



**Serrapilheira/ICTP-SAIFR
Training Program in Quantitative
Biology and Ecology**

Announcement no. 2/2022

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Application window: March 23 - April 13, 2022

The second call for applications for the Training Program in Quantitative Biology and Ecology is intended for students interested in exploring the different subfields of biology and ecology through a transdisciplinary approach including physics, mathematics, and computer science.

In 2022, the program will offer a five-month in-person course divided into two—the introductory (July-August) and the advanced (September-November)—modules at the facilities of the International Centre for Theoretical Physics – South American Institute for Fundamental Research (ICTP – SAIFR), in the city of São Paulo. By the end of the training program, participants are expected to compete for positions in top research centers of excellence worldwide.

This document contains the detailed description of the program, and the eligibility and selection criteria.

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1. The Program

The Training Program in Quantitative Biology and Ecology offers an intensive course for students at the beginning of their scientific careers. In addition to an immersion in the main topics of biology and ecology by working directly with scientists who are leading major advances in their respective fields, participants will receive training in mathematical modeling and computational methods. Participants will leave the program prepared to tackle cutting-edge open questions in the life sciences.

Transdisciplinary Approach

Given the inherent complexity of the life sciences, many of the big unanswered questions in this field may only be solved by combining approaches and tools from different fields.

We understand transdisciplinarity in the life sciences as the cross-referencing and integration of several fields of knowledge (mathematics, physics, computer science) to answer difficult questions and generate conceptual, theoretical and/or methodological innovations.

One of the main goals of the course is to train students to combine traditional and quantitative approaches in the life sciences in order to better understand biological and ecological processes.

Quantitative Tools

Describing living systems through the lens of mathematical models and physical principles enables the identification of patterns in natural systems, thereby pushing the boundaries of purely experimental research. Moreover, technological advances have made it possible to collect and analyze high-quality and precise data about biological processes. We now have access to a huge volume of data, and an enormous capacity to analyze and extract valuable biological knowledge from them.

These resources open up multiple possibilities for life science research, facilitating the observation of new phenomena that are key to making steps forward in a given field.

Thematic overview

By being exposed to a broad range of research lines and approaches—from more traditional to predominantly quantitative approaches—in different fields of the life sciences (biology and ecology), program participants will be able to decide the next step in their careers after exploring new research directions with a transdisciplinary approach.

Goal

The goal of the program is to train participants to develop the critical thinking required to ask big, open questions in the life sciences and

acquire some of the mathematical and computational skills needed to better answer them.

We hope that, after completing the modular course, the students will continue their training in a PhD program of excellence. Our long-term goal is to create a highly qualified generation of young Brazilian and Latin American scientists with quantitative skills to further the understanding of biological systems.

Target Audience

We are looking for pre-doctoral students who are either enrolled in an undergraduate program or have completed their undergraduate studies in any field in Brazil or other Latin American countries. Our selection aims to compose a group of students with diverse academic backgrounds, curious and interested in diving into a wide variety of topics and methodological approaches in biology and ecology.

Although excellent academic performance is a key factor in the selection process, we are especially looking for young researchers who demonstrate the ability to tackle challenging tasks with methodological rigor, critical thinking, creativity, and a spirit of collaboration.

Candidates should have full-time availability to work on the course and be willing to continue their scientific careers in doctoral programs of excellence.

Organization

The Training Program in Quantitative Biology and Ecology was launched in 2021 in a partnership between the Serrapilheira Institute and the International Centre for Theoretical Physics - South American Institute for Fundamental Research (ICTP-SAIFR).

The Serrapilheira Institute is the first private institution to support research excellence and scientific outreach in Brazil. As a non-profit organization supported by its endowment fund and broadly recognized by the Brazilian scientific community, it offers programs for researchers and communicators from all regions of Brazil.

ICTP-SAIFR is a South American hub for theoretical physics, created in 2011 through a collaboration between the International Centre for Theoretical Physics (ICTP) in Italy, the São Paulo Research Foundation (FAPESP), and the Institute of Theoretical Physics of the São Paulo State University (UNESP). ICTP-SAIFR's mission is to conduct research in theoretical physics at the highest international standards, to support research in regions of South America where theoretical physics is less developed, and to function as an international center for scientific training.

[More details about the requirements in section 4 \(Application\)](#)

Advisory Board

The Training Program in Quantitative Biology and Ecology was conceived and structured with the support of an Advisory Committee that systematically follows the development and consolidation of the program's different stages. The members of the Advisory Board are:

Jordi Bascompte

Professor of Ecology at the University of Zurich, Switzerland, and director of the master's Program in Environmental Sciences at the same university.

William Bialek

John Archibald Wheeler/Battelle Professor in Physics at Princeton University, USA, Visiting Professor of Physics at The Graduate Center at CUNY, USA, co-director of the Center for the Physics of Biological Function (The Graduate Center at CUNY and Princeton University).

Thiago Carvalho

Graduate Program Coordinator at the Champalimaud Foundation, Portugal.

António Coutinho

Former director of the Doctoral Program of the Gulbenkian Institute of Science (IGC), in Portugal.

Akiko Iwasaki

Professor at Yale University and principal investigator at the Howard Hughes Medical Institute (HHMI), USA.

Maria Leptin

Director of the European Research Council (ERC).

Simon Levin

James S. McDonnell Distinguished University Professor in the Department of Ecology and Evolutionary Biology at Princeton University (USA) and Director of the Center for BioComplexity at the Environmental Institute, also at Princeton

Gabriel Mindlin

Professor of Physics at the University of Buenos Aires.

Stevens Rehen

Director of Research at Instituto D'Or de Pesquisa e Ensino (IDOR) and Full Professor at the Federal University of Rio de Janeiro (UFRJ).

2. Modular course

The program offers a five-month, full-time (morning and afternoon) on-site course. The course is divided in two modules, introductory and advanced, and takes place at the ICTP-SAIFR facilities in the city of São Paulo.

Course Structure

Introductory module (July-August)

Mini modules:

- Quantitative foundations of biological concepts
- Hypothesis-driven research
- Data-driven research
- Computational methods
- Mathematical modelling in biology

Each mini module will consist of lectures, hands-on sessions, and question and answer sessions. The weekly course load will be complemented by activities such as journal clubs, research seminars delivered by guest speakers, and discussion sessions. In the last week of the module, students will develop group projects in which they will apply what they learned during the module.

Advanced module (September-November)

Mini modules:

- Genetics and epigenetics
- Evolution
- Developmental biology
- Neurobiology
- Molecular and structural biology
- Systems biology
- Immunology
- Biophysics
- Community ecology and biodiversity
- Climate change impact on biodiversity
- Behavioral ecology
- Microbial ecology
- Disease ecology and epidemiology

In this module, students will be exposed to different fields of biology and ecology through lectures, hands-on sessions, and question and answer sessions. As much as possible, each topic will be presented through a combination of quantitative and traditional approaches, aiming to show students how they complement each other. Activities such as research seminars, discussion sessions and journal clubs will also be part of the weekly schedule.

Faculty

The faculty is made up of scientists working in leading research centers worldwide. More than just highly qualified professors, their scientific careers illustrate how cutting-edge research is conceived and developed today.

Students will have the unique opportunity to interact inside and outside the classroom with researchers who are leaders in their fields. As we will have professors from different parts of the world and students of different nationalities, **all classes will be held in English.**

Students

We are looking for students with excellent academic records who are eager to learn new concepts and methods, willing to participate actively, ask questions, and interact and collaborate in developing different activities.

We expect that the participants will enjoy the opportunity to interact with leading scientists whose research has an impact on the international scientific community and who wish to contribute to the process of training the next generation of young researchers with great potential.

Therefore, full dedication is mandatory throughout the course and in all activities. Students with an unexcused absence may be dismissed from the program.

3. What comes after the course?

During the advanced module, students will receive guidance and support in preparing for the different stages of applying to doctoral programs. Participants are expected to be able to compete for positions in the world's top research centers by the end of the course.

The long-term goal of the Training Program in Quantitative Biology and Ecology is to develop a densely connected network of promising Brazilian and Latin American scientists dedicated to major questions in the life sciences with solid quantitative skills. To further strengthen this network, the Program will organize an annual symposium in Brazil, open to Brazilian participants who have completed the modular course and are in the second, third, and fourth years of their doctoral programs. All transportation, room and board for the participants will be covered by the Program during the days of the event.

A limited number of participants from other Latin American countries will have room, board and air transportation covered by ICTP-SAIFR.

4. Application

Who can apply

We strongly encourage all applicants to acquaint themselves with our selection process before applying.

- Applicants must either be enrolled in an undergraduate program or have completed their undergraduate studies at a higher education institution in Brazil or another Latin American country. Those pursuing or having completed a master's degree, regardless of the institution, are also eligible.

Students who are pursuing or have already completed a doctoral degree are not eligible.

- Mastery of the English language is essential. Both the selection process and the classes and other course activities will be conducted entirely in English.

- Persons with an academic background in any field of knowledge are welcome. Previous research experience in the biological sciences is desirable, but not a requirement. People with a background in exact sciences or computer science with a strong interest in the life sciences are encouraged to apply even without prior experience in biological sciences or ecology.

- Familiarity with differential and integral calculus is required. The selection process will involve questions aligned with a basic calculus course; calculus tools will be used in the lectures of some mini courses.

- Candidates must be available to dedicate themselves entirely to the on-site course in the city of São Paulo for the duration of the course.

- Participants in the Program's 2021 call who meet the eligibility criteria for the 2022 call are welcome to apply again.

How to enroll

All applications will be reviewed, but the first 500 applicants will have priority in the selection process. Therefore, we recommend that candidates prepare their documentation in advance and pay attention to the date the application window opens to be able to start the application process as soon as possible.

Starting **March 23, 2022**, applicants can apply to the Program at <https://www.ictp-saifr.org/qbioprogram/>, by filling out an online application form and attaching the following documents:

All answers on the online form must be in English. Entries in Portuguese will not be considered.

Curriculum vitae

In **English**, not to exceed two pages, in .pdf format.

Complete undergraduate transcripts

All applicants must submit their undergraduate academic transcript including grades obtained in the courses taken. **You do NOT need to translate this document (i.e., originals in Portuguese or Spanish are valid).**

Graduate school transcripts

Applicable only to those enrolled in or who have completed a master's program. There is **no need to translate this document (i.e., originals in Portuguese or Spanish are valid).**

Letter of Motivation

It must be written in **English**, with a maximum of 4,000 characters, not including spaces. Applicants should demonstrate their affinity for the Quantitative Biology and Ecology Training Program, state the reasons why they ought to be selected, and how their profile aligns with the premises presented in this announcement.

The letter of motivation will play a critical role in the selection process. We recommend that candidates devote time and thought to this item.

Advanced entry request letter

Applicable only to candidates whose previous training would allow them to waive the introductory module, enabling them to be admitted directly into the advanced module.

The letter must be written in English, with a maximum of 4,000 characters, excluding spaces. The candidate must justify why he/she considers that he/she is fit to be admitted directly into the advanced module.

Names and emails of two researchers who will send letters of recommendation

At this stage, applicants only need to provide the names and e-mail contacts of two researchers who have agreed to write letters of recommendation, and with whom the applicant has previous experience as a student, mentee, and/or research team member.

After the application has been submitted on the Program's website, the researchers listed by the candidate will automatically receive an electronic form that must be filled in and returned by **April 13, 2022, 5 p.m.** (Brasília time)—deadline for registration. Candidates can check and track the status of the letters of recommendation by logging into the application system.

It is important that candidates communicate with those who will recommend them about the process of sending the letters of recommendation

so that they check their inboxes for the automated email. It is also worth reminding them to check their SPAM box, since messages from unknown senders occasionally show up there.

Note: the date we receive the letters of recommendation does not affect the date the application is submitted (by the applicant) in giving priority to the first 500 applicants.

In other words, regardless of the date on which the letters of recommendation arrive (as long as they do so by the application deadline), the first 500 applicants to submit the form and their own documents will be given priority in the selection process.

5. Selection Process (introductory module)

Applications will be evaluated in two stages by a committee consisting of researchers from ICTP-SAIFR and members of the Serrapilheira Institute.

Documentation Evaluation

The first step consists in checking the eligibility criteria, followed by a pre-selection based on the information provided in the application form and the documents submitted (Note: the motivation letter will play a critical role at this point).

Interview

The second step consists of remote interviews with shortlisted candidates. At this point, we will evaluate:

- technical capability in field of study;
- motivation for applying;
- level of English proficiency;
- prior knowledge of basic calculus (differential and integral single-variable). The candidate should be familiar with concepts such as continuous and discontinuous functions, limits, and trigonometric, exponential and logarithmic functions, and be able to solve one-dimensional derivatives and simple integrals.

Result

Up to thirty students will be invited to participate in the introductory module; their names will be announced on June 3, 2022.

Should candidates be identified after the interview stage as having

If anyone listed does not receive the email message from the program's application system, the candidate needs to report it to us immediately via the contact email: qbioprogram@ictp-saifr.org

previous training that justifies direct entry into the advanced module, they can choose not to take part in the introductory module.

Selection for the advanced module

This module will have a maximum of twenty participants, including advance-entry students and students selected from the introductory module. The selection criteria for students from the introductory module will be group project performance, individual interviews, and active participation in the introductory module courses.

Schedule

March 23, 2022

Application window opens

April 13, 2022, 5 p.m. (Brasília time)

Application window closes

May 20, 2022

Notification of acceptance to selected students

June 3, 2022

Publication of the list of selected students

July 4 – September 3, 2022

Introductory Module

September 12 – December 2, 2022

Advanced Module

6. Student stipend

When the modular course begins, all students will receive lodging in the city of São Paulo and a monthly stipend of BRL 1,500 to cover food and transportation for the two months of the introductory module. It is worth pointing out that this is an estimated amount and subject to change.

Those who are selected for the advanced module will continue to receive lodging and the monthly stipend until the completion of the course (an additional three months). The stipend will be suspended upon a student's withdrawal or dismissal from the course.

The Program will also fund two domestic air tickets (round-trip) between the student's home city and the city of São Paulo for those who live in other parts of Brazil.

A limited number of participants from other Latin American countries will

have their living stipend and air transportation funded by ICTP-SAIFR.

The stipend is a benefit that all students in the program can apply for, regardless of whether they already have scholarships from any national or international student funding agencies that provide similar incentives and support, as long as the applicable legislation and/or the internal rules of these agencies and their scholarship programs do not restrict them from receiving this type of stipend concurrently.

7. Important Considerations

Health conditions (COVID-19 pandemic)

Should the health conditions in Brazil and worldwide worsen during the months leading up to the date set for the start of the introductory module (July 4, 2022) to the point of making it unfeasible to hold an in-person course, the partner institutions responsible for organizing the program reserve the right to adapt the program to a remote format. In this case, participants will not receive a stipend.

Demographics

Applicants are invited to opt-in for spontaneous reporting of demographic data in the Quantitative Biology and Ecology Training Program application process. By opting in, applicants agree to contribute to the collection of diversity data in our selection process. Any processing and publishing of demographic data collected in the call is strictly for statistical purposes related to the Program's commitment to transparency. Therefore, there will be no mention or identification of candidates related to this data and it will be kept confidential and secret and handled sensitively as set out in the provisions of the law. Opting out of providing demographic data does not impact the selection process in any way, nor does disqualify any candidate. Opting out can be done by ticking the "I prefer not to inform" option on the application form.

On a legal note

The organizers reserve the right to cancel, suspend, modify, revise, or postpone, at any time and at their sole discretion according to their own criteria and convenience the process related to this call for applications, by simply publishing a notice on the same media channels as the Training Program in Quantitative Biology and Ecology was announced, whereby such a notice precludes any type of compensation or indemnity owed to those registered in the program.

In order to preserve impartiality and equality in the evaluation and selection of applicants for the Training Program in Quantitative Biology and Ecology, persons married to, in a civil union with or of kinship by consanguinity or affinity, either in a direct, collateral or transverse line,

up two degrees of separation, with directors of the partner institutions responsible for organizing the Program, are not allowed to apply, directly or indirectly to the Program. Deliberately not abiding by this rule by any person qualifying for the calls for applications to the Training Program in Quantitative Biology and Ecology, will give the organizers, at their sole discretion of convenience and time, the right to request that the applicant be eliminated from the applicant pool.

Exceptions to the rules provided here must be evaluated and decided upon by the organizing institutions.

The names that make up the faculty of the course are the result of exhaustive research and reflect the quality and technical and academic competence that the organizers wish to establish for the program. Due to various factors beyond the control of the parties, however, some of the names listed may not be able to participate in the entire schedule as planned. In this case, the organizers will select other names while observing the same standards of quality and recognized competence used in selecting all nominees.

8. Contact

qbioprogram@ictp-saifr.org

