



## Integrating learning and research at the “Biomath” conference series<sup>1</sup>

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*Scientific meetings are at the heart of a scientist’s professional life since they provide an invaluable opportunity for learning, networking, and exploring new ideas [2].*

### Abstract

We give a short description of the annual international conference series in the field of biomathematics “Biomath”. A main goal of this conference series is to attract young scientists and integrate learning and research activities during the meetings and the subsequent publication process. We share our experience on the use of specific organizational formats.

*Keywords: academic conference meeting, school for young scientists, academic publications*

## 1 Introduction

In this report we briefly describe several international academic conferences in the field of biomathematics held in Bulgaria. Our experience led us

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<sup>1</sup> **Citation:** R. Anguelov, S. Markov, Integrating learning and research at the “Biomath” conference series. Biomath Communications 1/2 (2014) <http://dx.doi.org/10.11145/j.bmc.2015.03.091>

to certain ideas w.r.t. how to effectively involve young scholars in the academic activities during the meetings. The main idea is to integrate as much as possible learning and research activities using specific forms, such as “hot topics and open problem panels”, assessment of PhD student’s presentations, get-together meetings etc.

*Biomathematics* is an established field of education and research, also known as *mathematical biology* or *theoretical biology* [1], [21]. Biomathematics research involves applications of mathematics in life sciences as well as mathematics research applied to or motivated by biological studies. Biomathematicians develop and apply mathematical and computational tools to the study of phenomena in the broad fields of biology, ecology, medicine, biotechnology, bioengineering, environmental science, etc.

*Education in Biomathematics.* University programs in areas defined as biomathematics, theoretical biology, bioinformatics, computational biology, exist worldwide. Transformation of graduate, undergraduate and postgraduate educational programs has been recently actively discussed in many countries [13], [15], [17], [14], [16]. It is widely recognized that learning biomathematics is now an important part of human education.

## 2 The Biomath conferences

The conference series Biomath is devoted to recent research in biosciences based on applications of mathematics as well as mathematics applied to or motivated by biological applications. It is a multidisciplinary meeting forum for researchers who develop and apply mathematical and computational tools to the study of phenomena in the broad fields of biology, ecology, medicine, biotechnology, bioengineering, environmental science, etc.

During 2011–2014 four annual international academic meetings in the field of biomathematics were held in Bulgaria under the name “Biomath” [9]. All Biomath conferences involved a School for Young Scientists. During the years the organization of the meetings gradually evolved and reached a rather original format.

### 2.1 The school for young scientists

The 2011 and the 2012 conferences involved an one-day School for Young Scientists (SYS) organized mainly in a traditional form. Established lec-

turers were invited to present tutorial lectures for the participating (PhD) students.

A serious disadvantage of the traditional format was that it was difficult to attract interested students and young scientists. Besides, the attending young scientists were not too active and did not feel integrated in the scientific part of the meeting. Most of them attended just the one-day SYS-meeting.

Within the traditional format the organizers tried to introduce some elements of integration between the scientific and the school meetings: keynote lecturers were asked to present their lecture in an understandable form for the students from the latter were supposed to attend them. Some of the young scientists presented their research orally or in poster form.

As mentioned, keynote lectures were considered as part of the SYS-meeting and also some of the young scientists presented their research. This made students more active participants and so we decided to extend these two features as much as possible in the next events.

At the 2013 and 2014 Biomath conferences we experimented a novel original integration format of the SYS with the scientific conference. No particular tutorial lectures were offered at these meetings. Instead, the plenary and keynote lecturers were asked to present their lectures in a suitable form for the broad audience and the SYS participants were asked to attend these lectures and were encouraged to ask questions. Also, the presentations by the SYS participants were assessed both by their peers and a jury amongst the keynote lecturers and some of the established scholars and were awarded respectively. Accordingly the members of the jury were asked to listen to students presentations. In addition several of the established scholars known to have PhD students were asked to present “hot topics & open problems” and act as moderators of the discussions during this presentation. In this way the School for young scientists was fully integrated with the conference in the sense that both young scientists and many of the established scholars participated in the learning process. At an earliest occasion the participating young scientists were gathered at a meeting and were instructed about the specific arrangement of the conference.

The grading sheets for PhD presentations is given in the appendix.

No distribution of the talks into sections by specific subjects was made in the scientific program. As an exception one or two Birds-of-a-Feather

(BoF) sessions are organized in the last day of the conference (at some celebratubg occasion).

The integration of the SYS and the scientific conference enables certain benefits such as:

- the distance between established lecturers and students diminishes or even vanishes;
- students actively participate in the presentations as posing questions after lectures give them more scores; there is little possibility for the students to “sleep” during lectures (as may happen during trditional tutorial courses);
- established scholars have the opportunity to know good students and students have the opportunity to make contacts with prestigeuos professors;
- during the open tasks sessions students learn about important biomathematical problems;
- students recieve useful practical information related to their career;
- time is saved: usually at least half a day is spend on tutorial lectures, that time is now saved.

## 2.2 Biomath publications

Publications are considered as the most important final outcome and goal of the conference meetings. The Biomath conferences resulted in a significant number of original research articles [10]. About half of the conference papers are published in special issues of the renoun Elsevier journal “Computers and Mathematics with Applications”. Other journals publishing Biomath special issues are “J.UCS”, “B&BE”, “MATCOM”, “BIOMATH” and “Biomath Communications”, all of them requiring peer-to-peer review process. No book collections (proceedings) are published, as this format does not involve peer-to-peer-reviewing. Journal “BIOMATH” published by Biomath Forum [9] follows the highest standards of contemporary academiv publising of original scholar articles. Journal “Biomath Communications” [9] also publishes original articles and in addition publishes theseses, course project, review articles, open problems and recent advances, educational materials, abstracts of lectures and posters, news and announcements related to the field of Biomathematics, , etc. “Biomath Communications” aims at supporting the idea of integrating learning and

research acting as a forum for young researchers to communicate their scientific projects, dissertations and related problems.

## 3 Supporting organizations and committees

### 3.1 The Biomath Forum Society

The *Biomath Forum Society* is organizer of the Biomath conference series and publisher. It is a nonprofit organisation for the advance of biomathematical science and innovation worldwide. The Biomath Forum Society has set the following main goals and activities to serve the scientific community:

- Enhance communication and international cooperation among biomathematicians by organizing an annual international conference “Biomath”;
- Foster education in biomathematical science and technology by organizing annually an international “School for Young Scientists” intergrated with the conference;
- Promote biomathematical science and its practical use by publishing books and journals following contemporary editorial policies and technologies. At present Biomath Forum publishes two journals: BIOMATH and Biomath Communications in online and printed versions. Biomath Forum members are engaged in active research in biomathematics.

### 3.2 Committees

**The International Steering Committee.** The International Steering Committee (ISC) includes reputed scholars from different countries. The ISC is widely representative body with various areas of expertise. A main responsibility of the ISC is to compile (and control) the scientific program of the meetings and in particular to nominate and carefully select plenary and keynote speakers. About ten keynote speakers are selected and invited. Up to now we have only one plenary lecture on the name of the prominent Bulgarian molecular biologists Roumen Tsanev. In the future we plan to establish one or two more plenary lectures. The ISC is identical with the BIOMATH journal editorial board team. The ISC members meet during every Biomath conference.

**The International Young Scientists Council.** More than 30 young scientists participated at the Biomath 2014 meeting. After the conference

some of them continued to discuss the SYS organization and are on the way to form an International Young Scientists Council to act in support of the SYS organisation at future meetings. The Council will also act as Editorial Board of the journal *Biomath Communications*.

**The Program Committee.** The Program Committee (PC) consists mainly of scientists who are interested in the activities in the field of biomathematics and are willing to support such activities. The Program Committee gathers 2-3 times before the conference to discuss details about the scientific program.

**The Organizing Committee.** The organizing team consists of scientists (most of them from Bulgarian research institutes and Universities), actively working in biomathematics and related fields.

### 3.3 Financial support

Our efforts in attractin funds for young scientists were successful. The last 2014 edition of the *Biomath* conference series received financial support by the American NSF, which provided travel grants for seven young USA scholars. The *Biomath* 2014 conference received also financial support by the South-African NRF, which provided financial support for RSA scholars (including seven PhD students). *Biomath* 2014 was financially supported by the Bulgarian Ministry of Education and Science and the Bulgarian Academy of Sciences, which in 2014 marked the 145 anniversary of its constitution (in 1869).

Support by ESTMB and SMB has been received. Several academic publishers also supported the meeting such as Elsevier, Cambridge University Press, Taylor & Francis, Springer. A book and journal exhibition was organised at each conference.

### 3.4 The social program

The social program includes a get-together party for the young scientists, wellcome cocktail usually linked with the poster session, an official dinner and an one-day-excursion. An important social event is the get-together meeting of the participants of the SYS, which is organised on the first evening of the conference (arrival day evening). The young scientists are

asked to briefly represent themselves. Also, members of the ISC are introduced. After that, a dinner is organised in a restaurant, where the young scientists have the opportunity to get to know each other. The excursion is intended to make participants acquainted with cultural, geographic and archeological remarkable places of the country. During the Biomath conferences the following places were visited: Vitosha mountain, The historic museum and ancient Serdica (2011), The Starosel Thracian Cult Complex and Koprivshtitsa (2012), Old Plovdiv, Bachkovo monastery and Assen fortress (2013), Tsari-mali-grad, Tsarska Bistrica and Rila peak—Yastrebits (2014).

### 3.5 The benefits

According to [4] a conference meeting may have lots of social benefits, such as an opportunity to:

- meet science students and researchers from other countries,
- become familiar with education and research in a hosting country (curriculum, faculty equipment and possibilities for research work, first hand information about student exchange possibilities, local and national student organization and their projects, etc.),
- become informed about national science programs and events,
- extend connections, build networks with relevant institutions,
- get to know the history and beauties of the hosting country,
- get to know the culture and religion of the hosting country,
- be introduced to social life in hosting country by being part of it for a while,
- gain new life experiences,
- train your management skills,
- gain new friends, etc.

The cited manual [4] contains useful guidelines for conference organizers.

Under the described organization we may claim that the presented academic activities are beneficial for all participating parties:

- for young scientists, who being not forced to listen tutorial lectures, are put on equal level with established scientists and are stimulated to take a good opportunity of presenting themselves in a positive light and to make good contacts.

– for established scientists, who may benefit from the contacts with young scientists, and be in time with their current scientific (and not so scientific) interests.

– for the organizing team, who benefits from the many new contacts established in the course of preparation of the meetings and who learns a lot about the electronic publication process having some control over it.

From regional perspective the Biomath academic conference series fosters the biomathematical sciences in Africa and Eastern Europe, and in particular in South Africa and the Balkan countries:

– South Africa: A significant number of research papers authored by South-African scientists have been published in journals CAMWA and BIOMATH, several South-African scholars have presented as keynote lecturers, many South-African young scientists have been awarded as presenters; a satellite Biomath conference is organized in 2015 in South Africa;

– Balkan countries: many original papers have been published in journals (CAMWA, BIOMATH, etc), many scholars have presented as keynote lecturers, many young scientists have been awarded as presenters.

## **4 Summary of specific features of the Biomath Academic Conference Series**

Below we enlist several specific features of the Biomath academic activities that we intend to continue and elaborate in the future.

1. Biomath is a medium size conference (of 70–100 participants) organized by a team of scientists supported by the Bulgarian Academy of Sciences, the Union of Bulgarian Mathematicians and the non-profit scientific society Biomath Forum. The organisation of the conference is handled by a group of researchers with a common scientific interests and is directed by an International Steering Committee and a Program Committee.

2. The Biomath conference is essentially self-supporting. Registration fees are kept low mainly due to voluntarial work of the organizers, as well as members of the International Steering and Program Committees. The motto here is: a conference from scientists for scientists.

3. The Biomath conference incorporates a School for young scientists. The interaction between the conference and the school follows the principles outlined above.



4. A strong emphasis is put on participation of young researchers from Africa, America and Eastern Europe.

5. During the presentations we ask prominent experts to follow certain talks and be prepared to act as reviewers.

6. We do not use of parallel sessions, neither subdivide the scientific program into sub-sessions. Participants are expected to listen to all presentations.

7. Keynote speakers are nominated and carefully selected by the International Steering Committee. When inviting them, we ask them to present their lectures with an introductory part that is intended to the broad auditory and to the students.

8. Publications of good quality is the final goal of the conference, thus several possibilities of good quality journals are offered to the participants. All publications are in journals, more or less reknown and established. This is why there is no necessity to advertize indexing of proceedings as often done by many conferences.

9. Social program. An important social event is the get-together meeting of the participants of the SYS, which is organised on the first evening of the conference (arrival day evening). The young scientists are asked to briefly represent themselves at the dinner party.

10. Satellite meetings. It is planned to organize a satellite meeting of the Biomath 2015 conference. The satellite meeting will take place three weeks later in Pretoria, RSA.

## 5 Conclusion

In this work we share our experience with the organization of the scientific conference series Biomath and the accompanying educational and publication activities. We have effectively integrated these three activities to optimize the final outcome, namely possibly quick publishing of good quality presentations.

We hope that the presented report may be useful for colleagues who are planning to attend future Biomath meetings. The report may also be usefuf for colleagues who are ready and willing to invest time and efforts

for organizing similar academic events. Surely these colleagues must have some experience for conference organization and follow certain basic rules, cf. [2], [3], [4], [20].

**Acknowledgements.** The authors are indebted to the members of the Biomath ISC for useful discussions on the organization of the meetings and for their efforts in attracting funds for facilitating young scientists to partake in the meetings.

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**Appendix.** Grading list

BIOMATH 2014: Evaluation Sheet for PhD Presentations

Presenter: .....

Title of presentation: .....

Feedback for the presenter (comments, recommendations, advise that can be useful for the student):

Cut here

Presenter: .....

Score Chart on a scale of 1(low) to 5(high)

Score

Contribution to knowledge  
Demonstrated mastery of the field  
Presentation (clarity, accuracy, easy to follow)

Comments to the Awards Panel:

Evaluator: .....

Affiliation: .....