DISCOVERY RESEARCH (DR)-CTB PROGRAM

Discovery research for undergraduate students at Center for Biomedical Technology CTB:

Justification of the program

This program emerges due a special interest of researchers and professors at the Center for Biomedical Technology (CTB) to offer students a specific and complementary formation to their degree subjects that expand their current knowledge in the field of biomedical research. This program could be useful: i) to form graduate life sciences technologists of the highest quality; ii) To introduce students to the various areas of biomedical research and guide them in the implementation of their future degree, master thesis or dissertation projects; and iii) To identify potential talents training leaders in biomedical research and promoting careers of future students in biomedical technology. We consider this program should be part of a long-standing institutional commitment to biomedical technologist-scientist training to foster among students, the interest of research in the biomedical field. This program is voluntary. In our center we recruit students who wish to establish their first contact and collaboration with different research groups working in different disciplines, combining the depth of biomedical engineering schools and other related degrees and rigor of research training and formation through our scientific program.

As part of this program, Biomedical Engineers at the UPM or other universities, as well as undergraduate students of other degrees have the opportunity to start in the current research on new biomedical technologies. As a general rule, students can join this program from their third year of degree. The experience and training offered by our program is unique and allows introducing students to the complex, variable, and attractive world of research. Students can learn and develop their creativity in an exciting and innovative environment in the field of actual biomedical technologies. The Interdisciplinary collaboration is key in our program, which is focused on provide the student formation in different scientific lines and research groups at CTB, especially in the areas of Clinical Neuroscience, Neuroimaging and Advanced Biomedical Technologies , Cellular and Pharmacological Therapy in Cellular and animal Models, Tissue Regeneration and Biomaterials, Biochemistry, cellular and Molecular Biology, Computational Biology, Nanomedicine, Bioelectromagnetics, Bioinstrumentation and Biosensors and data Mining applied to health .

During the program, each student has the opportunity to conduct research in several scientific groups of CTB, through an **internal system of rotations**. One of our goals derived from this initial contact is to enable the student, after finishing the program, stably incorporate into a particular research group. Such incorporation can guide the

students in preparing their Final Degree Project or also be of interest in the development of a Master or a doctoral dissertation project.

You can learn more about the research groups participating in the program and its scientific lines http://www.ctb.upm.es

Aims of the Program

The main goal of this program is to provide the student a real research experience at our center. Students are hosted by different research groups, which include principal investigator, co -investigators, pre- and postdoctoral students and remaining staff scientist. The purpose of this staying is to get students to be integrated into the common research activities of our center. The specific aims are:

1. To provide the students their first research experience, causing them to discover the different facets of research. The student can familiarize with the different technologies in biomedical sciences: imaging technologies, biological signals, data analysis, nanotechnology, and cell biology among others.

2. To ensure that each student faces the common problems and challenges of every laboratory in which is integrated, finding the most appropriate solution to every particular matter, within an appropriate management training and research in each group.

3. Getting the student to interact with several research groups, being this, an initial soil for a more sustained collaboration (out of the program), allowing the development and achievement of a Final degree Project , Master or Thesis.

Phases of DR-CTB Program

The students can enroll in this program with an official recognized **3 credits**. The activities under the program are:

1. Initial visit to CTB. Initially, students visit our research center discovering "what is going on there". On a guider tour, students talk with different research groups, seeking information about areas of research, current technology and equipment. This is the first point of contact. By definition, a research group contains a team of investigators, including principal investigator, co-investigators, students and scientific lines of the group. Commonly a research group share laboratories and equipments with other research groups. In this initial contact, every group supplies the student complete information about research lines, current areas of activity, technology and methodologies. In this way, students gain essential information to evaluate and select those potential groups and research line/s of interest.

2. Student assignment. After this first visit, students express interest (through a form/survey) for a specific group and preferences for advisors or some particular research areas. In principle, each student can conduct research in any group at CTB. It is recommended that students consider all options in technology, translational and basic science available at CTB. The system of rotations ensures that students receive training in different areas of biomedical technologies. For example, a student can collaborate in groups doing applied research or basic research. Prior to the formal assignment of rotations between groups and students, it is required a brief interview between the student and the head of each group where the student wants perform the rotation. The objectives of this interview are: i) to ensure that the student chooses the right mentor and group; ii) defining the collaborative activities of the student during the rotation; and iii) to find an advisor who is impressed with the student and with whom student would like to work. Finally this stage concludes with the final allocation of students to different groups.

3. Research stay

The duration of this program is for six weeks coinciding with the academic calendar. During this time, each student must change research group at least twice. This means that to complete the program, each student must conduct research in at least three distinct groups (2 weeks per group with a total of 6 weeks). Therefore, each rotation lasts two weeks. For the initial allocation of students, we will consider the preference of students, but such rotations should include technological, basic research and applied research groups. The rotation is mandatory for students, since it is the essential element of the program.

After this stage, it also ends the program. However, the student has the option (upon agreement between mentor with the student) to remain in the group longer. Thus, the DR-CTB program allows students to evaluate and choose those groups in which their affinity and interest are maximum, what is needed ahead of a longer-term stay. The long-term research stay should be the natural continuation of this program. The permanent stay should be focused on the student gain further supervised research experience in designing and conducting experiments of a higher level than in the rotation program. In principle, this phase should be directed to a sustained collaboration between the student and his/her mentor, that can be eventually reflected in a i) Final Degree Project, and if applicable , ii) in a Master or Doctoral Thesis, whenever it is of interest for both, the student and mentor.

Evaluation of Students

The evaluation procedure will be conducted on two ways:

1. Continuous evaluation about research tasks assigned to students within each research group or rotation. This evaluation will be perform by each responsible of group.

2. Oral exposure and defense of results and conclusions obtained during the research stay. A panel of experts formed by the researches participating in the program will evaluate students.

What we expect from our program

As mentioned before, when a student enrolls this program, students will joint to a particular faculty preceptor, which will introduce the student to the specific research fields of the group. Faculty will assign students clear aims to accomplish during the permanency in our center. During the course in a specific laboratory or group we expect the students to achieve different competencies, with a clear definition of the goals and objectives. Students enrolling at DR-CTB program are expected to:

1. Knowledge

a) Display appropriate knowledge of basic sciences relevant to the research lines and selected scientific group. Students will be expected to become active participants in the different research activities. Interaction with different groups at the CTB is highly important during this program.

b) Development of research problem-solving skills and problem-identification interests. Display knowledge of study design and research methodology. Demonstrate the ability to synthesize information and place research findings into the context of existing literature.

2. Interpersonal and Communication Skills

a) Create and sustain effective relationships and work effectively with other students, research colleagues, and staff.

b) Display skill in communicating research ideas and findings verbally, including the ability to give research presentations.

c) Develop leadership attitudes

3. Professionalism

a) Development of the attitudes and professional behavior appropriate for biomedical research. Demonstrate integrity, accountability, and responsible and ethical behavior.

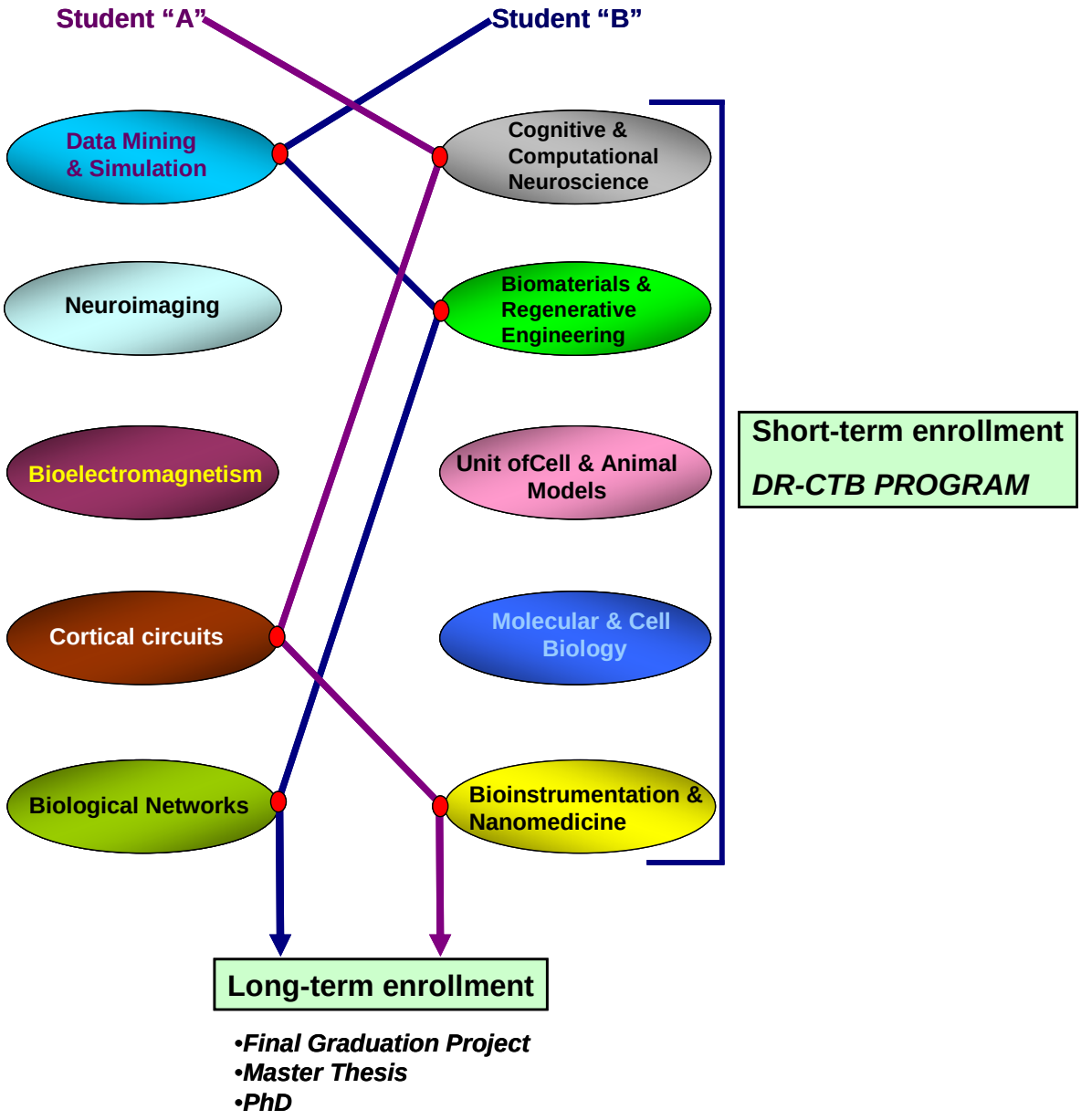
b) Demonstrate appropriate and responsible care of animals involved in research.

c) Display openness to supervision; accept constructive criticism. Seek direction when appropriate; demonstrate eagerness to learn.

Guide of activities/events

Activity/ Event	Academic course (specific days)
CTB visit (First point of contact) Including: *i) DR-CTB program introduction* *ii) Visit and contact with different research groups* *iii) Expression of interest (form/survey) for students* *iv) Personal interview between students and selected advisor/group*	*At the beginning of February*
Distribution of students into different research groups	
Research stay (3 rotations in 6 weeks) ***10-15 students maximal per course***	*(February-March)* ***Program duration:*** *6 weeks* ***Credits:*** *3* ***Total hours:*** *90*

Scheme of rotations within DR-CTB program



The DR-CTB program includes a research stay at our center. During six weeks, students rotate between three different research groups; two weeks in each group.