect of verification a bit, as well as more attention being given to the treatment of epistemic uncertainty, possibly using deterministic or mixed methods (e.g., set-based methods, imprecise probability) that gain more and more importance in life and data sciences nowadays.



Figure 2: Folk dance during the conference dinner at the restaurant Planinska Kashta.

All in all, from my experience at the conference, I can conclude that even researchers like me, who deal with the biological application of the mathematical models they develop only occasionally, could find inspiration and new stimuli among the thematically varied conference talks.

BIOMATH series pay special attention to young scientists, which includes the opportunity to participate in the School for Young Scientists (SYS) comprising such activities as lectures on the “tricks of the trade” from seasoned researchers, question-answer times, and possibility to exchange views about one’s own subject. I think that BIOMATH 2023 succeeded in creating a relaxed atmosphere necessary for productive discussions between more and less experienced researchers or young scientists among themselves. That fact was demonstrated, for example, in a lively question-answer time after the SYS lecture titled “How to get the most out of a model” by Ami Radunskaya, which went on long after the designated end time at 19:30.

The social program at such a splendid location as the Bulgarian part of the Black Sea was likewise impressive, with the welcome cocktail reception on Monday, the conference dinner on Wednesday (see Figure 2), and a ship excursion on Thursday. Coffee breaks and lunches were available for all of the five conference days and offered an excellent opportunity to exchange ideas with old colleagues or new acquaintances. My personal highlight was the opportunity to talk to



Figure 3: Prof. Svetoslav Markov and me in front of the posters.

the long-time supporter and co-organizer of BIOMATH conferences Professor Svetoslav Markov (see Figure 3), who was honoured for his contribution and turned 80 in 2023.

Last but not least, I would like to thank all the organizers for a successful conference, for furthering the important topic of biomathematics, and, additionally, for personal warmth and continual availability for problem solving. Special thanks should go to Roumen Anguelov, Emeritus Professor of Mathematics at the University of Pretoria, an associate member of the Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences, and a member of the Academy of Science of South Africa, who carried the conference with his energy and panache. Finally, I am grateful to the participants for giving high-quality talks. See you all at the next BIOMATH conference planned to take place in the Cutty Sark Resort, Scottburgh, South Africa, and to be hosted by the DST/NRF SARChI Chair on Mathematical Models & Methods in Bioengineering & Biosciences and Department of Mathematics & Applied Mathematics at University of Pretoria in June 2024 [2].

References

- [1] BIOMATH 2023 <https://www.biomath.bg/2023>
- [2] BIOMATH 2024 <https://www.biomath.bg/2024>