

# NEW DIMENSIONS OF HIGHER EDUCATION IN BIOLOGY IN ROMANIA

*Anca Sarbu and Angheluta Vadineanu*  
*University of Bucharest*

## *1. General Introduction*

The socio-economic transition in Romania, like in any Eastern European Countries, is a complex, profound and rapid process, which involves the reform of both: the Romanian socio-economic and higher education system.

The progressive and fast increase of the demand for higher education in Romania, during the last decade, has been accompanied by deep changes in the academic organization and education degrees.

After a long history of the Soviet model for higher education apply (since 1948), the implementation of the reform, started after 1990, induced a process of renewal, affecting all the system levels: organization, teaching staff, education curriculum and research.

Romanian higher education system is developed now, in accordance with the provisions of the Romanian Constitution, which establish the general framework and the fundamental functioning principles: democratic character, non-discriminatory access, promotion of competence, quality assurance, university autonomy and academic freedom.

Specific education laws (nr. 88/1993, nr. 84/1995) are the legislative acts, which regulate the important aspects of education, institutions organization, structure, financing, student rights and recognition of diplomas, ensuring the coherence of the educational process, at the national level.

At the same time, the decentralization of decision - making and the competence of the institutions themselves, ensured a wide degree of autonomy in managing their own activities.

In this general frame, the teaching of biology, like all university teaching, was highly affected, getting new conceptual and structural dimensions.

## *2. System of Organisation*

### *2.1. General structure of higher education*

The national system of higher education consists of a network of institutions of different types, levels and forms of teaching and research organization.

The responsibility of the national management of the higher education system is centralized in some way, and belongs to the Ministry of National Education (strategic co-ordinator). Other 4 consultative body are also involved in this activity:

- **National Council for Academic Evaluation and Accreditation** (evaluation and accreditation of higher education institutions)
- **National Higher Education Financing Council** (financial activities, concerning the budget allocations and external funding)
- **National University Research Council** (supports academic research)
- **National Council on Academic Titles and Degrees** (establishes the criteria for national and international academic recognition)

The National Academic Council ensures the relationships between the Ministry of National Education and the universities.

Inside the universities power and responsibility have been delegate to academic leaders, such as the Rector, Dean and Head of Chair or department. They have a considerable free hand in supporting research projects, graduate programs etc.

Depending on their financing system, Romania has two categories of higher education structure: public/state institutions (mostly state-financed) and private ones (mainly self-financed), as an alternative to public education.

Depending on the level, type of organization and education length, higher education is organized in two categories of forms:

- i. **Short term education**, a flexible category of studies, which expended rapidly after 1990, adjusting to the demands of the labor. market. Their organization and functioning are based on regulation issued by the universities, commercial units, non-profit organizations etc.  
The study certificate or attestation, received by the students enrolled, is not considered a standard university diploma. In most cases it is recognized on the labor market and grant the right to have a job. No national rules exist as to the official recognition of all study certificates awarded by this education type, and generally, it is the labor market which decides on their functional importance, depending on practical purposes.
- ii. **Long term education**, achieved by special institutions- the universities, established by law, with a twofold mission: teaching and scientific research.  
As a rule, any university includes a number of functional structures: faculties, university departments, research stations, research centers and sometimes production units. At the moment, the faculty is the basic functional unit of the university, organized by chairs or departments and responsible for their admission and graduation requirements, for the contents of their study programs and for their field or specialization.  
The faculty, includes teaching and research staff, students, auxiliary and administrative personnel, organizes basic studies and post-graduate study programs.

## 2.2 *Higher education in Biology*

### 2.2.1. *University teaching*

In Romania, biology is taught now, in all the public major national universities (Univ. of Bucharest, Univ. Al. I. Cuza from Iasi, Univ. Babes-Bolyai from Cluj-Napoca, Univ. of Timisoara, Univ. of Constanta, Univ. of Craiova etc.) and in the majority of the new, private ones.

The higher education in biology was fundamentally reorganized, on the general frame of higher education reform program; this concerned the educational process, the scientific research, as well as the resources (human, material, financial) and the social services offered to students.

The first Romanian higher education institution, which elaborated a reform program and a long-term development strategy was the University of Bucharest.

The principals of the reform, that guides the activity of the 17 faculties of this academic community were stipulated in the Charter of the University of Bucharest.

The most important of them, aim to the quality of education and scientific research, curricula reorganization (on levels or modules), credit system implementation, the decentralization of decision-making, promoting the university autonomy and the development of national and international co-operation.

The higher education in biology is organized by the universities at three levels (Fig. 1):

- i - Basic studies (equivalent with undergraduate curriculum)
- ii - Post-graduate studies
- iii - Doctoral studies

The study programs are imparted in Romanian language, but some universities, tray to offer also, programs in the language of the ethnic minority groups.

#### 2.2.1.2. *Basic studies*

In the University, the contents of basic courses in biology, depend upon a typology defined by the Ministry of National Education. The training activities are organized in the form of day courses, but in a very short time will be implement also the distance education.

The biology is in principal studied in the Faculties of Biology, but some biological aspects are also approach in some other faculties, like Faculty of Chemistry (profile - Technologic Biology), Faculty of Geography (profile - Environmental Science), Faculty of Agricultural and Forestry Science etc.

Admission to the Faculty of Biology is conducted on a competitive basis and the entrance examination is organized by each institutions, in compliance with the general criteria established by the Ministry of National Education. The admission procedures followed by private higher institutions of education in biology are diverse and as a rule, less selective than those employed in the public sector.

The study programs include: basic disciplines, mandatory for all students, optional specialty disciplines, which can be selected from a list of courses offered by the faculty or by other faculties with a similar profile and complementary disciplines, which can be selected either from among those offered to the student in his own faculty, or from other study fields, offered by the some university or other universities.

The biological training consists of attendance of lectures, seminars, laboratory and practical work, individual study, research and final examination.

The weight of these different kinds of activities (assessed in ECTS), depends on the study program, established by each Faculty of Biology, on a independent basis, respected some national minimal standards.

The credits obtained by the student can be transferred among the faculties and departments of university, among some universities in the country or between a national university and a university from abroad.

The graduation diploma is awarded on the basis of the number of credits obtained in each of the previous categories of study disciplines.

Since the 1996-1997 academic year, the University of Bucharest have been implement the European Credit Transfer System, inducing important changes, in the education process, student assessment and mobility.

The curricula for the basic studies in biology is organized in two cycles:

- i. The 1<sup>st</sup> study cycle, lasts for two years and offers a general instruction in the biological field; the theoretical lectures, laboratory, practical work and seminars are carrying the weight. Passing on to the 2<sup>nd</sup> cycle depends on the candidate's holding 120 study credits.
- ii. The 2<sup>nd</sup> study cycle takes two more years; the optional disciplines, scientific training and research (individual programs) are higher represented during this cycle.

The curricula of biology in the Romanian universities are not identical, but they are very similar. In what follows, the University of Bucharest and in fact the Faculty of Biology will serve as a representative example.

The Faculty of Biology is organized on 4- year full time courses and three profiles: Biology, Biochemistry and Ecology and environmental protection (Fig. 2). The both cycles of basic studies are organized on four successive semesters (30 ECTS/semester).

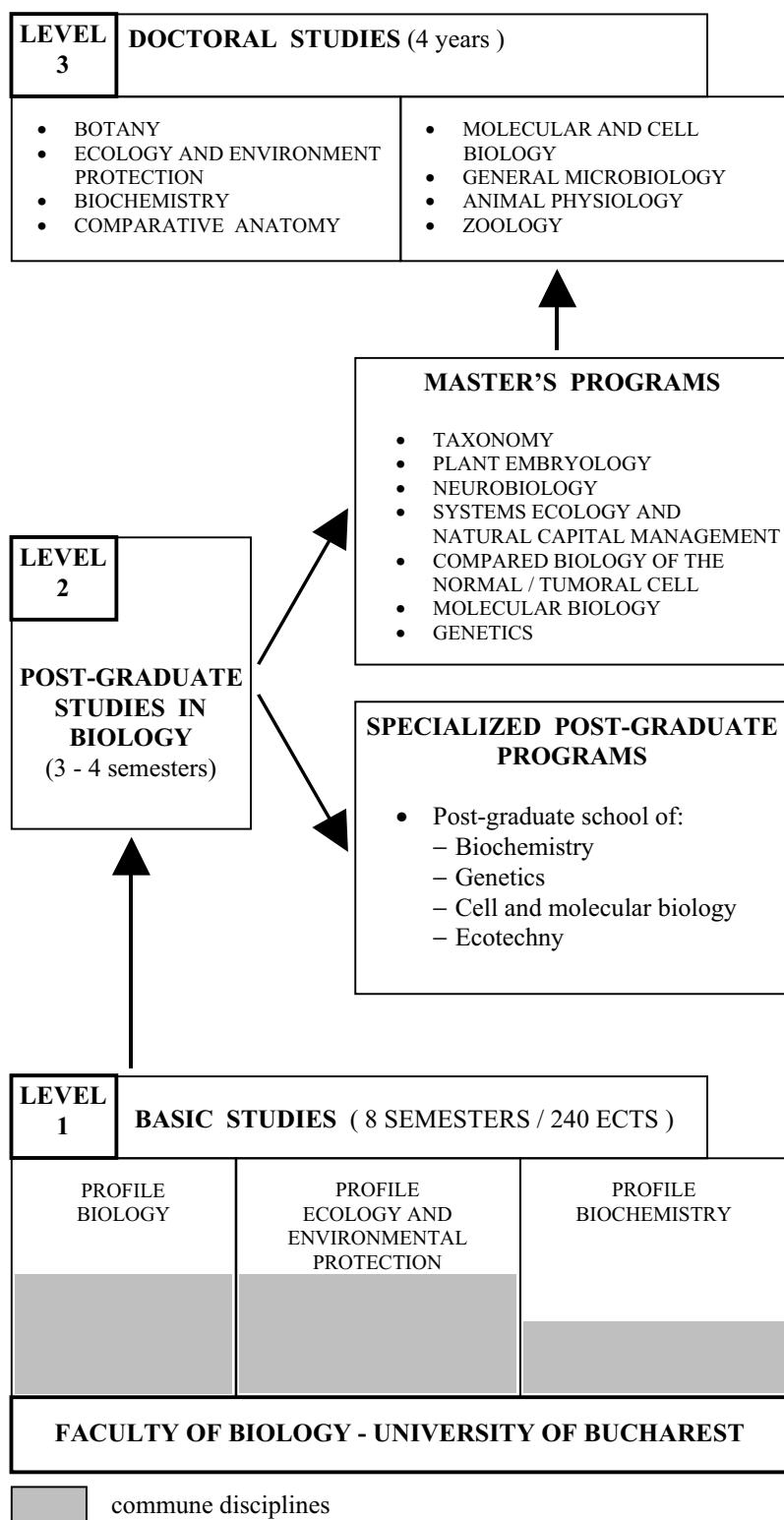


Fig. 1. Organization of the higher education in Biology at the Faculty of Biology (University of Bucharest)

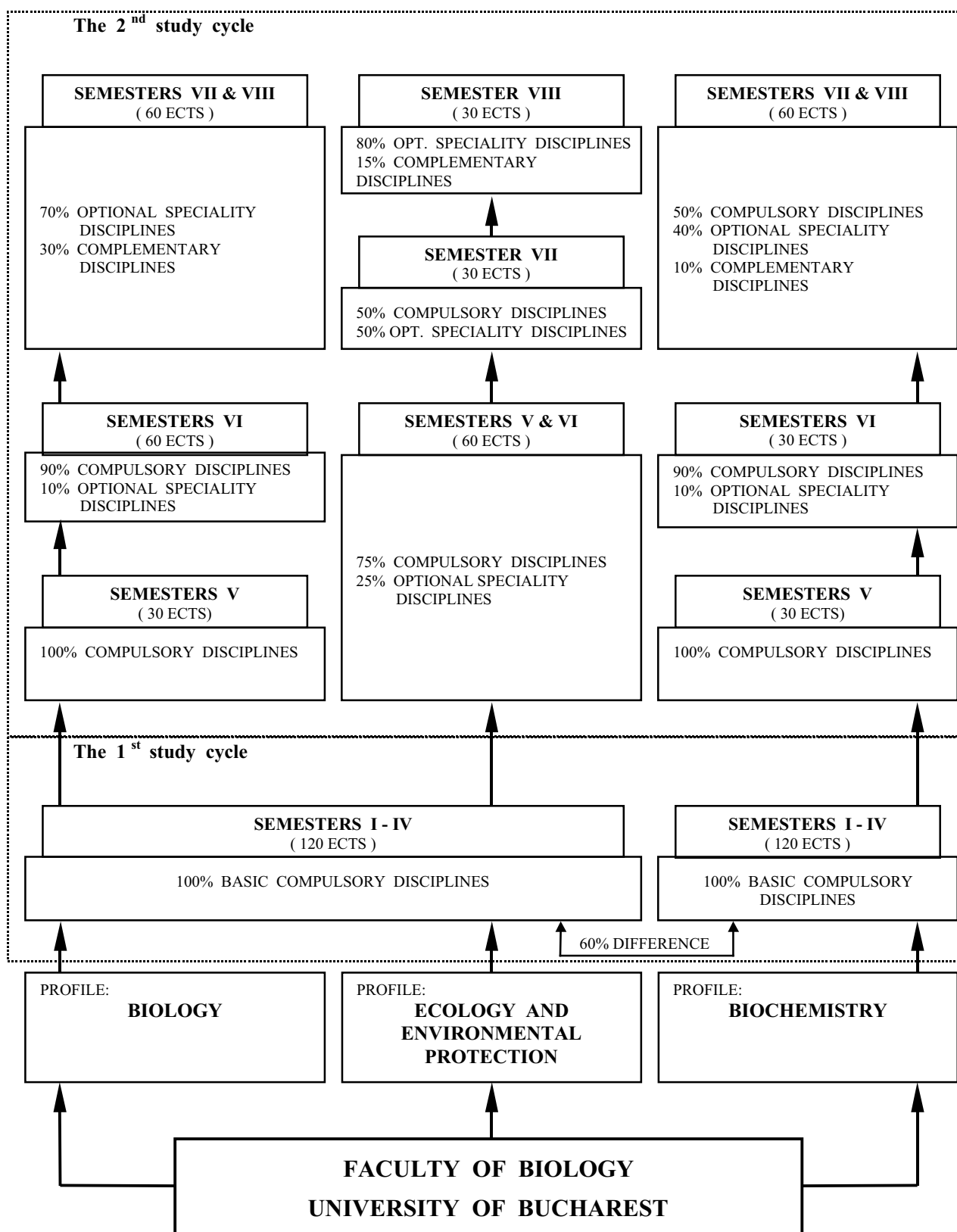


Fig. 2. The organization of basic studies in Biology at the Faculty of Biology ( University of Bucharest ).

The academic year begins on 1 October and ends at the end of June. Some study programs also include practical activities (Botany & Zoology & Ecology) at the end, or during the academic year. In such cases, the activities may be extended into the first decade of July.

Every academic year includes 30 weeks of theoretical and practical instruction and is divided into two semesters. The organization of the various lectures, seminars, laboratory and practical works, varies a lot. As a rule with some exceptions, they all last from one semester only and require an examination at the end. There are also some courses which require successful participation in the preceding lectures, but because students do not necessarily take the same lectures and courses in the same sequence, they become able to establish their own curriculum content.

This flexibility is related to the high proportion of optional and complementary disciplines, which can be choosed, during the length of the basic studies, in accordance with the profile and the branch of specialization.

For example, for the profile Biology, the first cycle ( semester I - IV ) consists on 17 compulsory disciplines and 2 practical field applications; the specialization starts in the VI semester and will be finalized during the second study cycle.

## 1. COMPULSORY DISCIPLINES

- Inorganic chemistry.....(5 ECTS)
- Organic chemistry.....(5 ECTS)
- Biostatistics.....(5 ECTS)
- Computer science.....(5 ECTS)
- Animal histology.....(5 ECTS)
- Humane anatomy.....(5 ECTS)
- Plant morphology and anatomy..... (7 ECTS)
- Invertebrate zoology.....(8 ECTS)
- Knowledge of geology and paleobotany.....(5 ECTS)
- Physics.....(5 ECTS)
- Field applications (botany and zoology).....(5 ECTS)

SEMESTERS:  
I (30 ECTS) & II (30 ECTS)

- General biochemistry.....(10 ECTS)
- Vegetal taxonomy.....(7 ECTS)
- Vertebrate zoology.....(8 ECTS)
- Comparative anatomy.....(5 ECTS)
- Plant physiology.....(10 ECTS)
- Biophysics.....(5 ECTS)
- Science of evolution.....(5 ECTS)
- Field applications (botany and zoology).....(5 ECTS)

SEMESTERS:  
III (30 ECTS) & IV (30 ECTS)

- Ecology.....(10 ECTS)
- Genetics.....(10 ECTS)
- Animal comparative physiology..... (10 ECTS)
- General microbiology.....(10 ECTS)
- Molecular and cell biology.....(10 ECTS)
- Immunobiology.....(5 ECTS)
- **First optional speciality discipline** (see point 2)..... (5 ECTS)

SEMESTERS:  
V (30 ECTS) & VI (30 ECTS)

**2. OPTIONAL SPECIALITY DISCIPLINES**

(semester VI)

- Medical microbiology → for specialization in **MEDICAL BIOLOGY**
- The biology of the vegetal cell → for specialization in **VEGETAL BIOLOGY**
- The genetics of microorganisms → for specialization in **CELL BIOLOGY AND GENETICS**
- Entomology → for specialization in **ANIMAL BIOLOGY**

**3. OPTIONAL SPECIALITY AND COMPLEMENTARY DISCIPLINES**

(semesters VII - 30 ECTS &amp; VIII - 30 ECTS)

**3.1. If MEDICAL BIOLOGY** is chosen as the main subject, the specialty disciplines are as follows:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Pathologic anatomy (5 ECTS)</li> <li>• Hematology (5 ECTS)</li> <li>• Medical virology (5 ECTS)</li> <li>• Endocrinology (5 ECTS)</li> <li>• Medical parasitology and entomology (5 ECTS)</li> <li>• Physiopatology (5 ECTS)</li> <li>• Humane biology (5 ECTS)</li> </ul> | <ul style="list-style-type: none"> <li>• Oncobiology (5 ECTS)</li> </ul> <p><i>* other 4 complementary disciplines will be choose either from among those offered to the student by his own faculty or from other study fields offered by the same university or other one..... (20 ECTS)</i></p> |
|---|---|

**3.2. If VEGETAL BIOLOGY** is chosen as the main subject, the specialty disciplines are as follows:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• The biology of the vegetal parasites (5 ECTS)</li> <li>• Phytocenology (5 ECTS)             <ul style="list-style-type: none"> <li>• Plant ecophysiology (5 ECTS)</li> <li>• Photosintesis and productivity (5 ECTS)</li> <li>• Algology (5 ECTS)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Micology (5 ECTS)</li> <li>• The biology of plant development (5 ECTS)</li> <li>• Vegetal biotechnology/Vegetal resources/Floral biology (5 ECTS)</li> <li>* .....(20 ECTS)</li> </ul> |
|---|---|

**3.3. If CELL BIOLOGY AND GENETICS** is chosen as the main subject, the specialty disciplines are as follows:

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• The genetics of population (5 ECTS)</li> <li>• Humane genetics (5 ECTS)</li> <li>• The biology of the animals development (5 ECTS)</li> <li>• Molecular cytogenetics (5 ECTS)</li> <li>• Genetics engineering (5 ECTS)</li> </ul> | <ul style="list-style-type: none"> <li>• The molecular biology of the cell dysfunction (5 ECTS)</li> <li>• Cell receptors (5 ECTS)</li> <li>• Ionic channels (5 ECTS)</li> <li>• Pharmacology/Radiobiology/*(20 ECTS)</li> </ul> |
|--|--|

**3.4. If ANIMAL BIOLOGY** is chosen as the main subject, the specialty disciplines are as follows:

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Pest populations control (5 ECTS)</li> <li>• General parasitology (5 ECTS)</li> <li>• Ornithology (5 ECTS)</li> <li>• Mammals biology (5 ECTS)</li> <li>• Etology (5 ECTS)</li> </ul> | <ul style="list-style-type: none"> <li>• Animal biodiversity (5 ECTS)</li> <li>• Neurobiology (5 ECTS)</li> <li>• Sociobiology (5 ECTS)</li> <li>• Ihtiology/</li> <li>* .....(20 ECTS)</li> </ul> |
|--|--|

**2.2.1.2. Post-Graduate studies**

Post-graduate education in biology is organized by universities, and post-graduate schools accredited to this purpose and offer to graduates, an in- depth specialization, a change of specialization or a

recycling modality, by post-graduate academic advanced studies (Master), specialization studies, doctoral studies and continuing education.

### **Post-graduate academic advanced studies / Master curriculum**

Master's programs in biology have been organized in the Faculty of Biology since the academic year 1994-1995. This type of multidisciplinary studies require a period of 3 semesters, and are accessible to university graduates already holding a study diploma (license diploma).

Post-graduate schools concerning 4 areas of specialization are related to the Master's programs: Biochemistry, Genetics, Cell and molecular biology and Ecotechny.

Admission is based on a contest (two examinations, at least one in writing), focused on a special topic, related to their future specialization.

The frame structure of the teaching program includes lectures, seminars and especially research activities, strongly related to the research programs developed by the chairs or departments which organized the advanced studies. In the Faculty of Biology, from the University of Bucharest, this post-graduate education program is organized for 110 students/year, in the following domain of specialization:

- **Taxonomy**
- **Neurobiology**
- **Plant embryology**
- **Systems ecology and Natural Capital Management**
- **Compared biology of the normal/tumoral cell**
- **Molecular biology**
- **Genetics**

The Master's programs are concluded with a dissertation and the subject of the final written thesis is related to the specialization area of the thesis work.

Graduates of Master's studies are awarded a Master's diploma or Magister diploma which ensure the future participation to the doctoral studies.

### **Specialization studies**

Such studies are organized by post-graduate study schools in biology, related to universities and may be attended by university graduates, awarded a license diploma, working in the field of education, research, services, administration, state or private companies.

The teaching program is very flexible, including basic courses, optional and intensive courses, seminars, practical activities, case studies and workshops, related to the specific aspects of the curriculum.

The national and international collaboration between universities, and the students mobility are essential for the successful of this type of academic studies.

Specialized post-graduate studies in biology, organized by the previous academic units, as distinct forms from the doctoral studies are very diversified and are all oriented towards particular applications.

These specialized studies, organized in quite different ways, end up all with a personal presentation of the student's work, by a written dissertation also orally defended.

### **Doctoral studies / Ph.D. curriculum**

Doctoral studies, the higher form of education and scientific research are offered by universities accredited for the purpose.



University doctoral programs train future lecturers and researches and offer more specialized areas of study. Such education through research is an essential source of scientific and professional creativity for society as a whole.

Doctoral studies have been established in Romania from a long time, and they expand now in many biological disciplines in accordance with the rapid expansion of biological concepts but also with the existing human, material and finance support. For example, in the Faculty of Biology, from the University of Bucharest, the chairs and departments with a research and teaching activities able to fulfil the criterions required by the Ph. D. curriculum accreditation are the follows::

- **Botany**
- **Ecology and environment protection**
- **Vegetal physiology**
- **Genetics**
- **Biochemistry**
- **Comparative anatomy**
- **Molecular and cell biology**
- **General microbiology**
- **Animal physiology**
- **Zoology**

The content of doctoral studies in biology is very diversified and the structure of Ph. D. curriculum is specific for each specialitie.

Doctoral training programs ( four years lenght ) are organized in accordance with the Government decisions and internal regulations of higher education institutions. The study programs are elaborated at the institutional level and the main activity - the research, are carrying the weight.

During the 2 years preliminary study period, students have to accumulated 23 ECTS, passing at least 3 examinations and developing at least 4 scientific reports, which will be defended in front of a remarkable team of experts.

The research work is carried out, under supervision and is generally integrated in some national or international research programs, but the student must show an independent critical and scientific attitude, towards his or her studies.

All Ph.D. degrees are awarded on the basis of a research thesis, assessed at the end, by an external examiner team of 5 experts and finally, orally presented in public.

A period of study abroad, during doctoral studies has been included, for students in some doctoral programs established in the Faculty of Biology ( Ecology and Environment protection, Genetics, Biochemistry, Molecular and cell biology ), to take courses or work on their research project.

Graduates of doctoral studies are awarded Doctor's Diploma and the scientific title of Doctor. This title is granted by institutions of higher education and sanctioned by the National Council for the Recognition of Academic Titles, University Diplomas and Certificates.

### ***3. Higher Education in Biology and the European Community Programmes***

An essential component of the development strategy, concerning the higher education in general, including also the higher education in biology, consists in promoting and implement the European cooperation and permanent participation in the activities of the international academic community.

The higher education reform, the adjustment to European and international standards, in the field of higher education and scientific research, has opened up many possibilities to add quality to higher education, to complement research areas, to promote compatibility in biology curricula and to provide and implement the credit transfer system. The impact of participation in the TEMPUS Program the

trans-European cooperation scheme for higher education, related to the specific needs of Central and Eastern Europe, have been multiple, at student, staff and curriculum level for instance.

The opportunity to joint the available TEMPUS projects, specifically addressed to the reform of higher education structures, institutions, their management and issues of curriculum development was an important way to overcome gaps and difficulties in the process of adhering to the European and international institutions and cooperation systems.

This, allows the teaching staff exchange, resulting in a broadening of teaching methodologies by comparison with methods used in other E.U. partner universities and the students mobility, to follow courses not present in their home curriculum, to work in specialized laboratories or to take a new specialization.

The Tempus grants were directly available for the curriculum development programs, including Master's and Ph.D. levels. Many doctoral students have been working to prepare their dissertation, under a project financed within such programs.

Other international programs, jointing research or teaching projects, such: SOCRATES, LEONARDO DA VINCI, COPERNICUS etc., will represent a good opportunity to ensure the deeply involvement of more and more universities in the E.U. programs, in the tendency to establish the new European dimension of Biology.

In biology, as in many sciences, the Europeanisation and internationalisation, represent an important way to guarantee the quality of the highly specialised teaching areas. The establishment of EURO BIO Network is a good opportunity to reach this objective. In this respect, the Senat of the University of Bucharest has endorsed the willingness to joint the EURO BIO initiative concerning the European Ph. D.

#### *4. Higher Education in Biology - Long Term Strategy*

The development of a long term strategy for higher education in Biology, must take into consideration the national and international priorities, to be asses in the general frame work, induced by the diversity of biological topics, a strong scientific background for the development of qualified human resource.

We consider that this biological studies imply an adequate background in different sciences and the basic knowledge of different life levels are expected to be offered by the higher education system.

Recognizing that the biology it's a practical subject, we promote the necessity to pay attention to the diversity of topics.

In order to accomplish the divers teaching and research activities as desirable goals of the education process we support and promote the necessity to develop and implement an appropriate university infrastructure - the university department, as the main structure functioning in order to avoid the existent overlaps in our curriculum.

The main compartments of this unit as it is already accepted at the university are the follows:

- the basic studies chair,
- the school of post - graduate studies,
- the research center,
- the documentation and information center,
- the consulting subunits,

They have strong links and are supporting both teaching and research activity by avoiding overlapping and parallelism and by using efficiently all the facilities.

We agree and recommend the continuing education increase ( induced by the rapid changes in biological knowledge and technics ), as a determining component, required by long term decisions for sustainable development.

Acknowledging the internationalization of industrial, agricultural, political, environmental problems and also the information sources, we recognize the necessity to establish a new European dimension of Biology.

In order to accomplish the previous objective, related to the internationalization of the studies in Biology, we promote a less rigid system for students and teaching staff mobility, the computerized teaching and distance learning, the European Ph. D. and the generalization ECTS system, as a very important way to assure a high training standard of the biology graduates, across all the E.U. countries.

We recognize that the main tool to achieve this objective is the network, at the national scale as well as at the European level.

## References

Mihailescu, I. 1998. *The system of higher education in Romania*. Edit. Alternative, Bucharest, Romania.

Tesio, C., Manoleli, D., Ciolpan, O., Cogalniceanu D. 1997. *The student information package - Faculty of Biology, University of Bucharest*. Edit. Geomedia. Bucharest. Romania.

Vadineanu, A., Risnoveanu, G., Oprina-Pavelescu, M. 1997. *Ecotehnie. An European postgraduate curriculum* (the information package). Bucharest University Press. Bucharest.

CEPES, UNESCO, *Multilingual Lexicon of Higher Education*, Volume 2. Central and Eastern Europe also including Greece, Israel and Turkey. 1996. Ed.-in-chief Adrian Nicolescu, University of Bucharest, Romania. K. G. Saur, München; New Providence; London; Paris.

*European credit transfer system. User's guide*. 1995. SOCRATES national agency. Edit. Alternative. Bucharest. Romania.

*YEARBOOK 1998/1999 - University of Bucharest*. 1998. Bucharest University Press. Bucharest.