Report for CIMPA School DaDyBio June 10-21, 2019 at Dhaka University Bangladesh

Scientific Aspects

<u>Courses</u>

6 courses of 5 hours each were delivered during the two weeks. Courses were either theoretical or applied to Biology.

Week 1: Symbolic Dynamics (Nicolas Bédaride) and Hyperbolic Dynamic I (I. Rios) for theoretical courses. Applications of ODEs and Dynamical Systems in Biology (S. Mousset) as an applied course.

Week 2 : Searching for deterministic chaos in biological data (H. Berry) and Ordinal symbolic dynamics with physiological data applications (K. Keller)as applied courses and Hyperbolic Dynamic II (R. Leplaideur) for theoretical course.

<u>Combination between Courses</u>

Roughly speaking, the applied course on application of ODE's illustrated how ODEs can be used to model biologically relevant phenomena, with a stronger focus on population dynamics (prey-predators modelling). Solving the ODE's yields to characterize the equilibria as fixed points for the flow associated to the ODE.

Then, dynamics is very well adapted to study how trajectories converge (or not) to the equilibria. There was thus a very good combination between this applied course and the two/three theoretical courses which described some chaotic phenomena in term of dynamics.
The two other applied courses (week 2) also went in the direction to study how orbits behave outside from the equilibria. H. Berry's course focused on how to determine if data are chaotic or purely random. K. Keller's course focused on several notions of entropy, which measure chaos of data. They thus also combine very well with other courses.

<u>Attendance</u>

Attendance was good. For local people, attendance has to be balanced by the fact that the first week was end of Eid vacations and the second week was the beginning of courses in some private universities. Moreover, during the second week there has been some fatigue. It is also noteworthy that courses for the second week were a bit more technical than the first week.

Students did not hesitate to ask for questions, sometimes very technical. Obviously, due to the topic of the school and the public, there were perhaps more questions on the applied aspects than on the theoretical ones. Nevertheless the courses showed the students both aspects, theoretical and applied, and focused on combinations between both. This is a new emerging research topic, and we expect that students got the flavor of this aspect and want to go in this direction and develop the studies and the research (either theoretical or applied).

Exercise Sessions: the Magma Medal competition

We decided to organize a "magma medal" competition (with reference to Fields Medal, Magma is the weakest algebraic structure we can put on some set whereas Field is one of the strongest). Each week, 7 groups were created (randomly), each group had to contain at least 1 student from DU, 2 Bangladeshis outside DU and 1 "international" student. Each lecturer of the week gave 2 exercises, and the groups had to solve them. The last day, there was a presentation, each group had from 10 to 15mn to present 1 (or more) exercise.
Finally, there was a vote on the best presentation and the winning group received the Magma Medal.

Apparently, student enjoyed this game. It made them work together, in groups and also contributed to create connections and a network of people in the region working (or expecting to work in a close future) on the application of dynamics to biology.
Very symbolic medals were given to the winning group. It has been a great pleasure to see for the last day, how students receiving the medal were proud to exhibit it during the BBQ dinner.
For the last session, there has been an extra-session (out of competition) to allow students/groups to present more exercises.

Vote: we discovered at the first session than vote was hedged. Actually, some of the attendants were local young staff members and we had feeling that several students (perhaps especially female) voted for their professor. Therefore, Lidia Fernandez suggested us to ask for a vote for 2 groups for the second session. It worked pretty well.