Report on the 12th International Biology Olympiad

Belgium

July 8 - 15, 2001

Under the Honorary Chairmanship
of His Royal Highness
Prince Laurent of Belgium

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Palais des Congrès - Bruxelles; Paleis voor Congressen - Brussel
PASS - Parc d'Aventures Scientifiques (Frameries)
PROBIO - association des professeurs de biologie
Royal Institute for Natural Technologies and Sustainable Development Technopolis, Mechelen, het Vlaamse doe-centrum voor wetenschap en technologie
Velewe - Vereniging Leraren Wetenschappen
VOB - Vereniging voor het Onderwijs in de Biologie, de Milieuleer en de Gezondheidseducatie

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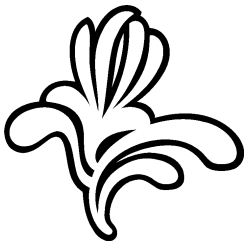

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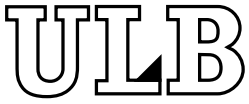

Université Libre de
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Vrije Universiteit Brussel

Royal Belgian Institute of
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Belgium, July 8 - 15, 2001

List of Belgian Universities acronyms

FUNDP	Facultés Universitaires Notre-Dame de la Paix Namur
FUSAGx	Faculté Universitaire des Sciences Agronomiques de Gembloux
K.U.Leuven	Katholieke Universiteit Leuven
LUC	Limburgs Universtair Centrum Diepenbeek
RUCA	Universitair Centrum Antwerpen
RUG	Universiteit Gent
UA	Universiteit Antwerpen
UCL	Université catholique de Louvain Louvain-la-Neuve
ULB	Université Libre de Bruxelles
ULg	Université de Liège
UMH	Université de Mons-Hainaut
VUB	Vrije Universiteit Brussel

The IBO trophy

Editors: Irène Popoff, Gérard Cobut, Hugo Vandendries
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Editorial

The International Biology Olympiad (IBO), which aims at increasing awareness of science among young people all over the world, has existed since 1990, when the initiative came from countries like Poland and Czechoslovakia which already had experience of national Olympiads. At a UNESCO meeting in 1989, Herman Snoeck was invited to send an observer to the biology Olympiad in Czechoslovakia. Michel Asperges and Patrick Reygel headed off to Brno, Mendel's town, where they were the only representatives from any western country. So it was that our little country became one of the six founders of the IBO, along with the German Democratic Republic and eastern European countries such as Poland, Bulgaria, Czechoslovakia, and the Soviet Union. The first IBO was held in 1990 in Oloumouc, Czechoslovakia.

One year later there was a full Belgian delegation, the different universities had offered their support, and Michel was accompanied by Gérard Cobut and Irène Popoff. A number of tall stories are still doing the rounds about Michel and Irène's experiences in Makhachkala in the republic of Dagestan. In 1992 the Olympiad returned to Czechoslovakia, this time to Poprad in the high Tatras. The Netherlands hosted the next edition, followed by Bulgaria, where Belgium's Laurent Minet, now one of the co-organisers, won the country's only silver medal in Varna. In 1995 the delegations were received by the princess of Thailand, who presented a new trophy.
In 1996 Gérard Cobut and Hugo Vandendries represented our country as members of the jury at the IBO in the Ukraine. They wer pressed by colleagues to say when Belgium would organise the Olympiad. The number of participating countries was growing constantly, so there was no point in waiting. In a moment of insanity, Gérard told a jury meeting that Belgium would organise the Olympiad in 2001.

Once the word had been given, the grass roots (the VOB and the PROBIO, Belgian associations of biology teachers) were mobilised and all the stops were pulled out. The first meetings were called, a core group was established, and made initial contacts with the Ministry for Scientific Policy and with the various governments agencies were promising. At the end of 1998 a non-profit-making body, IBO 2001, was set up with members from the VOB and the PROBIO.

We are proud of the scientific committee that we were able to bring together, representing all of the country's universities, and the honorary committee made up of prominent politicians, Belgian Nobel Prizewinners, and academics. HRH Prince Laurent of Belgium, chairman of the Royal Insti-

tute for Natural Technologies and Sustainable Development, accepted the post of honorary chairman of the committee.
One vacancy remained to be filled. Who would have the charisma required to chair the jury, lead the English-Russian jury meetings, and brave the barrage of questions from critical colleagues? When Gérard proposed Professor Dr. Louis De Vos, we knew immediately: Bingo! Louis was invited to the IBO in Turkey in 2000 as an observer. We were afraid at first that after the first night-time meetings he might have slipped quietly out of the country…

From 2000 on, the round of meetings became intense. Working groups met every month, regular as clockwork. The teachers found it difficult to come up with a practical test that would require no oral explanation, the search for accommodation was far from plain sailing, the cultural programme required constant modification, we failed to find any sponsors, and promises of government subsidies were not followed up by signatures. At times things were tense…

Yolande Cantraine, a secretary working with Professor De Vos, was allowed to work part-time with us. On occasions, part-time came close to full-time, and Yolande moved mountains of work and became our refuge and our strength for every conceivable problem. Hundreds of e-mails were expertly dealt with, in every possible language and with every possible question. Things began to look up, the first tranches of the subsidies came through, the exams took on their definitive shape and were translated, the programme firmed up: the great operation was under way.

The rest of the story forms the subject matter of this report.

Those who took part in the organisation will surely agree: it was a wonderful adventure. We hope that those who took part as participants or as members of the international jury returned to their own countries as good ambassadors of ours.

Gérard Cobut
Hugo Vandendries
Co-ordinators, IBO 2001

The IBO in a nutshell

The " International biology Olympiad " concept

The International Biology Olympiad (IBO) is an international yearly competition for final-year secondary school students. It aims to promote both science and friendship among youngsters from all over the world.
Each participating country organises the IBO in turn, since 1990. IBO 2000 was hosted in Turkey; Belgium hosted it in 2001.
Every participating country sends four students, winners of the respective national competitions. Two team leaders act as the representatives of each country.
The official languages of the IBO are English and Russian.

A Typical IBO Organization

An IBO includes 2 examinations: a practical test (laboratory) and a theoretical test.
During the remaining time,
- the students take part in socio-cultural activities and visits throughout the country (cities, institutions, sites...).
- the accompanying adults (who together make up the International Jury) fulfill their duties: checking questions, translating them into the competitors' native languages, discussing the competition and the future IBOs. Eventually, they too have some free time for visits.

Launching IBO 2001: the press conference

Tuesday 29 May 2001 – 10.30 am
Auditorium Royal Belgian Institute of Natural Sciences
Rue Vautier 29 Vautierstraat
B-1000 Brussels

Lack of interest in science? Biologists in the breach

It is well known: young people are not taking up scientific studies and careers. The Science faculties are lecturing to scattered small groups, and industry is short of young talent.
So the changing of the guard is not taking place as it should. Research is suffering as a consequence, and so is the training of young brains.
A number of initiatives have been launched, however, by people who refuse to accept this situation and who want to turn the tide. Among them, the Olympiads for biology, chemistry, mathematics, and physics, amicable competitions for pupils coming to the end of their secondary education.
Belgian biologists, in particular, are taking a bold step this summer: by organising in Belgium the International Biology Olympiad, with 40 delegations from the five continents.

Speakers:

- **Dr. Daniel Cahen**, Director, Royal Belgian Institute of Natural Sciences;
- **Prof. Arsène Burny**, Professor of Molecular Biology, Gembloux Agricultural University;
- **Prof. Jean-Jacques Cassiman**, Center for Human Genetics, Katholieke Universiteit Leuven;
- **Prof. Jean-Louis Van Herweghem**, pro-rector, Université Libre de Bruxelles , Chairman of the Scientific Policy Council of the Brussels-Capital Region;
- **Ms. Michèle Oleo**, advisor of Mr Dirk Van Mechelen, Minister of Science Innovation and Media, Flemish Community;
- **Mr. Etienne Reuter**, first-attaché – lawyer, government of the Walloon Region;
- **Mr. Philippe Busquin**, member of the European Commission;
- **Mr. Gérard Cobut**, **Dr. Hugo Vandendries**, co-ordinators, International Biology Olympiad 2001.

The press conference will be followed by an informal drink.

Olympiad at the Museum

Dr. Daniel Cahen, Director Royal Belgian Institute of Natural Sciences, Brussels

My first is a double: two professors of biology, who joined us fifteen years ago to contribute to the Museum's educational mission.

My second is a federal institution, more than 150 years old, which aims to achieve a harmonious combination between high-quality scientific research and a dynamic Museum. Research and the Museum cannot be separated. The quality of the research guarantees the importance of the heritage of collections that we are responsible for and the scientific rigour of the exhibitions, both permanent and temporary, that we offer our public, about 50% of which is made up of schoolchildren.

My whole is the International Biology Olympiad, Belgium 2001, which together we are launching today in the Institute, in our Museum. The connection between the Institute and the Olympiad is an obvious one. The two professors already mentioned are at one and the same time members of the Institute's staff and coordinators of this Olympiad. Biology is our principal scientific discipline here and is the subject of most of our exhibitions. Under the patronage of H.R.H. Prince Laurent, the authorities, both academic and political, of the north, south, and centre of the country have come together to support this ambitious project.

People complain in Belgium of a lack of interest on the part of young people in the study of science. Allow me to remind my listeners that our Museum, which addresses itself in the first place to a young public, sometimes a very young one, must have encouraged quite a few scientific vocations. The importance in this context of museums in awakening scientific curiosity has been noticed by a number of decision-makers. And so we have been delighted to see the recent creation by the Regions of two science and technology centres, Technopolis in Mechelen and the Parc d'Aventures Scientifiques in Frameries. Nonetheless, I must sound the alarm where we ourselves are concerned. Although (an achievement unique in Belgium) our Museum has succeeded over a period of fifteen years in renewing all of its permanent exhibitions, in organising major temporary exhibitions on various topical scientific subjects and in quintupling the number of visitors; and while our scientific activities are acknowledged within the framework of European and international research programmes, we fear that, due to lack of adequate resources and perhaps also to our federal status, we may face an increasing paralysis, which could be the prelude to our fossilisation

under the label of “ancient Belgians”. Let me assure you that, while we are indeed interested in their collection, we have no ambition to become fossils ourselves!

Biology in 2001: promises, hopes, and fears

Prof. Arsène Burny, Gembloux Agricultural University

The Biology Olympiad offers young people from many countries both a chance to meet for and an opportunity to reflect on the state of biology in 2001, what does it promise, what hopes does it offer, and why does it arouse fear?

Biology in 2001 is a gateway to in-depth knowledge of the organisation and workings of living matter. Those who went before us prepared the ground, raised questions, and developed techniques. We, the researchers and pupils of 2001, continue to research and to synthesise. The year 2001 will be a key date in the history of biology and of humanity: the human genome has been almost entirely sequenced.

Each chromosome is yielding up its secrets. A technological feat made possible by advances in molecular biology and in information technology, the completed sequence is a point of departure for the analysis of, among other things, the regulation of the expression of the many genes involved in embryonic development, in the regulation of the cell cycle and in its many possibilities for going off the rails.

The promise and the hopes of such a discipline at such a stage of technological advancement include everything one could think of in terms of understanding, loving, and – why not – using life, understanding embryonic development or malfunctions such as tumours, cancer, neurodegenerative diseases, etc. These are the tasks of today and of tomorrow. They involve setting in motion, and stopping at the right moment, an impressive array of wheels. The hopes are great, the tasks are complex.

Biology, in 2001, also raises fears. These fears must be exorcised one by one, and subjected to rational analysis. We must be rational, and not ideological. Our societies need to be democratic and objective. When the ideology of Lysenkoism invaded Soviet genetics, it meant the death of those genetics. This is a lesson to be borne in mind when faced with the fears, intertwined with ideology, of this start of a new century. Biology is, and must remain, an experimental science. There is no room for ideological dreams, even if the results are temporarily gratifying or offer an electoral platform. Biologists must guard against nourishing or encouraging anti-scientific currents.

In many countries, science’s appael is in decline. As if humanity is afraid of what it knows. Isn’t it better to know? A scientific culture needs to be developed for all of our youth, starting with the very young.

Correct teaching about scientific matters, taking advantage of museums and of everything that makes it possible to take part in the world's scientific adventure, these are the surest means of recalling to rationality a world that should be rational. In this respect, the success of the project inspired and led by Professor Charpak in France is particularly impressive.
May this Olympiad mark a turning point and a new beginning. Organisers and participants will reap their finest reward if it does.

The future of basic scientific research in doubt

Prof. Jean-Jacques Cassiman, K.U.Leuven

There is little doubt that biomedical and biotechnological research are experiencing an unprecedented boom. The unravelling of the human genome, and of a considerable number of animal, bacterial, and plant genomes, allow us to predict an unheard-of flowering of bio-industry. Despite an unfavourable financial climate for basic research – Belgium still invests only a tiny fraction of its GNP in research – a sizeable number of Belgian research teams have achieved outstanding results at an international level. This is borne out by the conspicious presence of Belgian groups in European and international projects.

The attempt to make up lost ground, stimulated *inter alia* by the universities and the EU's FP5 programme, by setting up more spin-off and start-up companies has led to a growth in the number of spin-offs to equal that in the US. Most of these companies, however, do not yet have the experience of their US counterparts, and most are not yet stock exchange-quoted like those in the US.
This unprecedented private sector growth has led to a situation where young people from certain disciplines regularly receive offers from industry during their university studies or before completing their doctorates. Even younger members of university staff regularly disappear from academia. This is certainly not unrelated to the fact that career opportunities in the universities are limited.
In itself this increased mobility of people from the universities is no bad thing, provided that movement is in both directions and that there is an adequate supply of top-quality young researchers in order to offset ageing and to maintain continuity. At the same time there must be real and attractive career opportunities in the universities, and young researchers must be able to develop their own ideas with the basic necessary resources and space, which are not for the most part available currently.
So a brain drain develops, in the past towards the US, now increasingly to industry, which in the long run will have very negative consequences for

the universities and for society, as the universities will gradually come to lack the expertise needed for training new researchers. There is, moreover, because of a lack of experience and tradition, little or no scope for absorbing researchers from those biotechnological companies that will inevitably fail or that will have to let many researchers go as a result of restructuring.
It is, then, in the interests of both parties to develop more collaborative programmes, each with its own specific goals and expertise. Doing so will not only improve the exchange of technology and ideas, but will also create adequate recruitment opportunities for both, without threatening the universities and without prejudicing the future of industry.
Belgium has a long tradition of failing to appreciate the value of scientific research. The Flemish government, it appears, has continued in this tradition. This is combined with a complete lack of information among the public, and young people in particular, about the possibilities and the limitations of research. In a society that increasingly (and fortunately) is concerned about the fate of humanity and the environment, there is a danger that basic science will become less and less attractive, and will even be seen as something dangerous, polluting, and inhuman. And yet it is the sciences that must help to find solutions for AIDS, mad cow disease, Alzheimer's, and other pestilences. There are few branches of industry that will be able to survive this century without being able to draw on the results of basic research. So it is high time that young people were correctly informed about the importance and the necessity of scientific research, and that the government provided the necessary funding for this. We may even hope that a real scientific policy will emerge. We may then avoid further waste of our most important natural resource, our brains.

Biology Olympiad 2001

Prof. Jean-Louis Vanherweghem, President of the Scientific Policy Advisory Council of the Brussels-Capital Region, Pro-Rector of the Université Libre de Bruxelles

In its first recommendation, submitted to the government on 20 March 2001, the Scientific Policy Advisory Council of the Brussels-Capital Region recommended "promoting training and activities designed to make scientific careers more attractive, particularly to young people."

It was the Council's opinion that this was above all a matter of "supporting continuing education, in particular in the area of new technology, and in-

creasingly encouraging activities aimed at making young people, at all levels of the education system, more aware of scientific careers and of research in particular."

In the Brussels-Capital Region, the "youth" campaign is aimed at familiarising young people with the world of science and research by arranging direct contacts between young people and the world of science in businesses, in universities, and in schools.

Specific projects supported by the Region have included:
-The International Biology Olympiad organised by the non-profit-making association IBO 2001, which has brought us together here today;
-The "Expo Sciences " organised by the non-profit-making organisation "Jeunesses scientifiques de Belgique" (Belgian Scientific Youth);
-"Tracer et Image", a series of lectures aimed at introducing young people to research, given by future Belgian astronaut Vladimir Pletzer.

In 2001, in the context of Belgium's upcoming presidency of the European Union, the regional government of the Brussels-Capital Region has launched a series of new initiatives. The first of these, the Ishango Prize, invites young researchers in the region to submit projects.

I wish the Biology Olympiad 2001 every success.

Action plan for scientific information and innovation 2001

Mrs. Michèle Oleo, Advisor to Mr. Dirk Van Mechelen, Minister of Flemish Community

Scientific and technological developments are changing society rapidly and tcomprehensively. For this reason, the Flemish government attaches considerable importance to a dynamic scientific policy, involving a modern approach to popularising science, technology, and technological innovation, aimed particularly at young people at school.

The strategic aim underlying this is to strengthen public support for science, technology, and technological innovation in a society that is increasingly evolving as a knowledge-based society.

The strategic goal is further underpinned by eight operational goals, some

of which are quite general and should be seen more as long-term aims, while others are highly specific goals that need to be realised in the (relatively) short term, but also need to be maintained in the longer run.

The most important are the provision of objective information on developments in science, technology, and technological innovation, making young people aware of their importance for our well-being and prosperity, increasing the numbers coming into, out of, and through the pure and applied sciences, and encouraging entrepreneurs to engage in technological innovation.

These latter goals apply particularly to clearly-defined target groups and have to do with clearly-defined social needs that are present now and that are predicted to become more pressing in the future. Since 1997 alarm bells have been ringing in the industrialised world because of a shortage of people trained in science and technology, which is increasingly recognised and for which there is no instant solution in terms of available potential.
If we want to reverse this tendency, then a balanced action plan must be drawn up that sets particular objectives both for the medium and long term, aimed at improving the current situation.
The Flemish government, and more particularly the Flemish ministers for Education and Training and for the Economy, Town and Country Planning, and Media, are trying, in line with their particular responsibilities, to remedy this situation. One of the tools used to this end is the annual action plan for Scientific Information and Innovation, which forms part of an overall policy for science and technological innovation. The business world is also making considerable efforts in this area.
The intention is to hold consultations on these particular problems and to arrive at a coordinated approach, by establishing a consultative forum where government, employers' organisations, and educationalists can meet each other.

The Scientific Information and Innovation 2001 action plan is the first action plan in which policy options for scientific information, technological innovation, and education are clearly presented and translated into concrete activities. The most important aspects, undoubtedly, are the considerable attention paid to the scientific underpinning of the action plan, the targeted approach to teachers, and gender issues.
The Scientific Information and Innovation 2001 action plan is also the first action plan in which scientific information and the stimulation of innovation are brought together (also in budget terms). The interfaces between scientific information activities on the one hand and the stimulation of innovation on the other are extensive. The aim is that the two types of activities should strengthen and complement each other. The approach from both perspec-

tives will then be maximised in order to achieve synergies.
Within the action plan 2001 still more attention will be paid to the media and the aim will be to achieve maximum interaction with gender issues. These will be constantly borne in mind in setting up activities so that, as far as possible, sectoral policy in this area will be consistent.
As already mentioned, the action plan will also, for the first time, involve activities on a large scale for teachers, so as to encourage their full participation, given their key role in relation to young people at school, in achieving the goals of Scientific Information and Innovation.

The Scientific Information and Innovation action plan is divided into five sections:
- Establishment of a consultative forum dealing with scientific in formation and technological innovation
- Research as the foundation stone
- General awareness activities (including media activities)
- Targeted activities (aimed at specific target groups and/or goals)
- The international dimension of scientific information and the stimulation of innovation

Each of these sections is explained below and a number of the activities within each section are described. This mainly concerns activities that are new, compared to earlier action plans, and which are being launched in the course of 2001.

1. Setting up a consultative forum

In response to the shortage of scientifically and technically trained people in the labour force, a consultation forum is being initiated that will bring together government, employers' organisations, and educationalists. The aims of the consultation forum can be summed up as follows:
- Improving the image of the pure and applied sciences and increasing the attractiveness of scientific and technical careers
- Increasing the numbers coming into, out of, and through the pure and applied sciences
- Encouraging girls so as to create a further potential reserve for the workforce
- Creating a positive attitude to technological innovation.

2. Research as the foundation stone

The initial research for Scientific Information and Innovation (action plan 2001) will make it possible by June 2001 to clarify which are the priority target groups and to decide on how the operational goals in relation to

these target groups can be put into practice in ways that are appropriate, concrete, and evolving. On the basis of this research, the objectives and guidelines for future action plans will be decided, both for the short and for the long term. As a further policy back-up, a research team will be set up to monitor the situation from day to day and to advise on possible modifications to the activities. This research group will also oversee a number of measures of the effectiveness of the activities set out in the action plan, and will also carry out research into public attitudes to science, technology, and technological innovation.

3. General awareness activities

This involves activities based on the strategic goal itself and that do not have any specific relationship to the operational goals. In other words, the whole range of sciences that are affected by the activities, without specifically targeting the pure and applied sciences or the world of business.

The aim is to take on the issue of the third society. Science (including biotechnology, telecommunications, etc) is developing so fast that every citizen has the right to correct information about it.

Although (general) awareness still remains an important aspect of the action plan, the role played by the targeted activities will continue to grow in importance (see below).

Within this section of the action plan, the importance of the media remains considerable, and will receive more attention than in 2000. Attention will continue to be paid to increasing scientific coverage on TV. The *overLeven* and *Curieuzeneuze* programmes, produced in cooperation with the VRT, are a first step in this direction. Four new productions are also planned, two in the area of scientific information and two dealing with technological innovation.
In order to make technological innovation accessible to as broad a public as possible, information on technological developments and innovation will be provided in a series of short, snappy, dynamic programmes, closely related to people's daily lives. For these short reports, about 7 minutes long, which will be broadcast every two weeks, the regional Flemish stations are a particularly suitable medium.

In addition, a soap, in the style of *Windkracht 10*, will be produced, dealing with technological innovation. The scenario for this series is already available, and is an initiative from the world of business. How this production can be financed is currently under examination.

Other new activities include:
"Hoe zit dat?", a TV quiz in which two or more groups of 4 people take each other on in a number of tests, questions, and puzzles concerning science and technology.
"Wordt vervolgd" is a combination of an exciting competition for schools and a TV programme for the general public.
Extra pages in "Klasse" and "Maks": pull-out sections with things to do related to scientific or technical subjects, aimed at young people, parents, and teachers.

4. Targeted activities

Targeted activities involve activities aimed at crucial target groups, i.e. target groups that are at a crucial phase of their education (course options) or that belong to a target group that is not normally reached or addressed so much (for example, girls).

As already indicated above, the targeted activities will involve a greater share of the Scientific Information activities. In 2001 attention will be increasingly concentrated on the pure and applied sciences (and their attractiveness for young people) and on girls.

In order to reverse the negative spiral in relation to positive and applied sciences, young people have to be reached by two methods, both by the direct approach and by the indirect approach, that is, via intermediaries (including teachers, parents, youth and other organisations, etc.)

In 2001 the targeted activities will also, to a considerable extent, concentrate on increasing cooperation with teachers, and will do so on a structural basis. Teachers' organisations could play an important role here. It is also essential to make teachers aware of the issues concerning pure and applied sciences (they do, after all, find themselves in a key position in relation to young people at school), and should be offered adequate facilities if their cooperation is being sought in getting the message across. The aim is to build on the expertise of the TOBO network and provide special training for teachers in relation to world studies. This training will be complemented with activities for pupils provided by students training to be teachers.
In addition, a large number of targeted activities will be aimed at young people still at school, and in terms of gender issues a start will be made in the development of an exhibition that will indirectly highlight these issues.
It is also important to pay attention to connecting all these activities aimed at both teachers and pupils with the action plans for technical and vocational education that are being developed by the Education minister.

Further, a media publicity campaign will be carried out in relation to the pure and applied sciences, in order to win over doubters. It will be important here also to pay attention to the non-commercial sector. This can be done by choosing appropriate examples when drawing up the campaign plans.

The Scientific Information activities will also be complemented by a number of targeted activities aimed at stimulating innovation. These will include bringing out a new updated version of the innovation booklet and a targeted information campaign to make known the innovation support measures being developed by the IWT (Institute for the Promotion of Innovation by Science and Technology in Flanders).

5. The international dimension of Scientific Information

The fifth section of the action plan concerns the international dimension. Just as scientific research does not take place in isolation, cross-fertilisation being made possible through international contacts and cooperation, so too in the areas of scientific information and innovation, a great deal of know-how can be acquired by studying best practice, establishing networks, and setting up international activities and collaborative ventures.
In addition, international activities are being developed from which Flanders cannot afford to be absent, in view of the expertise and the opportunities available in terms of scientific information and innovation.

Within the framework of the Belgian presidency of the EU, an international congress is planned for 2001 in the area of scientific information.

The implementation of the Scientific Information and Innovation action plan will not be carried out by the Flemish government alone. For many of the activities, the expertise and experience of other players in this area will be called upon. One important partner in this context is the F.T.I. Technopolis Foundation, which is taking on the implementation of a great part of the action plan. Activities that are being carried out by Technopolis include: Wetenschapstruck Experion®, the “do-packages”, the Science Festival, and many others.
Other partners include: the universities, the polytechnic colleges, the scientific institutes, the TOBO network, the Flemish Olympiads, the Flemish popular observatories, the VRT, the RVO Foundation, etc. In addition, the broadening of the action plan to include an Innovation element means that the world of business can also play a role in supporting the action plan.

Ways to promote and disseminate science and technology

Mr. Etienne REUTER, First-attaché – lawyer,
Government of the Walloon Region

The exposé deals with two main points:

1. The need to support the dissemination of scientific and technological culture. We must bear in mind the fact that young people are not taking up scientific and technical studies and careers in sufficient numbers. A summary will be given of the initiatives taken by the Walloon Region in this respect.

2. The importance of the biotechnology sector in terms of technological innovation and of the economy.
It will be pointed out that, of the technologies identified as being crucial to the future of the Region, many are in the area of biotechnology. The initiatives taken in support of biotechnology will be summarised.

Reawakening young people's interest in science

Mr. Philippe Busquin, Member of the European Commission

Ladies and Gentlemen,

It is with great pleasure that I take part in launching the 12th edition of the International Biology Olympiad, all the more so as this year it is taking place in Brussels.
The International Biology Olympiad offers a splendid opportunity to bring secondary students from all over the world (but in particular from many European countries) face to face with one of mankind's most noble intellectual pursuits: science.
Science makes possible the conquest of knowledge, it represents a crucible of creativity, and fosters wonder and a thirst for knowledge of the world around us.
But quite apart from their purely intellectual aspect and the way that they bring people together, this International Biology Olympiad is an excellent example of an event that brings science closer to society, and in particular to young people.
For years now Europe has been suffering from alienation, and from a growing lack of interest in studying scientific subjects.

This alienation affects all branches of science, with physics being one of those hardest hit. But very promising fields such as information technology and the life sciences are also affected.
As a result, Europe is suffering from a lack of science students, of teachers, and of highly qualified personnel (especially researchers), which goes far beyond the usual cyclical variations in enrolments in science faculties. In France, for example, figures show that this year there are 12% fewer students in scientific disciplines than in 1996.
This shortage will hit particularly hard around the years 2007-2010, when many of our present researchers are due to retire.
This tendency is worrying political decision-makers at all levels.
Firstly, because scientific research has a noble goal and makes a decisive contribution to improvements in living conditions and comfort, in health, and in technological and social progress. **A society that does not encourage scientific research is a poor society.**
Secondly, science makes it possible to understand and to resolve major socio-economic issues. Take, for example, the environment or future medical technology.
Thirdly, and this is the great paradox of the current alienation from scientific studies, science is currently going through a particularly fruitful period at the industrial level, and is creating jobs.

We are now very much moving into the information society, where 25 to 50% of economic growth depends on investment in research and technology.
The aim set out by the heads of state at the Lisbon summit in March 2000, of becoming the world's most dynamic knowledge-based economy, requires major investment in research and development, particularly by private companies. More and more companies specialising in scientific research are emerging and are contributing to substantial job creation.
Scientific research, these days, is not just a matter for many brilliant university laboratories, but also constitutes a major sector of the European economy, now and for the future.
And yet, in this field, our principal trading partners, the United States, and also Japan, are well ahead of Europe and are, moreover, increasing their lead in certain areas.
Some figures. Japanese and American companies employ proportionally twice as many researchers as do their European equivalents. In absolute terms, the number of researchers per 1,000 inhabitants is higher in Japan and in the United States. The number of patents taken out by American companies is far greater than that for European companies.
So it is urgent to react. We must make science more popular and more attractive to young people, and reinforce its positive image. The public in general, and young people in particular, must become more familiar with science and its methods.

The European Commission is fully aware of this need and it is a vital element in my objective of achieving a European Research Area.
Improved organisation of this European area and the highlighting of the scientific excellence that exists in Europe will assist in promoting science in society.
We must reconcile science and society. The Commission published a document in November 2000 on this subject, which was discussed by the 15 Ministers of Research and Education at their meeting in Uppsala last March. This document proposes certain lines of action on the major questions that are currently facing us.
How do we establish research policies addressing society's true goals and fully involving society in the carrying out of research programmes?
How do we cope with risk? What are the implications of the precautionary principle? How should we take into account both the ethical aspects and consequences of technological progress and the imperatives of freedom of research and of access to knowledge?
What should we do to strengthen the dialogue between science and society, enhance citizens' knowledge of science and young people's interest in scientific careers, as well as increasing the participation and the role of women in science and research?
It seems to me, in any case, that it is essential to reinforce the teaching of science, both at primary and secondary school level. The Ministers of Research and Education want to carry out a thorough analysis of existing programmes and of the place that science teaching should occupy at each level. They will also ensure better coordination of teaching between countries.

In addition, a series of initiatives have emerged within different countries with the aim of establishing "Science Weeks". The European Union is trying to encourage and to coordinate these different events, for example, through the "European Science and Technology Week". This European week, which aims to increase public awareness of science, takes place each year around November.

Competitions are another means of promoting science in Europe.
The European Union has established the Archimedes Prize for university students, which is awarded each year in recognition of a creative project.
The Commission also sponsors each year a "Contest for Young Scientists" at secondary school level. This competition brings together prizewinners from different countries and the 13th edition is being held this year in Bergen in Norway, from 15 to 22 September.
The "International Science Olympiads" in various fields of science are another type of competition for young scientists, on a more global, rather than purely European, scale.
I heartily applaud initiatives of this kind and I would like to encourage all of

our secondary school pupils to take part in ever-greater numbers in such events.
These various scientific events make it possible:
to promote young scientific talent;
for students to be faced with both the theoretical and practical aspects of their discipline, as well as with key socio-economic issues, such as, for example, the environment, Genetically Modified Organisms, or stem cells;
to compare educational policies in the different countries, which could be directly useful for improving teaching programmes.

I hope that those taking part in these events will benefit particularly from them and will be encouraged to persevere in their scientific studies; and that in the near future, they will contribute to strengthening the European "Networks of Excellence".
I would hope too that this opportunity for friendly confrontation with a large number of colleagues from other countries will encourage them to establish contacts with each other, to increase their mobility, and thus to realise in practice the ambition of a **European Research Area**.
The fact that these Olympiads came about on the initiative of countries in Central and Eastern Europe (Poland and the former Czechoslovakia) is, in this respect, a promising sign of the will to organise exchanges among young scientists on a Europe-wide, even global, scale.
Of course, these initiatives must not remain isolated ones, and other projects will have to emerge to awaken the interest of the greatest possible number of young people in science.
I am thinking here particularly of the place of science in television programming, on the Internet, and in the education departments of Europe's various scientific research institutes and museums.
In this connection, the European Commission is, for example, participating in the "European Initiative for Biotechnology Education" (EIBE) and is developing a network of scientific museums capable of pooling their experience in life sciences communication, in cooperation with the European science museums' association ECSITE.

So this international biology Olympiad is in line with a European desire to bring science and society closer together, and I must congratulate the organisers of this Olympiad for the remarkable work they have done.
I would also like to offer my heartfelt encouragement to all those who will take part in this competition.
But in particular, I hope that they enjoy themselves. "**Science is fun!**" By making science your career, you will face challenges that are particularly stimulating, both from a human and from an intellectual point of view.

I thank you.

Patronage Committee

Under the Honorary Chairmanship of His Royal Highness
Prince LAURENT of Belgium

Academics

Prof. Dr. Christian de DUVE (Nobel Prize Laureate, UCL)
Prof. Dr. Ilya PRIGOGINE (Nobel Prize Laureate, ULB)

Dr. Daniel CAHEN (Director, Royal Belgian Institute of Natural Sciences)

Prof. Dr. André THEWIS (Rector, FUSAGx)
Prof. Dr. A. OOSTERLINCK (Rector, K.U.Leuven)
Prof. Dr. Harry MARTENS (Rector, LUC)
Prof. Dr. W. DECLEIR (Rector, RUCA)
Prof. Dr. J. WILLEMS (Rector, UG)
Prof. Dr. R. VERHEYEN (Rector, UA)
Prof. Dr. Marcel CROCHET (Rector, UCL)
Prof. Dr. Pierre de MARET (Rector, ULB)

Prof. Dr. Jean-Louis VANHERWEGHEM (Pro-Rector, ULB)
Prof. Dr. Claude DEROANNE (Pro-Rector, FUSAGx)

Prof. Dr. R. PAQUAY (Dean Science Faculty, FUNDP)
Prof. Dr. Luc VANQUICKENBORNE (Dean Science Faculty, K.U.Leuven)
Prof. Dr. Herman CALLAERT (Dean Science Faculty, LUC)
Prof. Dr. A. VERSCHOREN (Dean Science Faculty, RUCA)
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Prof. Dr. Francis BORCEUX (Dean Science Faculty, UCL)
Prof. Dr. Pierre MARAGE (Dean Science Faculty, ULB)
Prof. Dr. C. HOUSSIER (Dean Science Faculty, ULg)
Prof. Dr. Philippe HERQUET (Dean Science Faculty, UMH)
Prof. Dr. J. LEMONNE (Dean Science Faculty, VUB)

Political authorities

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(Member of the European Commission)

Mr. Guy VERHOFSTADT
(Prime Minister)

Mr. François-Xavier de DONNEA
(Minister-President, Brussels-Capital Region)

Mr. Karl-Heinz LAMBERTZ
(Minister-President, German-speaking Community)

Mr. Pierre HAZETTE
(Minister of Secondary Education, French Community)

Mrs. Françoise DUPUIS
(Minister of Higher Education, French Community)

Mrs. Marleen VANDERPOORTEN
(Minister of Education, Flemish Community)

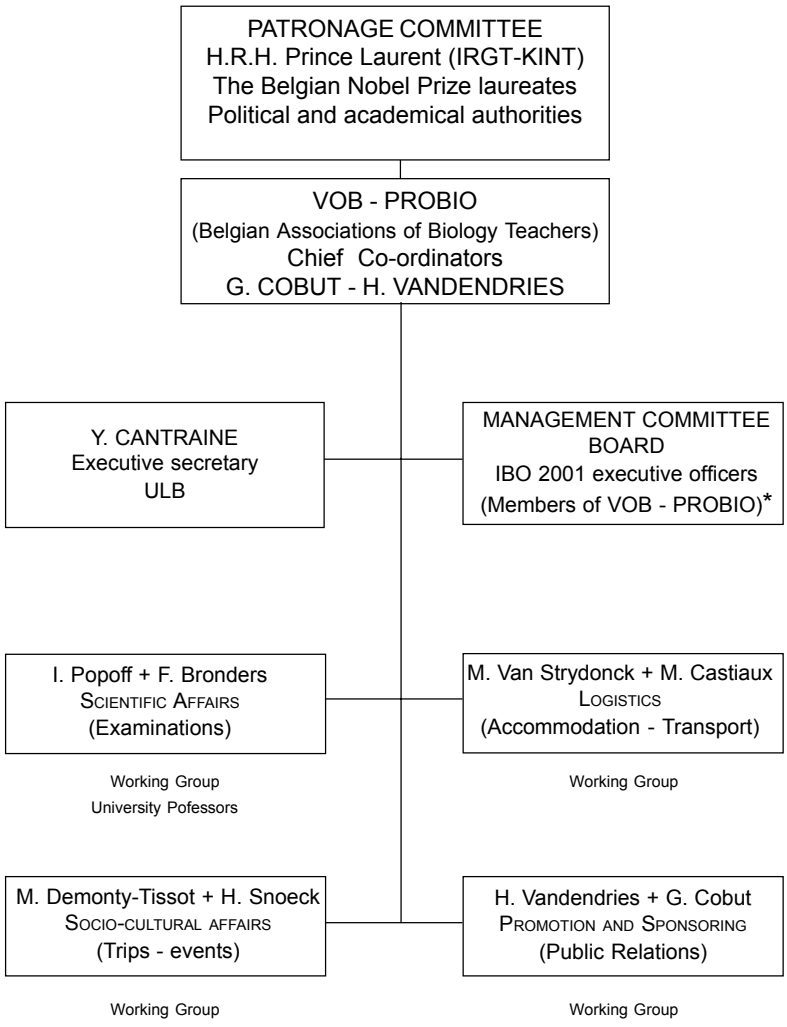
Mr. Bernd GENTGES
(Minister of Education, German-speaking Community)

Mr. Yvan YLIEFF
(Federal Commissioner for Science Policy)

Mr. Freddy THIELEMANS
(Mayor of Brussels)

Mr. Jacques SIMONET
(Deputy)

Organising Committee



* MANAGEMENT COMMITTEE BOARD: F. Bronders - M. Castiaux - G. Cobut - M. Demonty-Tissot - S. Descamps - J. Fraipont - J. Mignolet - L. Minet - I. Popoff - V. Rasquin - H. Snoeck - E. Van Damme - H. Vandendries - M. Van Strydonck

Management Committee Tasks

Task force "science"

Irène Popoff; Fernand Bronders
- choosing scientific committee
- briefing scientific committee
- preparing practical and theoretical tests
- managing practical and theoretical tests
- marking practical and theoretical tests (with help from volunteers)
- managing statistical processing

Task force "sponsoring and promotion"

Gérard Cobut; Hugo Vandendries
- estimating budget
- writing the sponsor and subsidy file
- contacting authorities and prospective sponsors
- managing press contacts and press conference (in collaboration with press officers RBINS)
- choosing promotional items
- managing opening and closing ceremonies (with help from Jean Fraipont)
- managing video report and photo CD-ROM

Task force "logistics"

Martine Castiaux; Marleen Van Strydonck
- managing facilities for delegations and guides (boarding, food, etc.)
- managing transport
- selecting and co-ordinating student guides team (40 persons)
- managing arrivals and departures of delegations

Task force "socio-cultural programme"

Madeleine Demonty, Herman Snoeck
- preparing, managing, co-ordinating and supervising excursions
- city trip and rally in Brussels
- excursion to Antwerp
- excursions in Flanders: Bruges, nature reserve 'Het Zwin'
- scientific excursions: Technopolis, National Botanical Garden, PASS, IBMM
- excursions in Wallonia: aquarium and greenhouses Liège, Hautes Fagnes, Spa
- guidance of students and supervision boarding school

Administration

- insurance: Jeannine Mignolet
- treasurer: Miel Van Damme
- management committee meetings reports: Vic Rasquin, Sylvette Descamps
- executive secretary management committee: Yolande Cantraine
- lay-out examinations & promotion banners: Eddy Terwinghe
- IBO-Flash: Vic Rasquin; Louise Cunningham; Sophie Van Rompuy

Jury meetings

- chairman: Prof. Dr. Louis De Vos
- computer support and presentations: Benoit Lété; Jean-Etienne Poirrier
- trouble-shooting and supervision: Laurent Minet

General co-ordination

Gérard Cobut; Hugo Vandendries
- managing meetings
- supervising task forces
- coping with any unexpected event
- writing report IBO 2001 (with help from Irène Popoff and Eddy Terwinghe)

Last problems to solve for the co-ordinators

The editors of the IBO-Flash debating with the co-ordinators

Composition of the Scientific Task Committee

Ethology
Prof. J. Pasteels ULB
Prof. S. Aron ULB

Ecology
Prof. T. Hance UCL
Prof. P. Rasmont UMH

Cell biology - General Biology
Prof. C. Balthazart Ulg
Drs. L. Minet Ulg
Prof. P. Reygel LUC

Zoologogy, Morphology, Anatomy, Systematics
Prof. M. Chardon Ulg

Molecular Biology
Prof. A. Burny FUSAGx
Prof. N. Bieliavsky ULB

Molecular Genetics
Prof. J. Vandenhaute FUNDP

Entomology - General Biology
Prof. J. Moens LUC

Plant physiology
Prof. R. Valcke LUC
Prof. R. Caubergs RUCA

General Plant Biology and Nature Preservation
Prof. L. Triest VUB

General Plant Biology
Prof. E. Smets KUL

National Scientific Experts Group

Chairman: Prof. L. De Vos

Prof. S. Aron

Prof. T. Hance

Drs. L. Minet

Dr. P. Reygel

Prof. M. Bieliavsky

Prof. J. Vandenhaute

Prof. L. Triest

Prof. R. Caubergs

Prof. R. Valcke

Prof. E. Smets

Participating Countries

Argentina
Australia
Azerbaijan
Belarus
Belgium
Bulgaria
China
Czech Republic
Estonia
Finland
Germany
Latvia
India
Indonesia
Ireland
Islamic Republic of Iran
Kazakhstan
Kyrgystan
Korea
Kuwait
Mexico
Mongolia
Netherlands
Poland
Romania
Russian Federation
Singapore
Slovakia
Slovenia
Sweden
Switzerland
Taiwan
Thailand
Turkey
Turkmenistan
Ukraine
United Kingdom
Vietnam

OBSERVERS

Cyprus
Mozambique
USA

International Jury

Argentina	Dr. Gladys Mori de Moro
Argentina	Mr. Edgardo Jofre
Argentina	Mrs. Maria Ortiz de Degioanni
Argentina	Mrs. Stella Maris Castro de Cantarini
Australia	Mr. Andrew Walter
Australia	Mr. Edward d'Auvergne
Australia	Mr. Nick Hagan
Azerbaijan	Mr. Bülent Ozen
Azerbaijan	Prof. Adalet Faracov
Belarus	Dr. Natalia Maximova
Belarus	Mr. Ivan Harnastai
Belarus	Mr. Vladzimir Lysak
Bulgaria	Dr. Iliyan Iliev
Bulgaria	Prof. Raycho Dimkov
China	Mr. Enshan Liu
China	Mr. Guangyao Wu
China	Mrs. Hong Cheng
Cyprus (observer)	Mr. Melis Nicokaides
Czech Republic	Dr. Jan Stoklasa
Czech Republic	Dr. Tomas Soukup
Czech Republic	Prof. Vitezslav Bicik
Estonia	Mr. Dimitri Teperik
Estonia	Mr. Illar Leuhin
Estonia	Mr. Radko Avi
Finland	Mrs. Annika Salama
Finland	Mrs. Eira Poranen
Germany	Dr. Eckhard R. Lucius
Germany	Mrs Christiane Mühle
Germany	Mr. Ralf Kittler
India	Mrs. Bakhtaver Mahajan
India	Mrs. Medha Rajadhyaksha
Indonesia	Dr. Agus Permana
Indonesia	Mr. Sucipto Hariyanto
Indonesia	Mrs. Maelita Moeis
Indonesia	Mrs. Tati Subahar
Iran	Mr. Ahmad Majd
Iran	Mr. Hossein-Ali Asgarian
Iran	Mr. Mohammad Karamudini
Iran	Mrs. Mahnaz Azar-Nia
Ireland	Mr. Richard O'Kennedy
Kazakhstan	Mr. Amangeldy Bissenbayev

Kazakhstan	Mrs. Sara Kudabayeva
Korea	Mr. Hee Hyung Cho
Korea	Mr. In Seob Han
Korea	Mr. Myung Hur
Korea	Mr. Nam Il Kim
Korea	Mr. Sung Ha Kim
Kuwait	Mr. Abdulhadi Alhussaini
Kuwait	Mr. Mustafa Boland
Kuwait	Mr. Rashid Alshimali
Kuwait	Mrs Ansam AlShumais
Kyrgystan	Mr. Emrullah Durmaz
Kyrgystan	Mrs. Aygul Akmatova
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Latvia	Mr. Indrikis Muiznieks
Latvia	Mrs. Maruta Kusina
Mexico	Dra. Cristina Revilla
Mexico	Mr. Adolfo Obaya
Mexico	Mrs. Maria de Lourdes Rosas
Mongolia	Mrs. Altantsetseg Magsarjav
Mongolia	Mrs. Ognoon Mungunsukh
Mozambique (observer)	Mr. Antonino Grachane
Mozambique (observer)	Prof. Bui quang Binh
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Poland	Mr. Piotr Bebas
Romania	Prof. Dr. Veronica Stoian
Romania	Prof. Mariana Ciobanu
Russia	Mrs. Valerya Kuchmenko
Russia	Prof. V.V. Pasechnik
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Singapore	Mrs. Shirley Lim
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Slovak Republic	Mr. Ivan Bartik
Slovak Republic	Prof. Dr. Pavol Elias
Slovenia	Mr Urban Cervek
Slovenia	Mrs. Andreja Skvarc
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Sweden	Mr. Andreas Ehn
Sweden	Mrs. Britt-Marie Lidesten
Sweden	Mrs. Christina Broman
Switzerland	Mr. Gilles Allenbach
Switzerland	Mr. Thomas Braschler
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Taiwan	Mrs. Jih-Suei Han
Taiwan	Mrs. Lin-Chih Hu
Taiwan	Mrs. Ling-Ling Lee

Taiwan	Mrs. Shu-Chuan Hsiao
Taiwan	Prof. Jer-Ming Tseng
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Thailand	Mr. Pitiwong Tantichodok
Thailand	Mr. Poonpipope Kasemsap
Thailand	Mr. Siriwat Wongsiri
Thailand	Mrs. Chanpen Chanchao
The Netherlands	Mr. Hans Morelis
The Netherlands	Mr. Henri Groeneveld
The Netherlands	Mrs. Agnes Legierse
The Netherlands	Mrs. Paula van Kranenburg
Turkey	Mr. Ali Demirsoy
Turkey	Mr. Ismail Turkhan
Turkmenistan	Mr. Ismail Arduch
Turkmenistan	Mr. Salih Demirbas
Ukraine	Mrs. Lidia Vaschenko
Ukraine	Prof. Mykola Makarchuk
United Kingdom	Mr. Christopher Glanville
United Kingdom	Mr. Stephen Winrow-Campbell
United Kingdom	Mrs. Norma Broadbridge
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USA (observer)	Mr. Vikram Shah
Uzbekistan	Mr. Talib Muminov
Vietnam	Dr. Pham Van Lap
Vietnam	Dr. Tran Linh Thuoc
Vietnam	Mr Le Dinh Tuan
Vietnam	Mr Le Ngoc Lap
Vietnam	Mrs. Nguyen Thi Mai
Belgium	Mrs. Bernadette Darville
Belgium	Mr. Thierry Leclipteux
Belgium	Mr. Laurent Inghelbrecht
Belgium	Mr. Pieter Leyssen
Belgium	Mr. Jean Bossiroy

Irène: welcome!

Henri Groeneveld, a jury member from the Netherlands, came by bicycle. He covered 200 km to reach Brussels at an average speed of 19 km/h.

General Schedule

Sunday, 8th July 2001		12th International Biology Olympiad Brussels • Belgium	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
	Arrival of participants		Arrival of participants
20.00	Welcome Dinner (Boarding school)	20.00	Welcome Dinner (Hotel)

The Atomium...this must be Brussels.

Members of the staff, beaming with enthusiasm at the opening lunch at the Congress Palace

Monday, 9th July 2001		**12th International Biology Olympiad Brussels • Belgium**	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
7:30	Breakfast (boarding school)	8.00	Breakfast (hotel)
8:30	Bus departure	9.30	Walk to meeting rooms
9.00	Visiting Brussels I	10.00	**Jury meeting** (1) Introducing IBO 2001, local experts, marking procedure…
11.00	Boarding school (Dressing up)		(administrative centre)
11.30	Bus departure	12.00	Walk to Congress Palace
12.15	Apéritif (Congress Palace)	12.15	Apéritif (Congress Palace)
12.45	Lunch (Congress Palace)	12.45	Lunch (Congress Palace)
14.15	**Opening ceremony** (Congress Palace)	14.15	**Opening ceremony** (Congress Palace)
16.15	Bus departure	16.15	Walk to meeting rooms
16.45	Changing clothes (boarding school)	16.30	**Jury meeting** (2) Approval – translation practical test
17.15	Bus departure Visiting Brussels II		(administrative centre)
19.00	Dinner (boarding school)	19.00	Dinner (hotel)
20.30	Free evening (boarding school)	20.30	**Jury meeting** (2 continued) Approval – translation Practical test (administrative centre)

Words of welcome at the Brussels City Hall by Mr. F. Thielemans, mayor of Brussels, introduced by Prof. L. De Vos, chairman of the IBO 2001 Jury

Tuesday, 10th July 2001		**12th International Biology Olympiad Brussels • Belgium**	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
6.45	Breakfast (boarding school)	7.30	Breakfast (hotel)
7.15	Bus departure		
7.45	Arrival on Campus		
8.00	**Practical Test** VUB/ULB (Campus Plaine)	8.30	Visiting Brussels
		11.30	Reception (City Hall)
		12.15	Bus departure to ULB
13.15	Lunch (Barbecue in ULB, Campus Plaine)	12.45	Lunch (Barbecue in ULB, Campus Plaine)
14.30	Visiting Antwerp (Zoo)	14.30	Visiting Antwerp (Zoo)
19.00	Dinner (In Antwerp)	19.00	Dinner (In Antwerp)
20.30	Social event	20.30	Social event
22.45	Departure to Brussels (boarding school)	22.45	Departure to Brussels (hotel)

A visit to a highlight such as Bruges is a must.

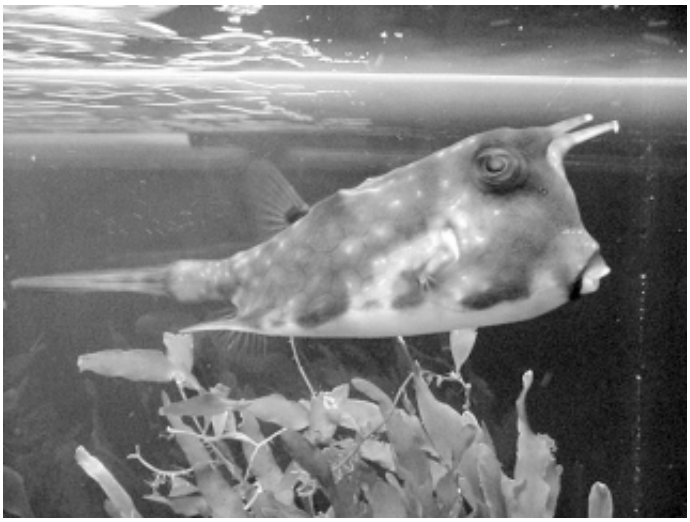
Excursion to the nature reserve "Het Zwin" at the Belgian coast

Wednesday, 11th July 2001		**12th International Biology Olympiad Brussels • Belgium**	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
8.00	Breakfast (boarding school)	8.00	Breakfast (hotel)
		8.45	Walk to meeting rooms
9.00	Trip to Flanders (Bruges, Zwin,…)	9.00	**Jury meeting** (3) Approval and translation of theoretical test (administrative centre)
		11.45	Lunch (administrative centre)
17.00	Departure to Brussels	12.45	End of lunch
		13.00	**Jury meeting** (3 continued) Approval and translation of theoretical test (administrative centre)
19.00	Dinner (boarding school)	18.00	Dinner (administrative centre)
20.30	Free time (boarding school)	19.00	**Jury meeting** (3 continued) Approval and translation of theoretical test (administrative centre)

Boechout Castle: walking in the National Botanical Garden

Visit to the PASS Science centre on an previous coal mine site

Thursday, 12th July 2001		**12th International Biology Olympiad Brussels • Belgium**	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
6.30	Breakfast (boarding school)	7.00	Breakfast (hotel)
7.00	Bus departure		
7.30	Arrival on Campus	7.45	Walk to meeting rooms
7.45 11.45 12.00	**Theoretical Test** VUB (Jette) Break **English Test** VUB (Jette)	8.00	**Jury meeting** (4) Practical test results, Approving answers to theoretical test (administrative centre)
13.00	Lunch (VUB)	13.00	Lunch (administrative centre)
14.30	Departure trip in 4 groups: Technopolis (science centre) National Botanical Garden PASS (science centre) IBMM (Institute of Molecular Biology)	14.30	Departure trip in 4 groups: Technopolis (science centre) National Botanical Garden PASS (science centre) IBMM (Institute of Molecular Biology)
18.00	Departure to Brussels	18.00	Departure to Brussels
19.30	Dinner (boarding school)	19.30	Dinner (hotel)
20.45	Brussels by night Rally	21.00	IBO Co-ordinators meeting (Hotel Astrid)

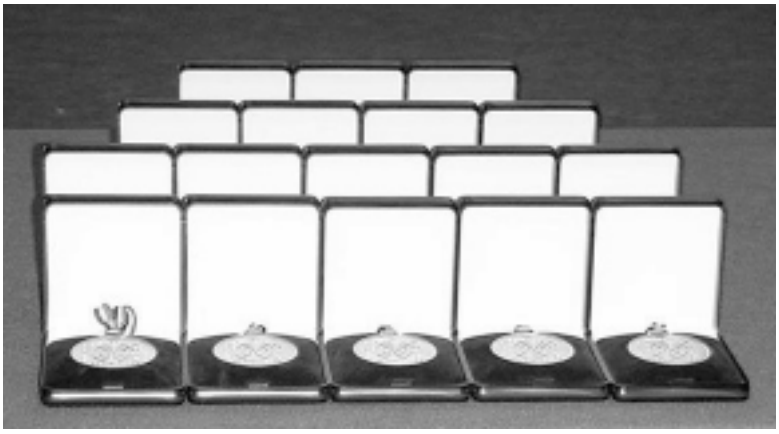


A cofferfish, at the aquarium of Liège, observing biologists

Kisses from "Les Hautes Fagnes",
Belgium's biggest nature reserve

Friday, 13th July 2001		12th International Biology Olympiad Brussels • Belgium	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
7.00	Breakfast (boarding school)	7.30	Breakfast (hotel)
8.00	Trip to Wallonia Liège (aquarium, greenhouses)	8.30	**Jury meeting** (5) Theoretical test results (administrative centre)
12.30	Lunch	11.45	Lunch (administrative centre)
14.15	Bus departure	13.00	Bus departure
15.00	Walk in « Hautes Fagnes »	15.00	Walk in « Hautes Fagnes »
18.00	Bus departure to Spa	18.00	Bus departure to Spa
18:30	Visiting Spa	18:30	Visiting Spa
19.30	Dinner	19.30	Dinner
21.30	Departure to Brussels	21.30	Departure to Brussels

Words of welcome at the Brussels City Hall



IBO medals, the finishing touch!

IBO chamber orchestra at the closing ceremony

Saturday, 14th July 2001		**12th International Biology Olympiad Brussels • Belgium**	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
8.00	Breakfast (boarding school)	8.00	Breakfast (hotel)
9.00	Go-as-you-please in Brussels	9.30	**Jury meeting** (6) Discussion prior to grading and awarding (administrative centre)
12.30	Lunch (boarding school)	12.30	Lunch (hotel)
14.00	Bus departure to ULB	14.00	Bus departure to ULB
14.45	**Closing ceremony** Janson auditorium, ULB	14.45	**Closing ceremony** Janson auditorium, ULB
17.30	Bus departure to Natural Sciences Museum	17.30	Bus departure to Natural Sciences Museum
18.00	Visiting the museum	18.00	Visiting the museum
19.30	Aperitif among dinosaurs	19.30	Aperitif among dinosaurs
20.00	**Closing Dinner Natural Sciences Museum**	20.00	**Closing Dinner Natural Sciences Museum**
23.30	Departure to boarding school	23.30	Departure to hotel

Sunday, 15th July 2001		**12th International Biology Olympiad Brussels • Belgium**	
Competitors		**Adults**	
Time	***Activity***	***Time***	***Activity***
	Departure of participants		Departure of participants
12.30	Lunch	12.30	Lunch
	Departure of participants		Departure of participants

A Belgian IBO-jazz trio welcomes the participants of the opening ceremony.

Presentation of the competitors during the opening ceremony

Opening Ceremony

Programme

Moderator: Mrs. Yannick Siebens,
Royal Belgian Institute of Natural Sciences, Brussels
Musicians: Mr. Bruno Vansina: alt sax; Mr. Mathieu Verkaeren: bass;
Mr. Yves Peeters: drums
Visual presentation: Mr. Stéphane Van Israël

Words of welcome: Mrs. Yannick Siebens

Solemn entrance of the olympic trophy

Mr. Gérard Cobut, Dr. Hugo Vandendries, co-ordinators IBO 2001

Ceremonious marching in of the international students' delegations

Intermezzo

Words of welcome:

- Mr.Nic Vandermarliere, representing Mrs. Marleen Vanderpoorten, Minister of Education, Flemish Community
- Mrs. Marina Schaus, representing Mr. Bernd Gentges, Minister of Education, German-speaking Community
- Mr. Jean-Paul Simon, representing Mr. Pierre Hazette, Minister of Education, French Community
- Mr. Hans Morélis, Chairman of the IBO Coordinators
- Dr. Tomas Soukup, IBO Coordinating Centre

Intermezzo

Olympic oath
- Mark O'Brien (Ireland)
- a student from Belarus
- Prof. Dr. Vitezslav Bicik

Official Opening: Prof. Dr. Louis De Vos, chairman of IBO 2001

Opening ceremony

Speeches

Gérard Cobut & Hugo Vandendries,
IBO 2001 co-ordinators

Dear Ministers,
Dear Rector(s) and Professors,
Dear Competitors and Members of the International Jury,
Ladies and Gentlemen,

As you certainly know, since the 1st of July, Belgium got the Presidency of the European Union for 6 months. As a result, Mr. de Donnea, Minister President of the Brussels-Capital Region, presides for six months over the discussions of the European ministers responsible for Scientific Research. And look: just one week later Brussels is full of young people, future scientists from 38 countries spread all over the world, participating in the International Biology Olympiad. This can't be a coincidence.
In the name of the organising team of this 12th International Biology Olympiad in Belgium, we bid all of you welcome.

Such a International Olympiad cannot be organised without the support of important people.
We are proud to announce that His Royal Highness Prince Laurent of Belgium - chairman of the Royal Institute for the sustainable Management of natural resources and the promotion of clean Technology - accepted the Honorary Chairmanship of this Olympiad. We are honoured that he will join us in the Closing ceremony.
We appreciate that Prof. De Duve and Prof. Prigogyne, Nobel Prize Laureates, accepted to participate in this committee. At the same time, we are happy that the Rectors of the Belgian Universities, the Deans of the Science Faculties and the director of the Royal Belgian Institute of Natural Sciences joined the committee, too.

We thank the many political authorities who are not only member of our patronage committee but who support our project by sponsoring the Olympiad from the Federal Government, the Community Governments and the Governments of the Regions. We must confess, it's an advantage of the federal structure of such a small country as Belgium, to have different governments.
We express our appreciation to the Ministers of Education and their representatives who support the event by their presence and who will give you words of welcome during this ceremony. Thanks to the General Secretary

of the Belgian Federal Office for Scientific, Technical and Cultural Affairs, Ir. Eric Beka.

Dear participants, we wish you all the best for the practical and theoretical competitions. But we also hope that all of you will make many friends and that you will enjoy this International Biology Olympiad, the competition as well as the socio-cultural excursions so that you can return to your country as good ambassadors of Belgium.
This Olympiad will be something special indeed: the slogan used in the Netherlands to promote participation this year was at least promising. “Participate in the 12th IBO: win a trip to Belgium!”. I’m quite sure they were right.

Thank you.

Dr. Tomas Soukup,
IBO Co-ordinating Centre, Prague

Dear Participants, Colleagues, Distinguished Guests and last but not least, dear Organisers,

When I look back on the preceding 11 International Biology Olympiads (IBOs), I have found that all “European” IBOs organized in the Czech and Slovak Republics, in Russia, The Netherlands, Bulgaria, Ukraine, Germany, Sweden and Turkey took place outside the capital towns. Interestingly, two “Asian” IBOs were located in capitals of Thailand and Turkmenistan, namely in Bangkok and Aschabad, respectively.

So the twelfth IBO is the first to be organized in one of European capitals, in the capital of Belgium, in Brussels. And both the organizing country and its capital are in many respects quite special. Let me explain this in more detail.
In our world, at present, there are many countries where two or more nationalities live together. And, unfortunately, in many countries their coexistence is very strained. But this is not the case in Belgium. We appreciate very much that the organizers from different regions of Belgium have worked together and prepared this IBO. I realised, that Belgium is divided really into many parts, when I was asked to send a letter from the Co-ordinating Centre providing information about this IBO to 12 addresses belonging to various Ministries of Education in Belgium. Belgium is a federal state and set an example that people of different nationalities can live together in one state. Let me thus express the gratitude of the IBO Co-ordinating Centre to

the Belgian authorities for such a good example. But our admiration and gratitude should go mainly to the organisers who have worked together on the extremely difficult work. I wish them and I wish also us that the 12th IBO will be very successful.

The 12th IBO is thus held in Brussels, in the capital of Belgium. But Brussels is not only a capital of Belgium, but also the capital of the European Union. It is therefore also our great pleasure to thank the representatives of EU for their moral support to this IBO. We all know that our planet is endangered by the results of our own human activities. Fortunately, the EU governments realize their responsibility for the Earth survival. Let us hope that also other governments, although their programs are being supported by the greatest producers and users of energy will find a way how to support efforts for a sustainable and equal development of all parts of our planet.

The IBO Co-ordinating Centre in Prague would like to express once more our thanks to all organizers but, especially to Mr Gerard Cobut, Hugo Vandendries and all their team. We look forward to collaboration with Prof. Louis De Vos, a chairman of the 12th IBO Jury. Besides the main organisers, we have to thank the many unknown volunteers who always help to prepare and run the IBO competition.

The last three IBOs including the present one, were also special by the fact that IBO in Sweden was the tenth, the 11th IBO in Turkey was the last in the twentieth century and this IBO is the first in this century. I hope that IBO, our planet and we all will enjoy this 21st century as a peaceful and successful time.

Let me please present a small cup, in the name of the IBO Co-ordinating Centre, as an expression of our hope and wish that this IBO will be an excellent example for all the next IBOs of the 21st century.

Dear participants, I would like to wish you good luck in the competition and a pleasant time during your stay at the 12th IBO in Belgium.

Mr. Jean-Paul Simon, General Inspector
representing Mr. Pierre Hazette,
Minister of Education, French Community

It is a great honour for me to be here today and to represent the Minister of Education of the French Community, Mr. P. Hazette, who apologises for not being able to come.

It is also a great pleasure for me to have the opportunity to talk to you as a biologist addressing other biologists. I used to be a Biology Inspector, and I, therefore, attended the two or three first meetings during which this International Biology Olympiad was prepared.

To begin with, let me quote Pascal de Genen, a Nobel prize-winner for Physics, who discovered Biology too late in life and regretted it very much. He said:

> *"Biology is the only truly concrete science, and everybody would benefit from a basic training in this field. Biology develops our capacity to observe, to compare, to experiment."*

Secondly, I wish to stress the importance of this meeting and especially of this competition. Indeed, in the true spirit of the Olympic Games, the most important is to participate.

Thirdly, the importance of Biology is enormous if we seek the answer to the question "What is life ?". A question which summarises the origin of life, where we live, how we live, the different ways to live together.

I also wish to sincerely congratulate all the participants who are not here today. They tried and did their best, participating in regional or national preselections of the Biological Olympic Games.

But my first congratulations go, naturally, to all the participants having reached this final stage of the competition.

There are differences between the countries: curricula, intellectual doping in order to prepare the final round of the Olympiad,... perhaps chemical dopings are not the same.
I do not know the laboratory questions, but to analyse blood or urine is always possible !

In any case, to everybody, students and teachers, coming from all over the world, I wish a very pleasant stay in Belgium.

Good luck to all participants.

I wish everybody much success, and a golden medal !

I thank you for your attention.

Pascaline Lauters, Nicolas Ruzicka, Bert Maddens and John Wittocx, the Belgian competitors of IBO 2001

Opening lunch at the Congress Palace in Brussels

Prof. S. Aron and Dr. P. Reygel, members of the National Scientific Experts Group

The staff at work behind the scenes.

Practical test

Practical Test

General remarks about the practical tests

In practical tests you are expected to demonstrate that you know some basic methods, processes and techniques of biology and that you are able to use them for experimental purposes.
This will be tested in a series of tests, organised in four different laboratories.

Laboratory 1: Plant anatomy, morphology and taxonomy

Laboratory 2: Animal anatomy, morphology

Laboratory 3: Plant pigment analysis

Laboratory 4: Ethology

You have approximately 60 minutes in each laboratory. You can score 50 points at a maximum in each laboratory, which means a total amount of 200 points for the practical test. If at some task you mark some incorrect alternative(s) as well as some correct ones, you will get a lower score at that particular task than if you only mark the correct answers.

Laboratory 1: Plant anatomy, morphology and taxonomy

Introductory remarks

In this laboratory you will be given three separated tasks. It is of no importance with which you start. The time to perform all the tasks is 70 minutes. Please be sure that the task paper given to you fits the task you are performing.

The dissection case must be used in two laboratories. It's a gift. Take it with you.

Task 1: making sections of plant organs. Identification of the organs. Taxonomic classification.

Task 2: identification of 3 representatives of a plant taxonomic group by selecting distinct parts of the species.

Task 3: identification of flowering plant families on the basis of flower buds and reference slides of transverse section of the buds.

TASK 1: Making sections of plant organs. Identificarion of the organs. Taxonomic classification. (Total points 11)

Material
Plant organ samples (2 types A and B)
Instruments and equipment:

Razor blade
Stain and glassware +H_2O
Slides and coverslips
Microscope
Reference slides of transverse section of plant organs of 7 different taxonomic groups

1. Make a cross section of sample A. Prepare a wet mount and use the stains if necessary.
You have a set of reference slides (1-7) with cross sections of different plant organs.
Examine your preparation under the microscope and compare with the reference slides. Identify the corresponding reference slide and fill in the correct number of that slide on the answer form in the blank **1A1**.
(1,5 points)
You have a list of organ types. Select the correct number out of the list and fill in the blank **1A2** on your task 1 answer form. **(2 points)**
You have a list of taxonomic group. Select the correct number out of the list and fill in the blank **1 A3** on your task 1answer form. **(2 points)**

2. Make a cross section of sample B. Proceed as in 1 and fill in blanks on your task 1answer form .
1B1 (1,5 points) 1B2 (2 points) 1B3 (2 points)

TASK 1. List of organ types

1. Primary root
2. Primary stem
3. Rhizome

4. Leaf petiole
5. Leaf rachis
6. Secondary root
7. Secondary stem

TASK 1. List of taxonomic groups

1. Flowering plant monocotyl (Liliaceae)
2. Flowering plant dicotyl (Magnoliaceae)
3. Conifer
4. Fern
5. Clubmoss
6. Horsetail
7. Cycad

TASK 2: Identification of 3 representatives of a plant taxonomic group by selection of distinct parts of the specimen.

Material

Mixture of plant parts of 3 representative species of different plant taxonomic groups
Binocular microscope
Dissecting equipment (tweezers)
Glassware (petri dishes)

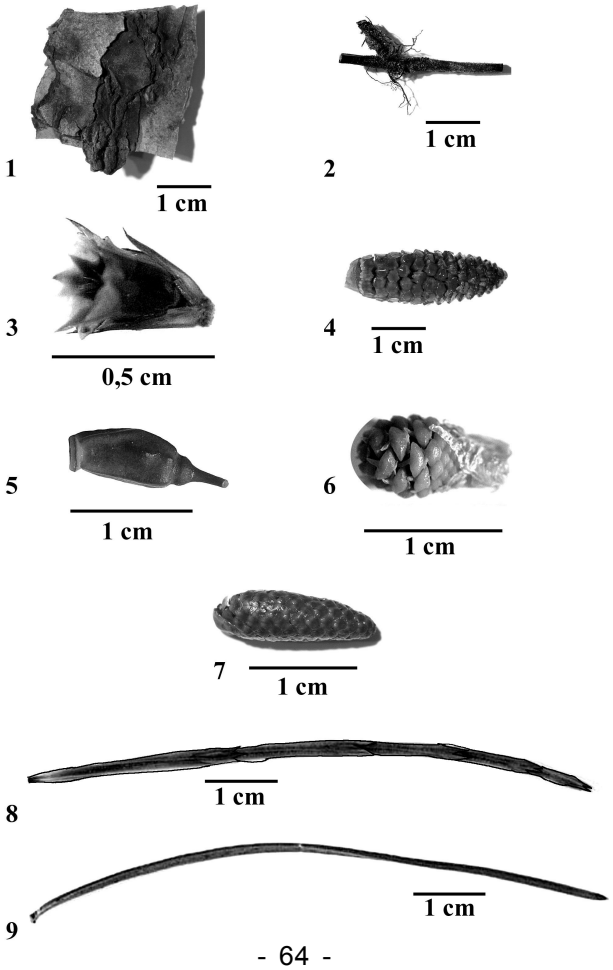
1. Transfer the mixture of plant parts into a large petri dish. Select the parts which belong to the same species (if necessary the binocular microscope can be used) and transfer the items that belong together.
In petri dish A you have to collect **4** items.
In petri dish B you have to collect **3** items.
In petri dish C you have to collect **2** items.
You have a figure with several plant parts of different plant species belonging to several taxonomic groups. Select those figures, that corresponds with the items in the petri dishes. Fill in the blanks in **211**, **212** , **213** and **214 (each 2 points)** for the items belonging to **species 1**, on the **task 2 answer form.**
Do the same for **species 2** and **3**. Fill in for petri dish A and petri dish B **221**, **222** and **223 (each 2 points).** Fill in for petri dish C **231**, **232 (each 2 points)** on the **task 2 answer form** .

2. You have a list of taxonomic groups: select the appropriate group for the species in Petri dishes A, B and C and fill in the corresponding number in the blank code **215, 224**, **233 (each 2 points)** on the **task 2 answer form**.

TASK 2. List of several taxonomic groups.

1. Monocotyl
2. Dicotyl
3. Cycad
4. Conifer
5. Moss
6. Alga
7. Horsetail
8. Clubmoss

Task 2. Figure of different plant parts



TASK3: Identification of flowering plant families on the basis of flower buds and refernce slides of transverse section of buds (Total points 15).

Material
Samples of flower buds of 2 plant species belonging to 2 different families A and B.
Reference slides of cross sections of flower buds (1, 2, 3)
Binocular microscope
Dissection tools
Petri dishes

3.1. Take the flower bud out of petri dish A. Dissect the flower and observe its characteristic diagram.
You have a set of selected reference slides (1-3).
Select, on the basis of these characteristics, the corresponding reference slide and fill in the number in the blank code **311**. **(1,5 points)**

You have a list of families of flowering plants.
Select the correct number corresponding with the family of the sample A flower bud and fill in the number in the blank code **312 (2 points)** on your answer form task 3.

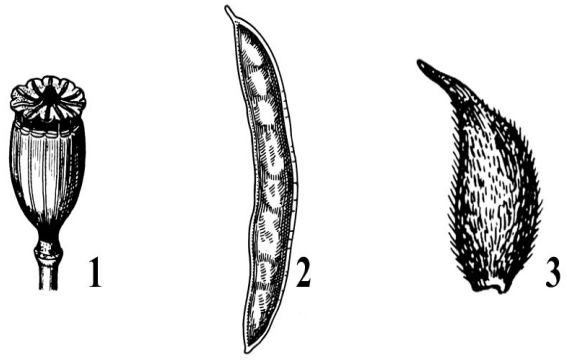
You have pictures of fruit types.
Select the number of the type of fruit belonging to this family and fill in the number on the blank code 313 **(1,5 points)**.

3.2. Do the same for the petri dishes B and C.
Fill in for petri dish **B** the number in the blank code **321 (1,5 points)**, **322 (2 points)**, and **323 (1,5 points).**
Fill in for petri disch **C** the number in the blank code **331 (1,5 points)**, **332 (2 points)**, and **333 (1,5 points).**

TASK 3. List of families of flowering plants

1. Ranunculaceae
2. Lamiaceae
3. Oleaceae
4. Fabaceae
5. Apiaceae
6. Asteraceae
7. Poaceae
8. Liliaceae
9. Fagaceae
10. Brassicaceae

Task 3. Pictures of fruit types



Laboratory 2: Animal anatomy, morphology

Introductory remarks

The insect to be dissected is a cockroach : Insecta, Dictyoptera, Blattidae, from the genus *Periplaneta*. These insects are well known to you. They have invaded nearly all the buildings in some cities. As they are nocturnal, the humans may considerably underestimate their number. They are sometimes seen as mark of dirtiness, however, they can be very abundant even in very clean environment, like hospital. A main factor of their proliferation is the climate : summer, with both high temperature and humidity are extremely favourable to the species.

Dissection of *Periplaneta*

Material
Periplaneta
A dissection tray
6 entomological needles
8 coloured needles (one to eight)
Scalpel

H_2O
tweezers
fine scissors
slides and cover-glasses
binocular microscope + light

Manipulation

1. add tap water in the dissection tray (1,5 cm high).
2. fix the animal properly. The dissection can be made under binocular microscope : start cutting it with fine scissors beginning at the anus ; cut along the two lateral sides as far as the prothorax.
3. lift up the cut off tergite (dorsal plate) and turn them over. (**5 points)**
4. unroll the digestif tract, lift it away from the body without cutting it and pin the different sections with labelled needles in the following order

Use needle	red 1. for the crop / stomodaeum.	**(5 points)**
	blue 2. for the gizzard / proventiculus	**(5 points)**
	orange 3. for the digestive caeca	**(5 points)**
	black 4. for the mesenteron / midgut	**(5 points)**
	yellow 5. for Malpighi tubules	**(5 points)**
	green 6. for proctodaeum	**(5 points)**
	white 7.for nerve cord	**(5 points)**
	pink 8. fat body	**(5 points)**

5. Cut a piece of trachea and make a wet mount of it, bring it under the binocular microscope and ensure you have a thin preparation. Take this between slide and cover-glass and examine it under the binocular microscope **(5 points)**.

The dissection must be completed within 40 minutes.
The dissection must be checked by an assistant.
When you have finished the dissection, raise your hand to call for an assistant.
The assistant and you must sign the evaluation sheet.
Re-evaluation is supervized by a Professor.

Laboratory 3: Plant pigment analysis

Reversed Phase Thin-Layer Chromatography of Photosynthetic Pigment

Introduction remarks

Thin-Layer Chromatography is an important technique for analysis of molecules. How do biologists and biochemists know so much about molecules

such as, for example, proteins, lipids and plant pigments? The answer is of course that they have been isolating, separating and studying these molecules for more than a century. One important technique for the analysis of molecules is thin-layer chromatography (TLC). This technique can separate different kinds of molecules based on their relative affinities for a hydrophilic stationary phase and a hydrophobic mobile phase. The stationary phase is usually a thin layer of silicic acid (silica gel) on a glass or metal plate, while the mobile phase is a mixture of appropriate solvents. Although largely replaced by several new and more efficient and accurate techniques, TLC remains a rather simple but effective technique to make a first qualitative analysis of photosynthetic pigments in samples.
For the analysis of photosynthetic pigments some problems may appear, such as the formation of pheophytins due to the reaction of pigments with H_2SiO_3 molecules, present in the silica gel. The problem can be avoided by using silica gel from which the polar groups are saturated with C_{18}-alkylchains. This results in a non-polar silica gel and the technique is specified as reversed phase thin layer chromatography (RP-TLC) with an appropriate solvent for the mobile phase (e.g. mixtures of ethylacetate, methanol and water).

Equipment and material available for each student

1. Simple chromatography tank (high-200/250ml-beaker filled with small but suitable volume of solvent, covered with petri dish)
2. sheet of parafilm (spare)
3. 2 TLC-strips cut at 40 x 100 mm , dried for at least 30 min. at 60 - 80 ° (1 spare strip)
4. pencil
5. ruler
6. piece of aluminium foil
7. 3 test tubes (glass 20 ml)
8. graduated measuring cylinder (10ml)
9. chemicals : petroleum ether 40 - 60° (bottle A); acetone 100 % (bottle B)
10. distilled water in test tube
11. fine sand in test tube
12. mortar + pestle
13. 2 capillary tubes (20 µl)
14. bean plant
15. task description with experimental protocol
16. Multiple choice questions
17. answer leaflets

TASKS:

1. Separation and identification of plant pigments by reversed phase TLC
2. Solving MC questions related to TLC and Plant Pigments (use answer leaflet no 1)
3. Completing the answer leaflets no 2 for task evaluation

At the end of the session each student presents two answer leaflets and 1 TLC-plate.

Task 1: Separation and identification of pigments by reversed phase TLC

Preparation (takes approx. 15 minutes)

1. Take about 8 cm^2 of plant material.
2. Grind the plant material in a mortar using a bit of sand.
3. Add **100 % acetone** (max. 10 ml) bottle B.
4. Pour in test tube, decant after 5 minutes (meanwhile you can prepare the TLC-plate, see step 7).
5. Add approximately 20 drops petroleum ether (bottle A) and ap proximately 5 ml distilled water.
6. Shake well and allow to separate into two layers (wait 1 min for the separation).
7. Take a TLC plate and draw carefully and faintly a start line (**use pencil**) at 1.5 cm from the bottom (avoid damaging the silica gel layer).

Spotting (takes approx. 5 minutes)

1. Spot the pigment extract on the start line with a small capillary tube in three different locations (do it gently and avoid damaging the silica gel layer).
2. Dry the spots by gently blowing.
3. Repeat this 4 to 5 times.

Running (takes approx. 25 minutes)

1. Put the TLC plate in the tank and allow to develop in the dark (cover the jar with aluminium foil). **IMPORTANT: Use your free time to solve the MC questions (task 2).**
2. After approx. 20 minutes, take the plate out of the tank. In any case take the plate out when the front line reaches 1 cm from the top of the TLC plate.

Interpretation

1. Mark the solvent front line (**use pencil**).
2. Use the answer leaflet to draw a copy of your TLC plate, including the front and start line and the pigments observed.
3. Calculate R_f-values for the photosynthetic pigments you have sepa rated.

Remarks:
Photosynthetic pigments with a R_f-value equal or greater than 0,4 might be only slightly visible. Examples for this RP-TLC:

neoxanthin	R_f =0,6
violaxanthin	R_f =0,5
luteïn	R_f =0,4

Despite the precautions pheophytins may appear. If they show up, you might see them as a grey-blue haze. We do not consider them as photosynthetic pigments because they are derived from photosynthetic pigments through chemical alteration.

4. Mark on your drawing, each of the observed photosynthetic pig ment spots. **Numbering of your spots starts with no 1 for the spot with the lowest R_f-value**. Try to identify four photosynthetic pigments with the lowest R_f-values.
5. Cover your TLC plate with aluminium foil to prevent deterioration of the pigment colors.
6. Continue with **task 3** by completing n° 2 answer leaflet, using all available information including that from the MC questions.

Task 2: Answer the MC questions related to TLC and Plant Pigments
Choose the one best answer for each question.

Scoring for each question:
- Right answer = + 3 points
- Wrong answer = - 1 point (guess correction)
- No answer = no points

Mark your answers on leaflet no 1

1. Which of the following statement is correct?

A. Plants have chloroplasts and therefore can live without mitochon-dria.
B. Both chlorophyll and heme contain an extensive system of double bonds that allow them to absorb visible light.
C. The role of chlorophyll in photosynthesis is equivalent to that of heme in mitochondrial electron transport.
D. All the statements above are wrong.

2. Study the molecular structure of major plant pigments to predict the relative solubility in polar or non-polar solvents (**see figure on page 17**). To determine polarity of these pigments, one can count the number of atoms per molecule. Which count is the most suitable?

A. H-atoms
B. N-atoms
C. C-atoms
D. O-atoms

3. Acetone is very suitable to extract pigments from chloroplasts. Choose a correct answer that supports this fact.

A. Non-polar molecules only dissolve in non-polar solvents.
B. Chloroplast-membranes are polar structure.
C. Non-polar molecules only dissolve in polar solvents.
D. The stroma in chloroplasts contains a huge number of non-polar molecules.

4. Plant material often contains red pigments; their structure reveals that they have no function in photosynthesis and are soluble in water. A perfect location for these pigments in plant cells is:

A. Membranes of chloroplasts.
B. Membranes of mitochondria.
C. Lumen of vacuoles.
D. Cytosol of the cell.

5. Chlorophyll is a complex molecular structure with a magnesium atom held in the centre of a porphyrin ring, which is structurally similar to the porphyrin ring that binds iron in heme. Which of the next statements is correct and completes the functional description of the molecule?

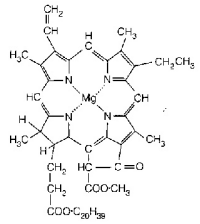
A. Electrons within the bond network of the porphyrin ring absorb light, while the long hydrophilic tail helps to hold the chlorophyll in the thylakoid membrane.
B. Electrons within the bond chain of the long hydrophilic tail absorb light, while the network of the porphyrin ring helps to hold the chlorophyll in the thylakoid membrane.
C. Electrons within the bond network of the porphyrin ring absorb light, while the long hydrophobic tail helps to hold the chlorophyll in the thylakoid membrane.
D. Electrons within the bond chain of the long hydrophobic tail ab sorb light, while the network of the porphyrin ring helps to hold the chlorophyll in the thylakoid membrane.

6. A researcher has just discovered a new bacteria species that has a unique photosynthetic pigment. In a TLC, the pigment appears to be reddish yellow. What colours of the visible light spectrum are not absorbed?

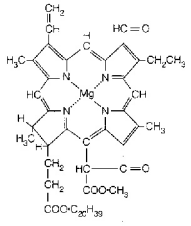
A. Red and yellow.
B. Blue and violet.
C. Green and yellow.
D. Blue, green, and red.

7. If you know the absorption spectrum of a plant pigment, you can be reasonably certain of:

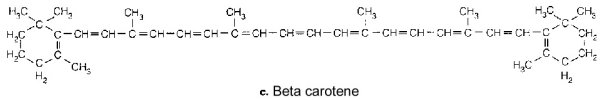
A. The wavelength of visible light it absorbs.
B. The wavelength of visible light it reflects.
C. Tthe energy of the visible light it absorbs and reflects.
D. All of the above.



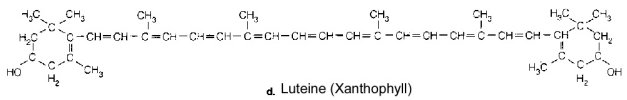
a. Chlorophyll A



b. Chlorophyll B



c. Beta carotene



d. Luteine (Xanthophyll)

ANSWER LEAFLET N° 1: MC QUESTIONS (21 points)
Scoring for each question:

right answer	**+ 3 points**
wrong answer	**- 1 point**
no answer	**no point**

Question 1	A	B	C	D
Question 2	A	B	C	D
Question 3	A	B	C	D
Question 4	A	B	C	D
Question 5	A	B	C	D
Question 6	A	B	C	D
Question 7	A	B	C	D

Code number:

ANSWER LEAFLET N° 2 (29 points)

Fill in for RP-TLC task evaluation

RP-TLC plate n°:.....

Photosynthetic pigment n° 1
name:..... **(3 points)**
R_f -value:..... **(3 points)**

Photosynthetic pigment n° 2
name:..... **(3 points)**
R_f -value:..... **(3 points)**
Photosynthetic pigment n° 3
name:..... **(3 points)**
R_f -value:..... **(3 points)**

Photosynthetic pigment n° 4
name:..... **(3 points)**
R_f -value:..... **(3 points)**

Draw a copy of your TLC-plate in the box **(5 points).**
Mark the most abundant photosynthesis pigment spots.
Present answer leaflet n° 1, n° 2, and your TLC-plate to the panel of examiners.

Laboratory 4: Ethology

Introductory remarks

In this part, you will see 6 film sequences dealing with the behavior of insects, birds and mammals. Each sequence will be shown twice.
We suggest you proceed as follows:
First, watch the sequence.
Second, read the relevant question.
Third, watch the sequence a second time.
Fourth, answer the question on the answer sheet correctly.

Good Luck

Questions about sequences

1. Butterfly chrysalis : the chrysalis of this species is either green or brown. Both morphs are cryptic in their natural environment (trees) **(8 points).**

A. Chrysalis colour is conditioned by the texture of the substrate on which the caterpillar moves before pupate.
B. Chrysalis colour is conditioned by the colour of the twig on which the caterpillar ran before pupate.
C. Both A and B are correct.
D. Neither A nor B is correct

2. Path selection by ants: two video sequences are displayed. During the first sequence, a bridge made of two unequal lengths connects the nest to a food source. During the second sequence, the ants have access to the food only by using the long path of the bridge during the first part of the experiment. The ants, however, can use both the long and the short paths in the second part of the experiment, which started after a heavy traffic was first established on the long path during the first part of the experiment **(8 points).**

A. The ants randomly select one or the other path.
B. The ants are able to evaluate travelled distances and to remem ber the shorter path.
C. Path selection depends on the number of ants which had previ ously travelled along each path.
D. Ants never travel along a path that they have not marked chemi cally.

3. Honeybee dance: in the video sequence, a bee loaded with pollen per-

forms a waggled dance for recruiting nest-mates towards a food source. The bee dance informs nest-mates on the direction they must follow to find the food source: **(8 points)**

A. About 45° right to the sun.
B. About 135° left to the sun.
C. South-west from the hive.
D. North-east from the hive.

4. Social interactions between cows: the video sequences illustrate dominance relationships between feeding cows in five experimental conditions. Out of the following assertions, which one is correct **(8 points)**?

A. Visual stimuli are required for holding dominance position.
B. A dominant cow always expresses its status whatever the experimental condition.
C. Dominance is not expressed without head contact between cows.
D. All the above answers A, B and C are wrong.

5. Maternal behavior in sheep. Three video sequences are shown: the first illustrates the behavior of a mother and her lamb soon after parturition; the second, a lamb is washed immediately after parturition before its mother was able to care for it, after what it is given to its mother who had never cared for lambs before; the third, the lamb was washed soon after parturition and then given to a foreign ewe who had experienced lamb care before **(10 points).**

A. Suckling acceptance requires that the ewe had the opportunity to care for a lamb after parturition.
B. An ewe is more prone to accept a lambkin if she marked it by licking it before.
C. Washing eliminates all odours, preventing suckling acceptance.
D. The three answers A, B, C are correct.

6. Emperor-pinguin :four videos are shown:1)egg-laying and egg-transfer to the male ; 2) incubation of eggs by aggregated males ; 3) females join the males and chickens are tranferred to them; 4) chickens are grouped in a nursery **(8 points).**

A. Only males take care of chickens.
B. Only females take care of chickens.
C. Brood-care by males and females is similar.
D. Both males and females take care of the chickens, but there is a division of tasks between them.

Answer Key to the practical test

Laboratory 3: Chromatography

Task 2 MC questions
1. b; 2.d; 3.a; 4.c; 5.c; 6.a; 7.d

Task 3
1. carotene; Rf +/- 0.1
2. chlorophyll b; Rf +/- 0.2
3. chlorophyll a; Rf +/- 0.3
4. lutein; Rf +/- 0.4

Laboratory 4: Ethology
1.a; 2.c; 3.b; 4.c; 5.a; 6.d

Barbecue at the campus of the Université Libre de Bruxelles after the practical test

Theoretical Test - Part A

Cell Biology

A 1. The genetic code is:

A. the set of cellular genes.
B. the nucleotidic sequence of the gene.
C. the genetic expression.
D. the law of correspondence between ribonucleotide sequences and amino acids.

A 2. During differentiation:

A. cells loose a substantial part of their genetic information.
B. each cell of a multicellular organism expresses only one gene at a time.
C. different strains of procaryotes can be produced.
D. only part of the genes of a given cell are active at the same time.

A 3. During meiosis:

A. tetrads are formed at metaphase II.
B. crossing over occur at prophase I.
C. homologous chromosomes are pairing during prophase II.
D. sister chromatids are separated at anaphase I.

A 4. A given biochemical reaction:

A. always looses energy.
B. always receives energy.
C. transmits energy to any other reaction or receives energy from any other reaction.
D. transmits energy to another specific reaction or receives energy from another specific reaction.

A 5. The study of crossing over frequency between linked genes has been used:

A. to estimate the efficiency of chromosome separation at anaphase.
B. to estimate the physical distance between genes.
C. to establish the genetic map of the chromosome.
D. to estimate the frequency of a mutation.

A 6. Thinking about cellular respiration, which of the following statements is correct?
Dinitrophenol (DNP) rapidly kills a cell because:

A. it destroys and paralyses all the cell proteins.
B. it forbids the access of the oxygen to the cell.
C. it forbids the transport of cellular molecules transporting energy.
D. it increases the oxygen consumption of the cell.

A 7. Under how many forms can a 2000 nucleotides gene exist?

A. 1.
B. 2000.
C. 700.
D. a practically illimited number.

A 8. ATP is an important molecule in metabolism because:

A. it has high-energy phosphate bonds.
B. its phosphate bonds are very easily formed but not easily broken.
C. it is readily obtained from an organism's environment.
D. it is extremely stable.

A 9. Which cell type would probably provide the best opportunity to study lysosomes?

A. muscle cell.
B. nerve cell.
C. phagocytic white blood cell.
D. leaf cell of a plant.

A 10. Large numbers of ribosomes are observed in cells that specialise in the production of:

A. lipids.
B. polysaccharides.
C. proteins.
D. glucose.

A 11. A biologist ground up a piece of plant tissue and then centrifuged the mixture. She obtained some organelles from the sediment in the test tube. The organelles took up CO_2 and gave off O_2. The organelles were most likely:

A. chloroplasts.
B. ribosomes.
C. nuclei.
D. mitochondria.

A 12. Which one of the following cell structures doesn't contain nucleic acid:

A. mitochondria.
B. nucleus.
C. rough endoplasmic reticulum.
D. smooth endoplasmic reticulum.

A 13. Which is the correct series of histones forming the core of a nucleosome?

A. H1 , H3 and H4.
B. H2A , H2B ,H3 , H4.
C. H1 , H2A and H2B.
D. H1 , H2A , H2B and H4.

A 14. How does cyanide (CN^-) cause the death of living things?

A. by stopping photosynthesis.
B. by breaking down protein molecules.
C. by stopping (-oxidation).
D. by stopping the electron flow through ETS enzymes.

A 15. Which of the following phenomena is responsible for arteriosclerosis?

A. non modification of LDL receptors.
B. joining of LDL complex and LDL receptors.
C. shape modification of the active site of LDL complex.
D. high concentration of cholesterol.

A 16. Which of the following experimental observation(s) support(s) the chemiosmotic theory about oxidative phosphorylation?

I- During electron transport, a proton gradient develops across the inner membrane of mitochondria.
II- A closed membrane or vesicular structure is required for oxidative phosphorylation.
III- ATP synthesis starts when a proton gradient develops in mitochondria.

A. only II.
B. only III.
C. only I and II.
D. I, II and III.

A 17. The oxygen atoms used to form H_2O at the end of the oxidative phosphorylation chain (also named: terminal oxidation), come from:

A. carbon dioxide.
B. glucose.
C. molecular oxygen.
D. pyruvate.

A 18. Pyruvate is the end product of glycolysis. Consequently, which of the statements below is true?

A. there is more energy in 6 molecules of carbon dioxide than in two molecules of pyruvate.
B. there is less energy in two molecules of pyruvate than in one molecule of glucose.
C. pyruvate is a more oxidized state than carbon dioxide.
D. there is more energy in 6 molecules of carbon dioxide than in one molecule of glucose.

A 19. During aerobic respiration, electrons travel "downhill" from

A. food → Krebs cycle → ATP → NAD^+.
B. food → NADH→ electron transport chain → oxygen.
C. glucose → ATP → oxygen.
D. food → glycolysis→Krebs cycle → NADH → ATP.

A 20. You eat a nice portion of Belgian fries (fried potatoes) with chicken meat and a fresh salad. Which of the following molecules of this meal would normally not be oxidized in aerobic respiration to generate ATP?

A. polysaccharides.
B. proteins.
C. nucleic acids.
D. lipids.

A 21. In plant cells, ATP is produced in response to light. The electron transport chain that is involved in the process is located in the:

A. thylakoid membranes of chloroplasts.
B. stroma of chloroplasts.

C. inner membrane of mitochondria.
D. cytoplasm.

A 22. The substance that is the general biosynthetic precursor of sex hormones and hormones of the adrenal cortex is:

A. inositol.
B. lecithin.
C. phosphatidyl-choline.
D. cholesterol.

A 23. During replication, the excision of the primers:

A. is made by a DNAse.
B. produces OKASAKI fragments.
C. occurs only in the lagging strands.
D. occurs in the nucleus.

A 24. The following substances are proteins of the cytoskeleton:

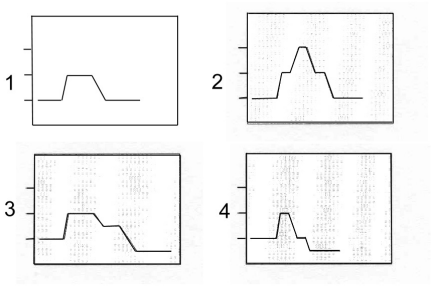
A. actin, actinomycin, myosin.
B. desmin, tubulin, dynein.
C. tubulin, desmin, vinblastin.
D. cytochalasin, actin, myosin.

A 25. Two bottles of liquid were labelled X and Y. The two bottles contained different 0,2 molar (hypotonic) solutions. Red blood cells in a drop of blood were placed in each bottle. The cells in X swelled and some of them burst while those en Y shrunk and became shrivelled. On the basis of this information which of the following conclusions is most valid?

A. the concentration of the solute in liquid X was higher than in the red blood cells
B. the concentration of the solute in liquid Y was higher than in the red blood cells.
C. the ionization of the solute was responsible for the shrinking of the red blood corpuscles in liquid Y.
D. the diffusion of solute into the red blood corpuscles was respon sible for the shrinking of the red blood corpuscles in liquid Y.

A 26. The diagrams below refer to variation in the amount of DNA (y axis) as a function of time (x axis) during cell division. (the units are arbitrary). Which ones of these diagrams depict what happens during meiosis and mitosis, respectively?

A. 1 and 2.
B. 4 and 1.
C. 3 and 4.
D. 2 and 3.



A 27. The following short DNA sequence 5' AGGATGCTA 3' can be perfectly hybridized with:

A. 5' AGGATGCTA 3'.
B. 5' UGGUACGAU 3'.
C. 5' ATCGTAGGA 3'.
D. 5' TAGCATCCT 3'.

A 28. The following sequence in registered in a genomic data bank as part of a coding locus in a genome:
5'.....AGGAGGTAGCACCTTTATGGGGAATGCATTAAACA.....3'.

The ATG underlined represents the initiation codon of the gene located at that locus. Among the following sequences, which one could be part of the transcribed mRNA corresponding to that locus?

A. 5' AGGAGGUAGCACCUUUAUGGGGAAUGCAUUAAACA 3'.
B. 5' UCCUCCAUCGUGGAAAUACCCCUUACGUAAUUUGU 3'.
C. 5' ACAAAUUACGUAAGGGGUAUUUCCACGAUGGAGGA 3'.
D. 5' UGUUUAAUGCAUUCCCCAUAAAGGUGCUACCUCCU 3'.

A 29. In eucaryotic cells the sequence of organelles involved in the synthesis and secretion of a protein, is:

A. ribosome, endoplasmic reticulum, Golgi, cell membrane.
B. ribosome, Golgi, endoplasmic reticulum, cell membrane.
C. mitochondrion, ribosome, endoplasmic reticulum, cell membrane.
D. nucleus, mitochonrion, ribosome, Golgi, cell membrane.

A 30. If you extract the DNA of the bacteriophage (X174, you will find that its composition is 25 % A, 33 % T, 24 % G, and 18 % C. How would you interpret these results?

A. the experiment's results must be erroneous; something went wrong.
B. we could admit that the A percentage approximately equals that of T, and the same for C and G. Consequently, Chargaff's rules are not eluted, DNA is double stranded and replicates semi-conservative.
C. as the A and T, respectively C and G percentages are different, DNA is single - stranded; it is replicated by special enzymes, following a particular replication pattern, with single - stranded chain as a template.
D. because A does not equal T, nor does G equal C, the DNA must be single - stranded; it replicates by synthetising a complementary strand and uses this double stranded form as a template.

A 31. DELETED

A 32. In the nucleus of a eukaryotic cell

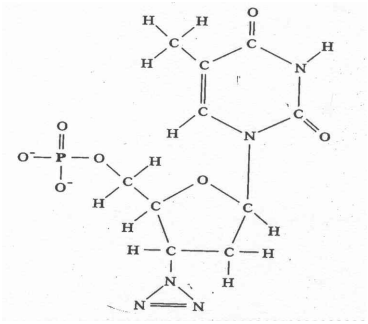
A. more than 50 % of DNA codes for proteins.
B. all the proteins are histones.
C. transcription of DNA takes place only in the heterochromatin.
D. nucleolar DNA codes for the synthesis of ribosomal RNA.

A 33. During protein synthesis,

A. aminoacyl tRNA synthetase is involved in the synthesis of the amino-acids.
B. the C-C-A end of tRNAs is used to attach the transfer RNAs to the mRNA.
C. each new amino acid added to the system locks first in the A site of the large ribosomal subunit.
D. peptidyltransferase moves the newly formed peptide from site A to site P.

A 34. The drug, AZT, is given to AIDS patients to slow down the progress of the disease. The structure of the drug is given here. The drug is effective as it:

A. targets the HIV envelope proteins which prevents CD4 binding.
B. inhibits DNA replication of HIV.
C. binds to metabolic enzymes of the virus.
D. interferes with the protease activity of HIV.



A 35. If the steps by which a virion is replicated are designated as follows:

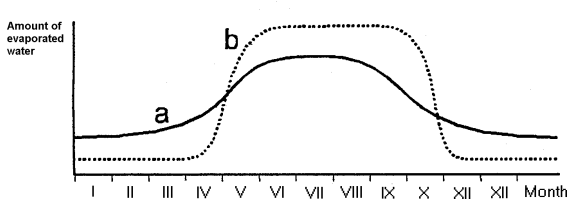
1. Synthesis of viral protein
2. Fusion of virion envelope with cell membrane
3. Assembly of proteins
4. Removal of capsid
5. Release of virus from cell
6. Replication of viral RNA,

Which of the following sequences is the correct one?

A. 4-2-1-6-3-5.
B. 6-4-1-3-5-2.
C. 2-6-4-5-1-3.
D. 2-4-6-1-3-5.

Plant anatomy and physiology

A 36. Graph demonstrates the amount of evaporated water during the year in two equally high trees growing in the same habitat in Belgium. To which tree species belong the two given curves in the graph?



A. a) pine (*Pinus*), b) spruce (*Picea*).
B. a) oak (*Quercus*), b) birch (*Betula*).
C. a) pine (*Pinus*), b) oak (*Quercus).*
D. a) oak (*Quercus*), b) spruce (*Picea*).

A 37. What is the number of chromosomes of the primary endosperm in the seed of Pinus?

A. haploid.
B. diploid.
C. triploid.
D. polyploid.

A 38. DELETED

A 39. DELETED

A 40. The changes (colour, texture and chemical composition) that take place in the fruits when they ripen are due to:

A. the CO_2 content in the atmosphere.
B. the temperature variation.
C. the ethylen synthesis in the plant.
D. the indolacetic concentration in the fruit.

A 41. *Pinus* pollen is moved from male to female cones by:

A. wind.
B. water.
C. insects.
D. birds.

A 42. Which of the following statements about fungi is true?

A. ascospores are formed asexually.
B. gills of mushrooms are diploid.
C. mycelia of nearly all fungi are predominantly dikaryotic.
D. in the dikaryotic condition two unfused nuclei lie within the same cell.

A 43. How have bryophytes managed to survive on land?

A. they were the first plants that developed stomata.
B. they do not require moist environments for their reproductive cycles.
C. they grow close to the ground in relatively moist regions.
D. the sporophyte became independent of the gametophyte.

A 44. The gemmae of *Marchantia* are homologous to:

A. seeds.
B. gametes.
C. asexual cells.
D. pollen grains.

A 45. Which of the following is not an essential mineral element for plants?

A. potassium.
B. magnesium.
C. calcium.
D. lead.

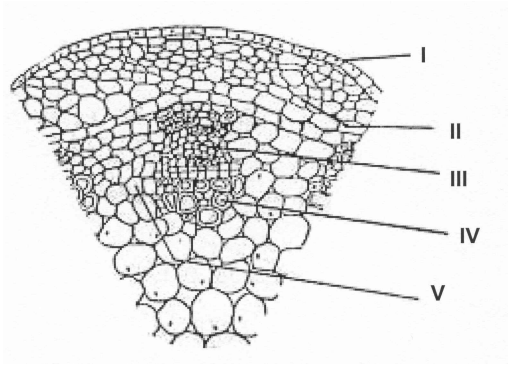
A 46. Nitrate reduction:

A. is performed by plants.
B. takes place in mitochondria.
C. is catalyzed by the enzyme nitrogenase.
D. is known as the nitrogen fixation process.

A 47. In C_4 plant photosynthesis

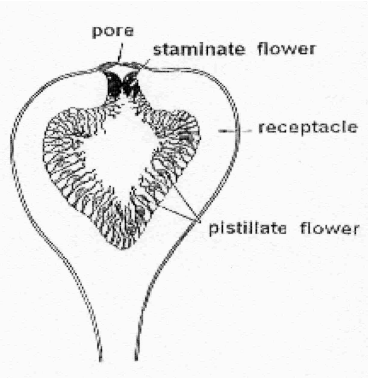
A. 3 PG (phosphoglyceraldehyde) is the first product of CO_2 fixation.
B. four-carbon acid are formed by PEP (phosphoenolpyruvate) carboxylase in the bundle sheath.
C. continues at lower CO_2 level than in C_3 plants.
D. CO_2 released from RuDP (ribulose diphosphate) is transferred to PEP.

A 48. The diagram below shows a cut across a portion of a green non woody stem with a vascular bundle. It may be reasonably concluded that:



A. starch would be found in the cells of area III.
B. area II differentiated from protoderm.
C. area IV was stained red of safranin.
D. area V was interfasicular cambium.

A 49. The diagram below is a longitudinal section of a flowering plant. What is the type of pollination?



A. self-pollination by pollen from staminate flower to pistillate flower of the same flower.
B. transfer of pollen from staminate flower to pistillate flower of other flowers on the same plant.
C. wind-pollination.
D. insect-pollination.

A 50. Two similar plants of a species of angiosperm grew under different amount of sunlight.
Plant I received full sunlight. Plant II received only seven percent sunlight. Both plants were grown in the same type of soil, and received equal amounts of water and the necessary mineral ions. At the end of the experiment, transverse sections were prepared from the leaves of each plant and examined under a microscope. The features seen in a typical section for each plant are illustrated below.
It is reasonable to suggest that:

A. the rate of photosynthesis of plant I is less than the rate of respiration for plant II.
B. the rate of respiration of plant I is less than the rate of respiration for plant II.
C. the rate of photosynthesis of plant II is equal to the rate of respiration.
D. the high concentration of light intensity decreases cellular respiration of plant I.

A 51. DELETED

A 52. The difference between cyanobacteria (blue-green algae) and the other algae groups (red, brown and green algae) is marked by the fact that:

A. cyanobacteria are only found in marine habitats.
B. cyanobacteria always have flagella.
C. cyanobacteria never are diploid.
D. cyanobacteria always use H_2S for their photosynthesis.

A 53. Diatoms (Bacillariophyta) can reproduce asexually through the process of template formation of silica-plate boxes (epitheca - hypotheca). As a result, most of the newly formed boxes will decrease in size and ultimately lead to unviable small cell sizes. This problem is avoided:

A. through the fact that during sexual reproduction the zygote will increase in size before formation of new silica plates.
B. through conjugation (fusion of the content of two small cells into one large cell).
C. through the fusion of two small silica plates into one larger silica plate.
D. through the fusion of four small silica plates into one larger silica plate.

A 54. Where does the embryo in flowering plants gets its energy from?

A. the haploid endosperm.
B. the tapetum layer.
C. the light that penetrates through the seed coat.
D. the albumen (triploid endosperm).

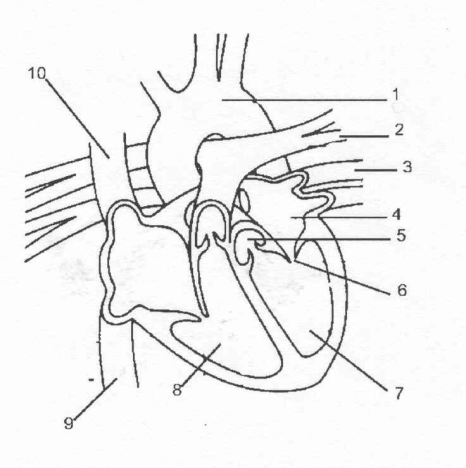
Animal anatomy and physiology

A 55. In fishes, auditory sensitivity rests on groups of ciliated cells of the labyrinth wall called neuromasts and attached to a heavy mass ($CaCO_3$ grains or a sort of stone, called otoliths). Neuromasts register movements of the otoliths relative to the labyrinth wall. Underwater sounds are transmitted in the form of pressure waves that do not result in important water molecules displacements. Selachian Sandry otoliths are less efficient than Teleostean ones, which consist in little stones. Choose the group of fishes provided with the best auditory device:

A. no particular group.
B. teleosts which possess a gas bladder.
C. fishes swimming near the surface of seas and lakes.
D. skates.

A 56. Here is a diagram of the mammalian heart. Through which of the following does oxygenated blood enter the heart?

A. 1.
B. 2.
C. 3.
D. 10.



A 57. Which of the following statements is correct?

A. all veins carry blood flowing to the heart.
B. all veins carry oxygenated blood.
C. all veins carry deoxygenated blood.
D. arteries are larger than their corresponding veins.

A 58. The taste quality detected by taste buds located on the posterior third of the tongue is:

A. sweet.
B. acid.
C. hot.
D. bitter.

A 59. Erythrocytes of man with blood group A are mixed with blood plasma of another man. No agglutination is observed. It can be concluded that the blood group of the plasma donor is:

A. only B.
B. A or 0.
C. A or AB.
D. A, B or 0.

A 60. The use of stimulant drugs, as cocaine or amphetamine, evokes, among other effects, a state of intense nervous excitation. Which one of the following sentences related to these drugs **could not** explain their effect?

A. their structure is such that they link to the CNS dopamin recep tors.
B. they are less efficiently metabolized by the organism, than the neurotransmitter they mimic.
C. they contain an amino group, just as dopamine and adrenaline.
D. their affinity for dopamine receptors is superior to that of the natur al neurotransmitter.

A 61. To elevate the level of circulating lactate dehydrogenase (an enzyme) in a rabbit, a scientist injects a solution of sodium lactate. One hour later he measures the actual lactate dehydrogenase activity in the muscles. Which physiological mechanism does he challenge in this experiment?

A. positive feed-back.
B. negative feed-back.
C. detoxification.
D. gene induction.

A 62. Essential oils from such aromatic plants as nutmeg contain large amounts of aromatic hydrocarbons which, upon simple addition of an amino

group, yield amphetamine derivates with hallucinogenic properties. This reaction has been accomplished in vitro with cellular homogenates converting a fraction of these essential oils to sympathomimetic compounds. The ingestion of large quantities of powdered nutmeg leads to an intoxication state reminding the amphetamine's effects, indicating that some conversion also occurs in vivo.

a) Which of the following enzymatic systems could be responsible for this?

A. oxydoreductases.
B. hydrolases.
C. transaminases.
D. kinases.

b) Where does this enzymatic activity mainly take place?

A. in the liver.
B. in the brain.
C. in the lung.
D. in the kidney.

A 63. In fish, inhibition of the ejection of the second polar body can be achieved by the application of a physical shock (pressure, temperature) at a precisely determined moment after fertilisation. The resulting embryos have two sets of DNA from the mother, and one from the father, and thus are triploid.

a). These individuals are sterile because,

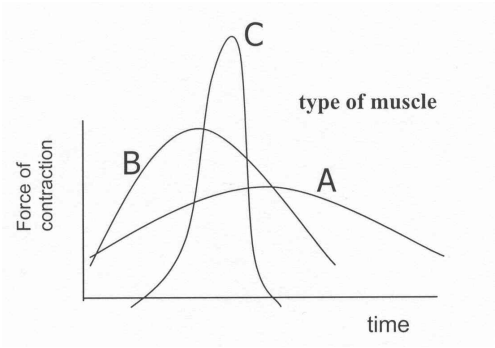
A. they have an odd chromosome number.
B. their sexual organs grow abnormally.
C. the spermatozoa are too big, and can't pass through the micropyle.
D. triploid individuals have an abnormal behaviour, and their aggressiveness doesn't allow the necessary proximity during mating.

b). Which mechanism does explain the effect (non-ejection) of the physi cal shock on the second polar body?

A. cytoskeleton desorganisation.
B. the denaturing of some enzymatic systems.
C. plasmic membrane rigidification.
D. disintegration of the polar body inside the oocyte cytoplasm.

A 64. The graph below represents the contraction patterns for three different kinds of muscles. Please match the correct sequence of patterns for smooth muscle, skeletal muscle and cardiac muscle respectively:

A. BAC.
B. CBA.
C. ABC.
D. ACB.



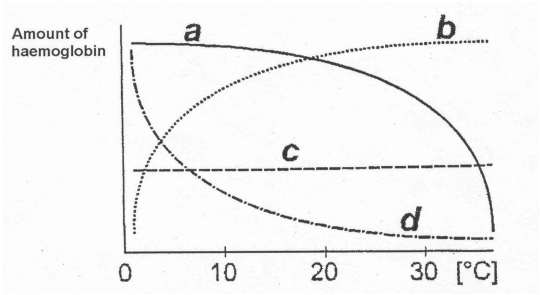
A 65. In an experiment designed to find what proportion of cabbage leaf material eaten by a caterpillar was converted into caterpillar biomass, it was observed that the caterpillar ate 2 cm^2 of leaf per day. In order to make an estimate of the conversion the following measurements were taken:

W. average dry weight / cm^2 of leaf similar to that eaten.
X. total weight of caterpillar faeces per day.
Y. dry weight of caterpillar faeces per day.
Z. weight of carbon dioxide produced per day.

Which of the following formulae would be the appropriate one to estimate the weight of cabbage leaf converted into caterpillar biomass?

A. W – X – Z.
B. W – Y – Z.
C. 2W – X – carbon content of Z.
D. W + X – Y.

A 66. The amount of dissolved oxygen in water changes when its temperature increases. The amount of haemoglobin in body liquids of aquatic vertebrates depends therefore also on the temperature of water in which animals live. Which of the curves of the graph describes these changes best?



A. curve a.
B. curve b.
C. curve c.
D. curve d.

A 67. Oxygen release from hemoglobin is caused and enhanced by:

A. low pO_2, low pH and low temperature in the tissues.
B. high pO_2, high pH and high temperature in the tissues.
C. high pO_2, low pH and low temperature in the tissues.
D. low pO_2, low pH and high temperature in the tissues.

A 68. When a person suffers severe trauma, such as a broken leg, which hormone mobilizes aminoacids, sugar and fats to be used in the long-term stress response?

A. acetylcholine.
B. cortisol.
C. aldosterone.
D. adrenalin.

A 69. DELETED

A 70. Of the following anatomical structures, which one is homologous to the wing of a bat?

A. the dorsal fin of a shark.
B. the arm of a human.
C. the pelvic fin of a fish.
D. the wing of a butterfly.

A 71. The plant-louse of oak trees is a small insect, stinging with its mouth parts into young branches and living on the sucked up liquid. How far do these lice sting into the branches?

A. into vessel areas outside from the cambium.
B. into the cambium.
C. they sting into the different areas depending on the tree's age.
D. the area depends on the louse's age and stage of development.

A 72. Which of these statements about reproduction in invertebrates is NOT correct?

A. many invertebrates have separated sexes.
B. many invertebrates utilise external fertilisation.
C. some invertebrates have structures that store sperm.
D. invertebrates do not engage in copulation.

Co-ordinators meeting

Ethology

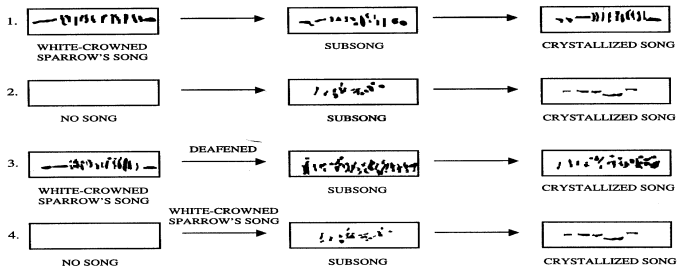
A 73. When a worker bee stings to defend itself, its sting often remains blocked in the enemy's flesh, which in turn causes bee's death. Assuming that defence is suicidal for a bee, how could you explain the persistence of such behaviour?

A. honey bees are naturally aggressive.
B. sometimes, the sting doesn't remain stuck in the opponent's flesh, and the bee can reuse it's weapon.
C. due to altruism.
D. because the bees which are more exposed to fighting enemies outside the hive are also the oldest ones and are thus near the end of their life expectancy.

A 74. Why are mammals often polygamous, whereas birds are frequently monogamous?

A. females available for mating are more frequent in mammals.
B. mammals, and not birds, display in leks.
C. external fertilisation in birds requires the presence of the male to avoid new-laid eggs to be fertilised by competitors.
D. breast-feeding by the females in mammals, but not in birds, makes males investment in brood care less necessary.

A 75. P. Marler has carried out many experiments to determine the role of the genes (inheritance) and the environment (learning) in song acquisition in males of the white-crowned sparrow *Zonotrychia leucophrys*. His results are shown in the following illustration:

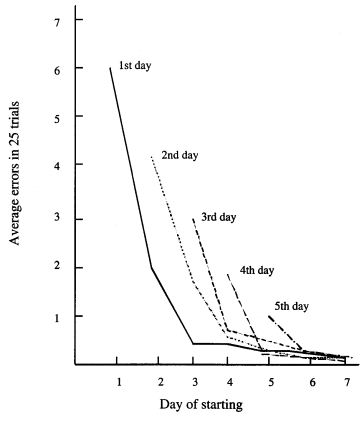


1. normal course of development : the bird hears its species' song while young (first 50 days), and initially produces a subsong, which crystallises into the final adult song characteristic of the species.
2. the juvenile bird is isolated from the sound of all songs.
3. the juvenile bird is allowed to hear normal songs during the first 50 days after birth, but is then deafened.
4. the juvenile bird is isolated from the sound of all songs during the first 50 days. It then receive songs of its own species.

What can you conclude from these experiments?

A. hearing the song of its own species is sufficient to develop a normal song.
B. young adults must hear the song of an adult male and need to train themselves to reproduce it correctly.
C. chicks must hear the song of an adult male and need to train themselves before developing a normal song ; learning is only possible if chicks hear the song during a critical period of 50 days following birth.
D. singing does not require any learning and develops according to a maturation process.

A 76. As shown below, as soon as a domestic hen chick hatches it starts pecking at grains that look like food, and as it grows older its aim at food grain improves. Note that if a chick is prevented from pecking at food during its second day, it will still be better at pecking on its third than on its first day ; however, it will not be as accurate as it would have been if it had been allowed to practice. What are the necessary mechanisms for the development of an accurate pecking in chicks?



A. accurate pecking develops following maturation of the nervous system.
B accurate pecking develops by learning allowing the chicks to dis - tinguish between alimentary items.
C. both processes of maturation and learning are involved in accurate pecking.
D. there is a critical period - ranging from day 1 to day 7 - during which the chicks learn how to peck food on the ground.

A 77. Passerine birds may produce different types of sounds and alarm calls. The songs of males birds differ between species. Basically, they have two main functions : defending the territory and attracting/stimulating females to mate. Alarm calls are emitted when birds spot a dangerous predator flying over. Alarm calls when a hawk flies over stimulate other nearby birds to take action to escape. Whereas the songs of male birds are different between species, alarm calls of several species sound similar i.e., they share certain common acoustic properties. How do you explain this cross-species similarity of alarm calls?

A. there is a convergent evolution of alarm calls because their acoustic properties make the call difficult to locate.
B. there is a convergent evolution of alarm calls because their acoustic properties allow the caller to locate precisely the predator flying over.
C. there is a convergent evolution of alarm calls with simple acoustic properties, because simple alarm calls are easily and rapidly learned by young birds.
D. predators escape when hearing long calls, because such calls are also emitted by their own predators.

A 78. DELETED

Genetics - Evolution

A 79. In cats, black colour is caused by an X-linked allele; the other allele at this locus causes orange colour. The heterozygote is tortoise-shell. What kind of offspring would you expect from the cross of a black female and an orange male?

A. tortoise-shell female; tortoise-shell male.
B. black male; orange female.
C. tortoise-shell female; orange male.
D. tortoise-shell female; black male.

A 80. A man is brought to court in a paternity case. His blood type is B, Rh positive. The mother blood type is B, Rh negative. The child's blood type is A, Rh negative. What can be said about the man's chances of being the father?

A. he is not the father.
B. he might be the father.
C. he is the father.
D. he might not be the father.

A 81. The fact that all seven of the garden pea traits studied by Mendel obeyed the principle of independent assortment means that:

A. the haploid number of garden peas is 7.
B. the formation of gametes in plants is obtained by mitosis only.
C. the seven pairs of alleles determining these traits behave as if they were located on different chromosomes.
D. seven pairs of alleles determining these traits are located on the same pair of homologous chromosomes.

A 82. Given the parents AABBCc x AabbCc, with simple dominance and independent assortment for each of the three characters. What proportion of the progeny will be expected to phenotypically resemble the first parent?

A. 1/4.
B. 3/4.
C. 1/8.
D. 3/8.

A 83. Two true-breeding stocks of garden peas are crossed. One parent had red, axial flowers, and the other had white, terminal flowers. In F1 all individuals had red, axial flowers. If 1000 F2 offspring resulted from the

cross and assuming independent assortment, how many of them would you expect to have red, terminal flowers?

A. 190.
B. 65.
C. 250.
D. 550.

A 84. Three babies were recently mixed up in a hospital. After consideration of the data below, which of the following represents the correct baby/parent series of combinations?

Couple	I	II	III
Blood groups	A and A	A and B	B and O
Baby	1	2	3
Blood groups	B	O	AB

A. I-3, II-1, III-2.
B. I-1, II-3, III-2.
C. I-2, II-1, III-3.
D. I-2, II-3, III-1.

A 85. There is good evidence for linkage when:

A. two genes occur together in the same gamete.
B. a given gene is associated with a specific phenotype.
C. genes do not segregate during meiosis.
D. a single gene influences two traits.

A 86. Genes A and B are linked 12 map units apart. A heterozygous individual, whose parents were Aabb and aaBB, would be expected to produce gametes in the following frequencies:

A.	44 % AB	6 % Ab	6 % aB	44 % ab
B.	6 % AB	44 % Ab	44 % aB	6 % ab
C.	12 % AB	38 % Ab	38 % aB	12 % ab
D.	6 % AB	6 % Ab	44 % aB	44 % ab

A 87. The Darwinian fitness of an individual is measured by:

A. the number of its offspring that survive to reproduce.
B. the number of mates it attracts.
C. its physical strength.
D. how long it lives.

A 88. Among the various mice dihybrid crosses indicated below, which one will give the best chance to obtain in one litter a mouse with genotype AABb:

A. AaBb x AaBb.
B. AaBb x AABb.
C. AABB x aaBb.
D. AaBb x AaBB.

A 89. Two individuals are differing by one character. When crossed together all the offsprings belong to the parental phenotypes. Which of the following ratios between the two observed phenotypes seem in accordance with the hypothesis of a single gene difference (monogenic trait):

A. 421/416.
B. 862/281.
C. 762/435.
D. 1201/304.

A 90. Considering an animal strain, which is pure for a particular trait:

A. crossing of individuals from such a strain will not allow further selection of variants for that trait.
B. offspring from such crossing experiments will consist exclusively in homozygotes at any locus considered, including the locus re sponsible for the particular trait.
C. crossing is rendered impossible because sterility invariably arises.
D. crossing of individuals from such a strain is a way to obtain hy brids for that trait.

A 91. Phenylketonuria (PKU) is a genetic disease caused by a recessive mutation. If both parents are heterozygous for the gene, what is the probability for a normal child to be heterozygous?

A. 0.
B. 1/2.
C. 2/3.
D. 3/4.

A 92. How many different kinds of gametes can a trihybrid produce, considering that only independent assortment occurs during meiosis (no crossing over)?

A. 4.
B. 8.
C. 2 x 23.
D. 6.

A 93. Suppose you are able to observe under the microscope the total number of meiosis occurring in one gonad of a given individual and to outnumber exactly the crossovers between two given loci for which that individual is dihybridic. If the frequency of these particular crossovers is 100% (that is to say that every meiosis exhibits one crossing over between the two loci you consider) you anticipate that the total percentage of recombinant gametes would be equal to:

A. 100 %
B. 50 %
C. 25 %
D. 12.5 %

A 94. The sequence of a variant of the human globin protein shows a difference at aminoacid number 40 and another difference at aminoacid number 60 as compared to the normal protein. The number of nucleotides between the two point mutations in the DNA of the corresponding gene is necessarily:

A. a multiple of 3.
B. a multiple of 20.
C. at least 60.
D. at least 57.

A 95. A tomato plant that is heterozygous for a gene that makes stems purple or green and also for a gene that makes foliage hairy or hairless is test crossed to a green hairless plant and the 500 progeny are outnumbered as follows: 42 purple, hairy; 202 purple, hairless; 209 green, hairy; 47 green, hairless. The distance (in cM or m.u.: map units) between these genes is:

A. 17.8 cM.
B. 35.6 cM.
C. 8.9 cM.
D. 89 cM.

A 96. DELETED

A 97. Which of the following statement is in agreement with the Hardy-Weinberg law:

A. in a climax ecosystem, energy flow is constant.
B. in a panmictic population, the allele frequencies remain constant from one generation to another.
C. individuals are taller under high latitudes.
D. in a population, the mutation frequency compensates the selection pressure.

A 98. As we go from ferns through gymnosperms to angiosperms, the following evolutionary trend can be observed:

A. an increasing dominance of the sporophyte and a reduction of the gametophytic generation.
B. an increasing dominance of the gametophyte developing vessels and sieve tube elements with companion cells in angiosperms.
C. an increasing dominance of the sporophyte developing tracheids and sieve cells with albuminous cells in angiosperms.
D. an increasing dominance of the sporophyte while the gametophyte remains unaltered.

A 99. During Paleozoic era, tree forms are especially dominant during:

A. Silurian.
B. Devonian.
C. Carboniferous.
D. Permian.

Ecology

A 100. In a big lake under temperate climate, the temperature drop in winter provokes:

A. a mixing of the mineral nutrient.
B. the migration of phytoplancton.
C. a thermal stratification.
D. a strong mortality of fishes.

A 101. DELETED

A 102. Soil and cave animals share some common features: which of the following is not correct?

A. a reduction of pigmentation.
B. a reduction of visual performances.
C. a reduction of all sensory organs.
D. an adaptation to constant abiotic conditions.

A 103. Which ecological unit incorporates abiotic factors?

A. community.
B. ecosystem.
C. population.
D. species.

A 104. While local conditions such as heavy rainfall or the removal of plants limits the amount of nitrogen, phosphorus, or calcium available to a particular ecosystem, the amount of carbon available to the system is seldom a problem. The reason therefore is:

A. that organisms do not need very much carbon.
B. that plants can make their own carbon using water and sunlight.
C. that many nutrients come from the soil, carbon comes from the air.
D. that plants are better at absorbing carbon from the soil.

A 105. DELETED

A 106. DELETED

A 107. DELETED

A 108. DELETED

A 109.

1. all autotrophic organisms are also phototrophic.
2. of the total light energy reaching the atmosphere, only about 1 % is utilised in photosynthesis.
3. light intensity and quality changes vertically through a forest canopy.
4. light intensity and quality changes vertically through a water column.

Which of the above combination of sentences is correct?

A. 1,3,4.
B. 2,3,4.
C. 3,4.
D. 1,2,3,4.

A 110. Which of the following factors tends to be the most important factor controlling primary productivity in the oceans?

A. solar radiation.
B. temperature.
C. dissolved oxygen.
D. nutrients.

A 111. A uniform pattern of dispersion is likely to be found in which type of habitats and under what condition?

A. homogeneous distribution of essential resources, high population density.
B. heterogeneous distribution of essential resources, high population density.
C. homogeneous distribution of essential resources, low population density.
D. heterogeneous distribution of essential resources, low population density.

A 112. The cultural eutrophication of lakes often reduces the oxygen content to a risky level. The main reason for this excessive oxygen reduction is:

A. the oxygen consumption of plants.
B. the oxygen consumption of fishes.
C. the oxygen consumption of decomposers.
D. the oxidation of nitrates and phosphates.

A 113. " Corals" are marine cnidarians. Those building coral reefs live in shallow and translucent water. They contain Zooxanthellae symbiotic algae in their endoderm. The following chemical reactions may help you:
$6CO_2 + 6\ H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
$Ca(HCO_3)_2 \rightarrow CaCO_3 + H_2O + CO_2$
Which of the four following propositions isn't correct?

A. reef corals get exogenous food by several different ways (cnidoblasts, contact digestion, angling with mucous filaments).
B. reef corals "help" their symbiotic algae by giving them amino acids and glucose and receive from them glycerol and growth vitamins.
C. reef corals of the euphotic zone have lost cnidoblasts and do not need any longer because their zooxanthellae cover all their needs.
D. the carbon dioxide used for precipitating $CaCO_3$ results from zooxanthellae.

Biosystematics

A 114. Which of the following metazoan groups is characterised by a bilateral symmetry?

A. hydrozoa.
B. porifera.
C. cephalochordata.
D. echinodermata.

A 115. DELETED

A 116. Indicate which of the following cavities has a coelomic origin:

A. pulmonary cavity.
B. bladder cavity.
C. peritoneal cavity.
D. uterine cavity.

A **117.**
I. Odonata - Hymenoptera.
II. Coleoptera - Orthoptera.
III. Orthoptera - Homoptera.
IV. Hemiptera - Coleoptera.
V. Lepidoptera - Mecoptera.

In which of the above insect orders do the anterior (front) and posterior (rear) pairs of wing have different structures and are mouthparts of the chewing type?

A. only II.
B. I and II.
C. only III.
D. IV and V.

A 118. Of the following statements, mark the one, that is a characteristic feature of reptiles:

A. dry skin with epidermal derivatives and cutaneous respiration.
B. respiration only with lungs and stable body temperature.
C. development includes laying of eggs and a caterpillar stage.
D. a respiratory system which includes trachea and lungs with a faveolus.

A 119. Mark the incorrect statement about sponges:

A. their skeletons consist of calcium, silicon dioxide or spongin needles.
B. they gain food by phagocytosis.
C. all known sponges live in seas or oceans.
D. sponges can host many symbiotic species.

A 120. To which family does a plant with the following characteristics belong: 5 basely connate sepals, 5 free petals, many stamens, and a superior gynoecium consisting of 5 fused carpels?

A. Solanaceae.
B. Rosaceae.
C. Cactaceae.
D. Ranunculaceae.

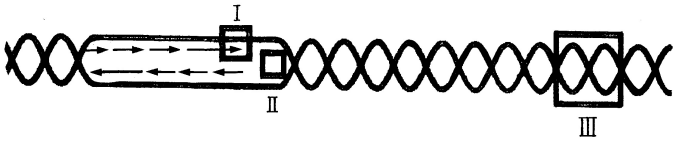
A 121. DELETED

Sssst...Concentration during the theoretical test

Theoretical Test - Part B

Cell biology

B 1. [3 points] The diagram pertains to the replication of double-stranded DNA. DNA shown with *arrows* indicates the newly synthesized strands and the direction of replication.
Match each site of action with the appropiate enzyme.



1. Telomerase.
2. DNA topoisomerase.
3. DNA polymerase.
4. DNA helicase.
5. DNA ligase.

☐ this enzyme functions at the square marked **I** on the diagram.

☐ this enzyme functions at the square marked **II** on the diagram.

☐ this enzyme functions at the square marked **III** on the diagram.

B 2. [6 points] The two compartments (A and B) of a tank contain each one liter of solution and are separated by a membrane whose permeability characters are to be identified.
One has placed in A: 300 g heparin (MW: 6000)
in B: 22.5 g formamide (MW: 45) and 5.8 g NaCl (MW: 58).
At equilibrium, a small rise in liquid level is observed in compartment A.
Mark your answer by putting an **X** in the appopriate box.

a) At the start of the experiment, the molar concentration in compartment A is equal to:

☐ 0.05 molar.

☐ 0.5 molar.

☐ 2 molar.

☐ 5 molar.

b) At the start of the experiment, the molar concentration in compartment B is equal to:

- ☐ 0.2 molar.
- ☐ 0.5 molar.
- ☐ 0.6 molar.
- ☐ 0.7 molar.
- ☐ 2.1 molar.

c) According to the results of the experiment, what are the conclusions that can be made concerning the permeability characteristics of the membrane that was used?

- ☐ the membrane is permeable to compounds that have a molecular weight lower than 6000 daltons.
- ☐ the membrane is permeable only to molecules that are not ionised.
- ☐ the membrane is permeable only to molecules that are ionised.
- ☐ the membrane is only permeable to water.

d) At the final equilibrium, the concentration of formamide in compartment B:

- ☐ will be unchanged.
- ☐ will be decreased by half.
- ☐ will be doubled.
- ☐ will be impossible to calculate.

e) With respect to the molecules that have been placed in the two sides of the container, this membrane:

- ☐ has the same permeability characteristics as the plasma membrane of a red blood cell.
- ☐ is more permeable than the plasma membrane of the red blood cell.
- ☐ is less permeable than the plasma membrane of the red blood cell.

☐ has the same permeability characteristics as as the plasma membrane of a onion cell.

☐ has the same permeability characteristics as the plasma membrane of a red blood cell and a onion cell.

f) What would happen if a few red blood cells were placed in compartment B at the beginning of the experiment?

☐ they would all explode.

☐ some would swell while others would explode.

☐ they would all shrink.

☐ some would shrink while others be normal.

☐ they would have a normal shape and size.

B 3. [6 points] The bacterium *Escherichia coli* adapts to lactose present in his medium by means of the lactose operon. Cytoplasmic components used for the function of this operon are randomly distributed among boxes of the following table. Each component is designated by a number.

1. β-galactosidase gene
2. Repressor
3. Operator
4. Lactose
5. Lactose-permease
6. Repressor messenger RNA
7. Regulator gene
8. Promotors
9. Lactose-permease gene
10. Plasmic membrane
11. RNA polymerase
12. Ribosomal apparatus
13. Transacetylase gene (lacA)
14. Transacetylase
15. β-galactosidase
16. Glucose
17. Messenger RNA, β-galactosidase, permease and transacetylase
18. Galactose

What are the elements present in the cytoplasm of the bacteria growing on a medium without lactose (put an **X** in the appopriate boxes).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

B 4. [5 points] Match each item in column A with one in column B to which

it is most closely associated. (Put the corresponding numbers of column B in the boxes in front of column A).

	Column A	Column B
☐	A. leucoplasts	1. Krebs cycle
☐	B. rough ER	2. bacterial DNA anchorage
☐	C. genome	3. microtubule-organizing center
☐	D. mitochondria	4. protein modification and targeting
☐	E. centriole	5. complete set of genetic instructions
☐	F. mesosome	6. starch storage
☐	G. lysosome	7. immunoglobulin
☐	H. microfilament	8. lipid synthesis
☐	I. smooth ER	9. digestive enzymes
☐	J. Golgi apparatus	10. cytoskeleton

B 5. [2 points] Mannitol / salt agar is a culture medium that contains a high salt (NaCl) concentration, mannitol (a fermentable sugar) and a chemical pH indicator that is yellow at acidic conditions and red at alkaline conditions. (Acids are released when microorganisms ferment mannitol). This medium also contains other carbohydrates that allow growth of nonfermenting, halophilic organisms (i.e nonfermenting organisms that tolerate high salt concentrations). Nonhalophilic organisms will not grow on mannitol / salt agar.

For each of the following situations, assume that the organisms described are the only organisms involved.
Place the number of the term in front of the box of the sentence that best describes the way the medium is being used.

1. selective medium
2. differential medium
3. both selective and differential medium
4. neither selective nor differential medium

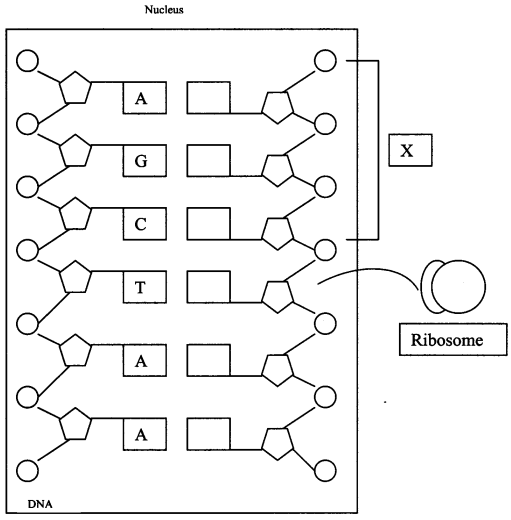
☐ onto mannitol salt agar you inoculate a halophilic fermenter, a halophilic mannitol nonfermenter and a nonhalophilic mannitol fermenter.

☐ onto mannitol salt agar you inoculate a halophilic mannitol fermenter and a halophilic mannitol nonfermenter.

☐ onto mannitol salt agar you inoculate a halophilic mannitol nonfermenter that is pigmented yellow, and a halophilic mannitol nonfermenter that is pigmented red. These two organisms show the same pigmentation (yellow and red, respectively) on a general purpose medium such a nutrient agar.

☐ onto mannitol you inoculate a halophilic mannitol nonfermenter and a nonhalophilic mannitol fermenter.

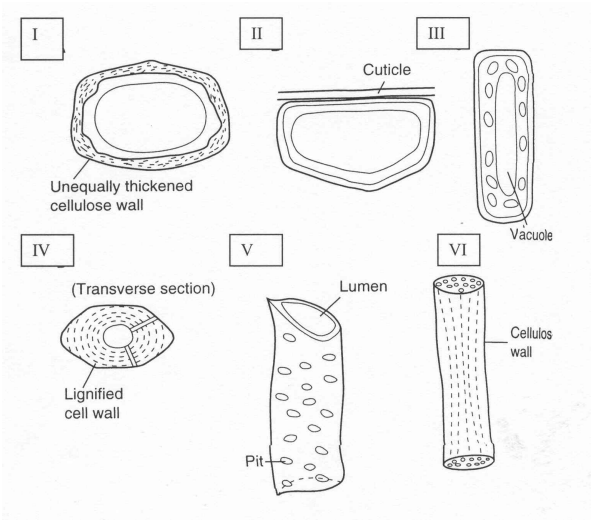
B 6. [1 point] The diagram below represents a function of the nucleic acid, DNA. Based on the diagram, what is the most likely nucleotide sequence of the messenger RNA. Put an X in the appropriate box.



A	U	T	T	T
G	C	C	C	U
C	G	G	G	G
T	A	A	U	A
A	U	T	T	T
A	U	T	T	T
☐	☐	☐	☐	☐

Plant anatomy and physiology

B 7. [3 points] Observe the diagrams I to VI illustrating different types of plant cells and identify the cell types. Match the numbers in front of the cell types (A-F) with the figures.

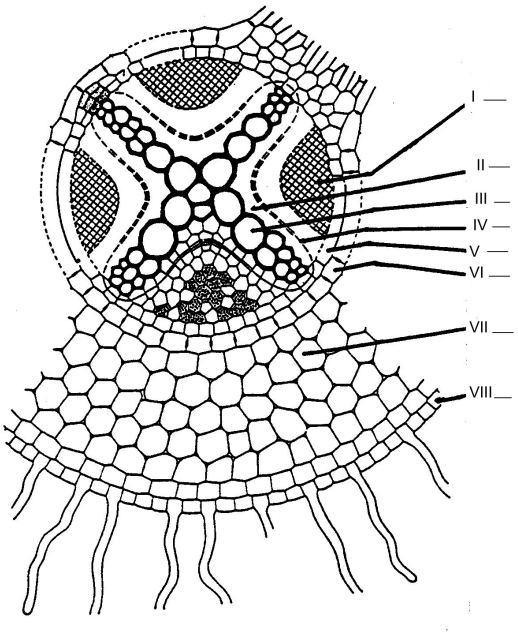


- ☐ A. sieve tube.
- ☐ B. collenchyma.
- ☐ C. sclereid.
- ☐ D. xylem vessels.
- ☐ E. epidermis.
- ☐ F. palisade cell.

B 8 A drawing of a cross-section of a (dicot) root is presented and 4 questions (a, b, c and d) relate to this figure. In this drawing several tissues and cell types have been marked (with a letter). A list of tissues and cell types have been numbered (1-14).

a)[4 points] Match the number with the markings on the drawing.

1. collenchyma
2. xylem
3. cortex
4. phloem
5. companion cells
6. mesophyl
7. trichome
8. pericycle
9. endodermis
10. cambium
11. epidermis
12. xylem parenchyma
13. root cap
14. pollen tube



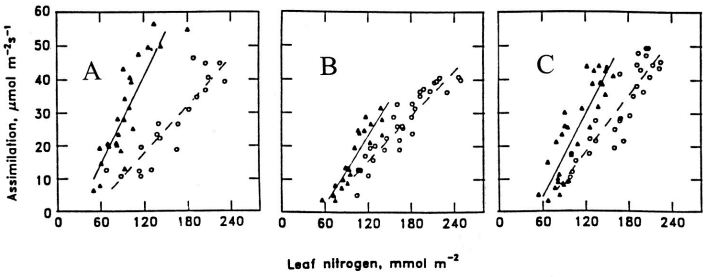
b) [5 points] Nutrients are taken up from the soil or from nutrient solution and translocated to the aerial parts of the plant.

☐ which tissue (in the figure above) translocates the nutrients from root to shoot? Mark the correct roman number in the box.

☐ in this part of the root some cells contain suberine (cork-like substances). Which cells do contain suberine? Mark the correct roman number in the box.

☐ the (dicot) root, depicted in the figure contains dead cells. Which ☐ cells in this section are dead? Mark the correct roman numbers ☐ in the boxes.

B 9. The relationship between light saturated photosynthetic rate of single leaves and organic leaf nitrogen in two plant species (represented by open circles and solid triangles) is presented in 3 graphs (A, B and C) below. Photosynthesis was measured at three temperatures: 20 °, 27 ° and 34 °C. One of the two plant species used is a C_3 plant, the other a C_4 plant.



a) [1 point] Which symbol represents the C_4 plant, ○ or ▲
Mark the correct answer with a cross in the appropriate box.

☐ ○

☐ ▲

b) [3 points] Which temperature corresponds to which graph?
Mark the right combination with crosses in the appropriate boxes.

	20 °C	27 °C	34 °C
A	☐	☐	☐
B	☐	☐	☐
C	☐	☐	☐

B 10. [1 point] Even when starving, snails still stay green for some time. Only after longer periods of starving they take up a brown-yellowish color. Scientists investigated the weight loss (wl) of starving snail. Which results could they have observed comparing starving green (gr) with starving brown-yellow (by) snails? Mark your answer with a **X** in the box.

☐ wl(gr) = 0 ; wl(by) > 0

☐ wl(gr) > 0 ; wl(by) = 0

☐ wl(gr) > 0 ; wl(by) > 0

☐ wl(by) > wl(by) > 0

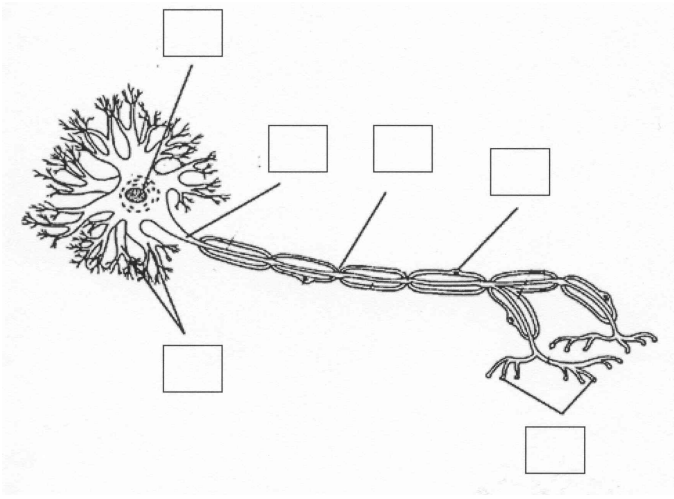
B 11. [5 points] Match the terms numbered 1,2,3 with the phrases under column A

	A	B
☐	contain palisade parenchyma	**1.** roots
☐	possess a cuticle	**2.** stems
☐	possess a pronounced periderm	**3.** leaves
☐	contain an x-shaped central core of xylem	
☐	modified to a potato	
☐	contain Casparian strips	
☐	modified to a carrot	
☐	contain an atactostele	
☐	contain growth rings	
☐	modified to corms (e.g. *Crocus*)	

B 12. DELETED

Animal anatomy and physiology

B 13. [3 points] Write down the correct code on the lines of the drawing.



Code

1. Ranvier node.
2. nucleus.
3. dendrites
4. axon initial segment.
5. Schwann cell.
6. terminal button.

B 14. [1 point]

1. most of the invertebrates neurons are not myelinated.
2. myelin sheats wrap the full length of the axon except in its end and in the Ranvier nodes.
3. there are no ribosomes neither in the axons nor in the nerve endings.
4. some neurons of the nervous system don't have any axon.

From the list above,which is the correct combination of statements?

- ☐ 1, 2, 3
- ☐ 2, 4
- ☐ 1, 3, 4
- ☐ all are correct.

B 15. [4 points] Choose a word or phase from the right column which is related to each word or phrase in the left column by placing a number in front of the word or phrase in the blank space in front of each word or phrase on the left (each word can be used only once).

☐ macrophage	**1.** yellow marrow
☐ specific receptor on a B cell surface	**2.** contains large number of granules
☐ cytokines	**3.** astrocyte
☐ site of differentiation for lymphocytes	**4.** oligodendrocyte
☐ neutrophil	**5.** microglia cell
☐ a major protein in plasma	**6.** complement
☐ target of HIV virus	**7.** B cell
☐ fat tissue inside a bone	**8.** antibody
☐ macrophage in brain	**9.** chemicals secreted by several types of cell in immune system
	10. T cell
	11. peptides and proteins
	12. spleen or thymus
	13. bone marrow
	14. albumin

B 16. DELETED

B 17. [1 point] Two types of muscles participate in the locomotion of an earthworm. When moving forward, the earthworm first squeezes the front segments into a long tube (I) and than drags its back part (II). Which muscles are contracted (C) and relaxed (R) in I and II respectively?

	I Longitudinal muscles/circular muscles	II Longitudinal muscles/circular muscles
☐	R/C	R/C
☐	R/C	C/R
☐	C/R	C/R
☐	C/R	R/C

B 18 [1 point] Which substance does not usually appear in the glomerular filtrate of mammals?

- ☐ urea
- ☐ glucose
- ☐ amino acids
- ☐ plasma proteins

B 19 [1 point] Several parts of the body are involved in the transmission of a stimulus. Which of the following represents the correct sequence as a stimulus is carried along the reflex pathway?

- ☐ sense organ; efferent neuron; spinal cord; afferent neuron; muscle/gland
- ☐ muscle/gland; efferent neuron; spinal cord; afferent neuron; sense organ
- ☐ sense organ; afferent neuron; spinal cord; efferent neuron; muscle/gland
- ☐ sense organ; afferent neuron; efferent neuron; spinal cord; muscle/gland

B 20. [5 points] Types of nonspecific defense mechanisms.
Indicate whether each of the following is a general (G) physical (P) chemical (C) or biological (B) defense mechanism by putting a «X» in the appropriate boxes.

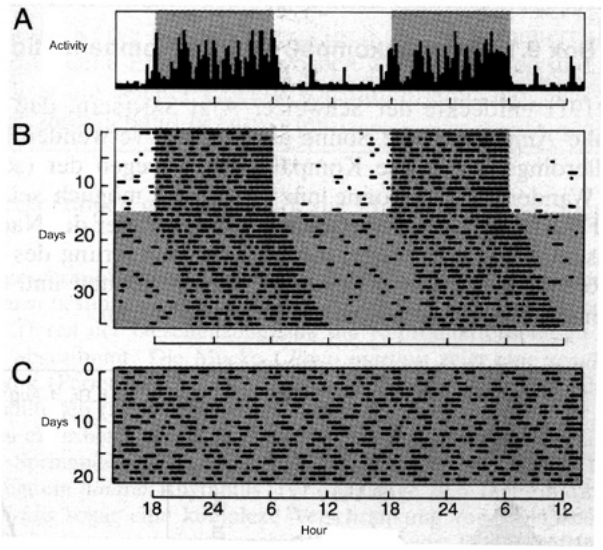
	General G	Physical P	Chemical C	Biological B
Skin	☐	☐	☐	☐
Interferon	☐	☐	☐	☐
Gastric acid	☐	☐	☐	☐
Mucociliary Blanket	☐	☐	☐	☐
Inflammation	☐	☐	☐	☐
Fever	☐	☐	☐	☐
Lysozyme	☐	☐	☐	☐
Phagocytosis	☐	☐	☐	☐
Bile	☐	☐	☐	☐
Urine	☐	☐	☐	☐

Relaxing at the Campus of the Vrije Universiteit Brussel after the theoretical test

Ethology

B 21. DELETED

B 22. [1point] The following diagrams show the circadian rhytmic activity of rats. The gray background represents dark phases.
Diagram 1: single record of locomotive activity within 48 hours
Diagram 2: summary activity over a period of 35 days
Diagram 3: activity of an arythmic rat after destruction of the Nucleus suprachiasmaticus



From the given information one can conclude that a normal rat has an endogenous period of rythmicity of:
Put a **X** in the appropriate box.

- ☐ less than 24 hours
- ☐ exactly 24 hours
- ☐ more than 24 hours
- ☐ the period varies strongly
- ☐ there is not enough information for a conclusion

Genetics - evolution

B 23. [3 points] Consider the following set of eight hybridised human-mouse cell lines:

Cell line \ Chromosome	1	2	6	9	12	13	17	21	X
A	+	+	-	q	-	p	+	+	+
B	+	-	p	+	-	+	+	-	-
C	-	+	+	+	p	-	+	-	+
D	+	+	-	+	+	-	q	-	+
E	p	-	+	-	q	-	+	+	q
F	-	p	-	-	q	-	+	+	p
G	q	+	-	+	+	+	+	-	-
H	+	q	+	-	-	q	+	-	+

Each cell line may carry an intact (numbered) chromosome (+), only its long arm (q), only its short arm (p), or it may lack the chromosome (-).
The following human enzymes were tested for their presence (+) or absence (-) in cell lines A-H.
Identify the chromosome carrying each enzyme locus. Where possible, identify the chromosome arm.

Enzyme	Cell line A	B	C	D	E	F	G	H
☐ Steroid sulphatase	+	-	+	+	-	+	-	+
☐ Phosphogluco-mutase-3	-	-	+	-	+	-	-	+
☐ Esterase D	-	+	-	-	-	-	+	+
☐ Phosphofructo-kinase	+	-	-	-	+	+	-	-
☐ Amylase	+	+	-	+	+	-	-	+
☐ Galactokinase	+	+	+	+	+	+	+	+

B 24. [2 points] A certain haploid fungus is normally red due to a carotenoid pigment. Mutants were obtained that were different colours due to the presence of different pigments: orange ($?^-$), pink (P^-), white (W^-), yellow (Y^-), and beige ($?^-$). Each phenotype was inherited as if a single gene mutation governed it. To determine what these mutations signified, double mutants were constructed with all possible combinations, and the results were as follows:

Mutations:		P^-	W^-	Y^-	B
B	-	pink	white	yellow	beige
P^-	-	-	white	pink .	pink .
W^-	-	-	-	white	white
Y^-	-	-	-	-	yellow

a) Determine the sequence of the five mutations in pathway of pigment biosynthesis. Mark with **X** correct answer.

☐ $P^- - Y^- - B^- - O^- - W^-$

☐ $Y^- - P^- - B^- - W^- - O^-$

☐ $W^- - P^- - Y^- - B^- - O^-$

☐ $O^- - B^- - Y^- - P^- - W^-$

b) Determine the sequence of the colour intermediates in the biochemical pathway of pigment biosynthesis. Mark with **X** correct answer.

☐ white, pink, yellow, beige, orange, red

☐ orange, pink, yellow, white, beige, red

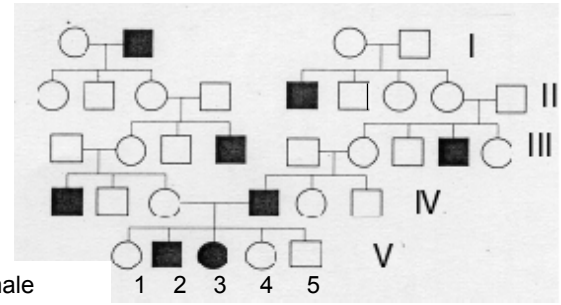
☐ beige, white, orange, pink, yellow, red

☐ white, orange, yellow, pink, beige, red

B25. [4 points] Match each item in column A with one in column B to which it is most closely associated. Mark the corresponding numbers of column "B" in boxes on the left side of column "A".

	Column A	Column B
☐	A. 5—bromouracil	1 translation termination
☐	B. alternative form of a gene	2 intercalating agent
☐	C. auxotroph	3 substitution one amino acid for another
☐	D. ethidium bromide	4 chromosome aberration
☐	E. nonsense mutation	5 substitution one purine for pyrimidine
☐	F. missense mutation	6 nutritional mutant
☐	G. inversion	7 base analog
☐	H. transversion	8 allele

B 26. [3 points] Study the following pedigree of a trait which has 100% penetrance.



○ : unaffected female
● : affected female
□ : unaffected male
■ : affected male

a) The probable mode of inheritance of this trait is:

- ☐ X-linked dominant
- ☐ autosomal recessive
- ☐ X-linked recessive
- ☐ autosomal dominant

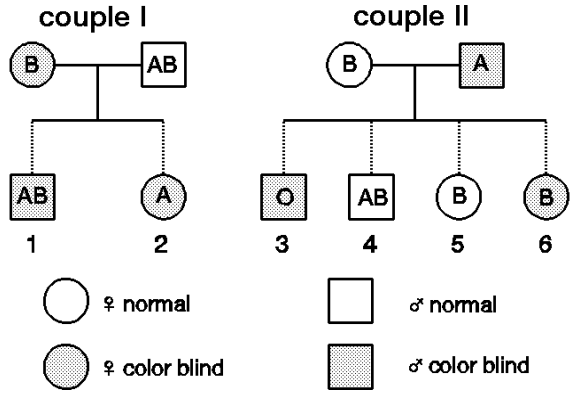
b) What are the genotypes of the mother and father of V-3?

- ☐ Aa and a/Y
- ☐ AA and AA
- ☐ aa and A/Y
- ☐ Aa and Aa

c) If the individual V-2 marries a homozygous normal person, what is the probability that their first child will be a carrier?

25 %	100 %	50 %	0
☐	☐	☐	☐

B 27. [1point]Three alleles are determining the ABO-blood groups: I^A, I^B and i. Colour blindness is caused by a recessive X-chromosomal allele. Inspect the following family trees where colour blindness and blood groups have been indicated.



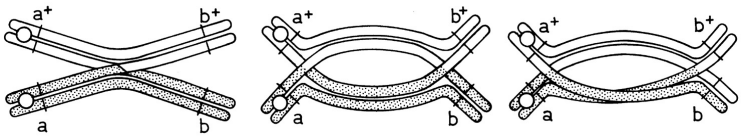
Directly after birth a baby of couple I must have been changed with a baby of couple II. Indicate the numbers of the changed babies.

Answer: …….. & ……...

B 28. [1 point] A dominant gene , A, causes yellow coat colour in rats. The dominant allele of another independant gene , R, produces black coat colour. When the two dominants occur together, they interact to produce gray. When the two recessives interact, they produce cream colour. A mating between a gray male and a cream female produced a litter in which 3/8 of the off-spring were yellow, 3/8 were gray, 1/8 were black and 1/8 were cream. If the genotype of the female was “aarr”, what was the genotype of the male?

- ☐ AARR
- ☐ AaRr
- ☐ AaRR
- ☐ AARr
- ☐ Aarr

B 29. [1 point] What are the frequencies of recombinant chromatids for the genes a and b if single crossing over, double crossover between two chromatids and double crossover between three chromatids take place as shown in the figure below?



	Crossing over	Double crossing over between 2 chromatids	Double crossing over between 3 chromatids
☐	25 %	50 %	75 %
☐	50 %	50 %	75 %
☐	50 %	0 %	50 %
☐	75 %	25 %	0 %

Ecology

B 30. [1 point] The growth of an animal population depends on the biological characteristics of the individuals within such as: life expectancy, fecundity (number of births given by a female during its life), the duration of the reproductive period, the distribution of the fecundity along the female age, the development time (the time between birth and thelaying of the first egg) and the age at the first egg laying. Moreover, the age structure of the population (i.e. the distribution of the age according to the age pyramids will influence the way these characteristics will be expressed.
Let us consider two populations A and B. Which one of these two populations will undergo the more rapid growth in relationships with the following statements, all other elements being constant?

☐ population A is mostly composed of young individuals whereas population B is characterised by a stable age structure.

- ☐ inside population A, females reached sexual maturity two times faster than B however females from B survived 1/3 longer.
- ☐ in population A female fecundity is uniformly distributed during all their life, whereas for B it is concentrated at the beginning of adult life.
- ☐ in population B female fecundity is two times higher than in A but life expectancy is two times shorter than in A.

B 31. [1 point] Social Hymenoptera (such as ants, social bees and wasps) are characterised by the frequent repetition of altruistic behaviours between individuals. This altruism may even lead to the death of some individuals such as soldiers. These behaviours are more frequent between close relatives. Reproduction in Hymenoptera is quite special as it relies on haplo-diploid parthenogenesis. This means that an unfertilised egg gives birth to a haploid male while a fertilised egg produces a diploid female. Under these conditions calculate (in %) the mean degree of relatedness between:

- ☐ a female and her daughter
- ☐ a female and her son
- ☐ two sisters
- ☐ a sister and her brother
- ☐ an aunt and her niece

B 32. [1 point] In order to measure the biodiversity in tropical forest, the following experiments was undertaken. A canopy tree was isolated using a plastic sheet before fumigation with an insecticide. All insects killed were collected.(this experiment was conducted by Terry Erwin and his staff from Smithsonian Institution, Panama). Investigators mostly concentrate on Coleoptera. They collected 1200 species. By studying that group, they observed that 20 % of phytophagous Coleoptera were specific of that tree's species. They concluded that each tree species in tropical forest welcomes 160 species of Coleoptera that are specific of the tree considered. Knowing that 40 % of the insect species already described on earth are Coleoptera they infer that, in average, each tree harbours 400 insect species. In tropical forest, only 2/3 of the insect are living in the canopy. Thus if the tree is taken in its totality (branches, trunk, roots, etc.) it would shelter 600 insect species.

Finally, as presently 50.000 tree species are identified in tropical forest, the total number of insect species should be of 30.000.000. Less than one million of insect species are actually described meaning that we know a very little part of the total earth biodiversity. Which among the following propositions is **not** correct?

- ☐ 30 millions of insects is an underestimation as it does not take into account species living in other countries.
- ☐ 30 millions is an overestimation as most tree species share common species.
- ☐ this experiment does not give an overall view because it is too limited in space and time but it just showed that we are lacking data on biodiversity.
- ☐ 0 millions is an overestimation as it does not take into account the species already described.

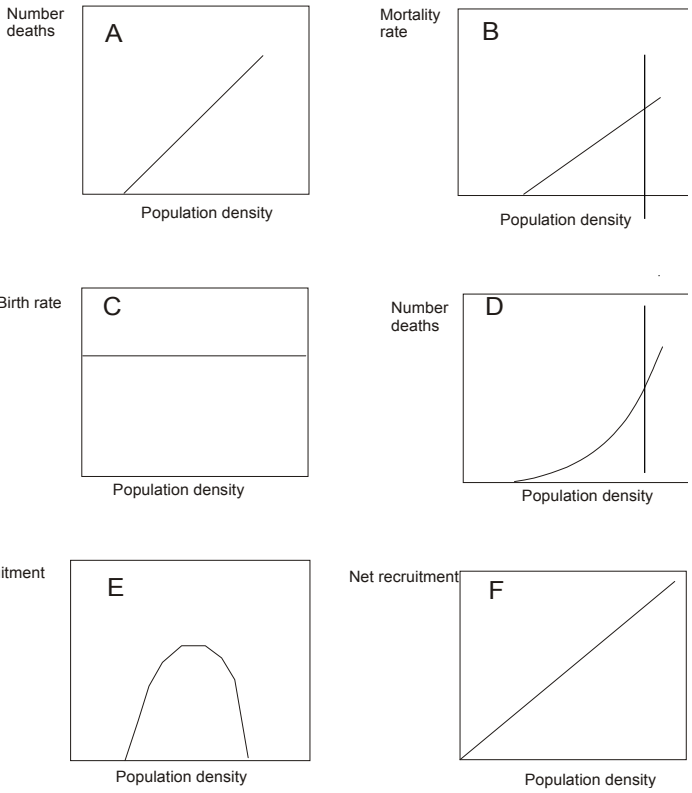
B 33. DELETED

B 34. DELETED

B 35. DELETED

B 36. [6 points**]** For each figure answer YES or NO to the following question: Does the figure show that population density is affected by birth or death rates, thereby representing a mechanism able to regulate population's size.

YES	NO	
☐	☐	A.
☐	☐	B.
☐	☐	C.
☐	☐	D.
☐	☐	E.
☐	☐	F.


Number deaths
A
Population density
Mortality rate
B
Population density
Birth rate
C
Population density
Number deaths
D
Population density
Net recruitment
E
Population density
Net recruitment
F
Population density

Biosystematics

B 37. [4 points] The following table contains a list of some cellular structures and processes. Make a comparison between Eubacteria, Archaeobacteria and Eucaryotes by making a cross (X) in appropriate boxes of the table, if these structures/processes are present in those domains.

Cellular structures and processes	**Eubacteria**	**Archaeobacteria**	**Eucaryotes**
RNA	☐	☐	☐
Introns	☐	☐	☐
Ribosomes	☐	☐	☐
Mitochondria	☐	☐	☐
Diploid stages	☐	☐	☐
Chlorophyll-based	☐	☐	☐
Photosynthesis	☐	☐	☐
Methanogenesis	☐	☐	☐
Nitrogen fixation	☐	☐	☐

B 38. [5 points] Among the members of the Animal Kingdom, some have body cavities, some do not. The following animals (1 - 9) possess different types of body cavities.

1. Rotifers
2. Gastropods
3. Insects
4. Sponges
5. Nematodes
6. Corals
7. Oligochaetes
8. *Planaria*
9. Sea anemones

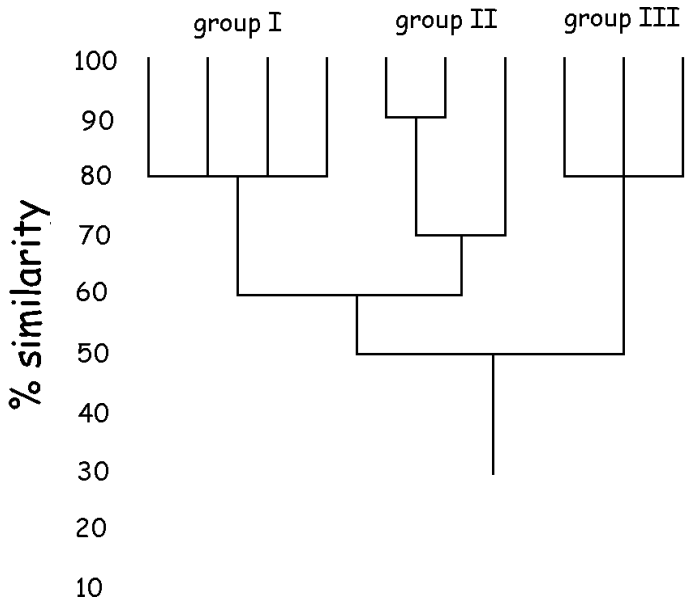
Identify which animals of the list above belong to what group of body cavity by filling in the blanks with the corresponding numbers. Each group may have more than one related animal.

- ☐ Animals with true coeloms (coelomates)
- ☐ Animals with pseudocoeloms (pseudocoelomates)
- ☐ Animals with no coeloms (acoelomates)
- ☐ Animals with gastrovascular cavities
- ☐ Animals with spongocoel

B 39. [3 points] Taxonomical classification of organisms can be realised in different ways.
One method is to take in consideration selected characteristics of a number of organisms and construct a grid (data matrix) showing the percentage of similarity between these characteristics.
An example of such a similarity matrix of 10 organisms 1 to 10 is:

1	100									
2	54	100								
3	80	55	100							
4	63	57	62	100						
5	62	57	64	74	100					
6	81	55	85	63	64	100				
7	50	86	51	56	56	54	100			
8	83	56	86	65	67	87	54	100		
9	50	87	50	56	56	52	85	54	100	
10	61	56	62	90	72	65	55	67	55	100
	1	2	3	4	5	6	7	8	9	10

Based on this matrix it is possible to produce a tree like diagram showing one group of four related organism (group I), one group of three (two + one) related organisms (group II) and another group of three organisms (group III) in the following way:



Indicate which organisms belong to group I, II and III:

Group I:.....

Group II:.....

Group III:.....

B 40. [5 points] Every insect Order is characterised by a specific structure and function of wings.

Insects	Order	Number
dragonflies	Odonata	1.
grasshoppers	Orthoptera	2.
lice	Anoplura	3.
beetles	Coleoptera	4.
flies	Diptera	5.

Complete the following statements by filling in the spaces, with the number of the appropriate insect order.

☐ similar in size non-foldable fore wings and hind wings with netlike venation are characteristic for individuals of the order.

☐ sclerotised fore wings and membranous hind wings with netlike venation are characteristic for individuals of the order.

☐ secondary reduced wings combined with protruding-sucking mouth parts are characteristic for ectoparasitic individuals of the order.

☐ hard fore wings having a protection function and membranous hind wings are characteristic for individuals of the order.

☐ membranous fore wings and hind wings transformed into halters having a function of stabilisation during flight are characteristic for individuals of the order.

The test is over, unstress yourself

Answer Key to the Theoretical Part A

A 001	D	A 041	A	A 081	C
A 002	D	A 042	D	A 082	B
A 003	B	A 043	C	A 083	A
A 004	D	A 044	C	A 084	D
A 005	C	A 045	D	A 085	C
A 006	C	A 046	A	A 086	B
A 007	D	A 047	C	A 087	A
A 008	A	A 048	C	A 088	B
A 009	C	A 049	D	A 089	A
A 010	C	A 050	C	A 090	A
A 011	A	A 051	Deleted	A 091	C
A 012	D	A 052	C	A 092	B
A 013	B	A 053	A	A 093	B
A 014	D	A 054	D	A 094	D
A 015	D	A 055	B	A 095	A
A 016	D	A 056	C	A 096	Deleted
A 017	C	A 057	A	A 097	B
A 018	B	A 058	D	A 098	A
A 019	B	A 059	C	A 099	C
A 020	C	A 060	C	A 100	A
A 021	A	A 061	D	A 101	Deleted
A 022	D	A 062	D/D	A 102	C
A 023	D	A 063	A/A	A 103	B
A 024	B	A 064	D	A 104	C
A 025	C	A 065	B	A 105	Deleted
A 026	B	A 066	B	A 106	Deleted
A 027	D	A 067	D	A 107	Deleted
A 028	D	A0 68	B	A 108	Deleted
A 029	A	A 069	Deleted	A 109	B
A 030	D	A 070	B	A 110	D
A 031	Deleted	A 071	A	A 111	C
A 032	D	A 072	D	A 112	C
A 033	C	A 073	C	A 113	C
A 034	B	A 074	D	A 114	C
A 035	D	A 075	C	A 115	Deleted
A 036	C	A 076	C	A 116	C
A 037	A	A 077	A	A 117	A
A 038	Deleted	A 078	Deleted	A 118	D
A 039	Deleted	A 079	D	A 119	C
A 040	C	A 080	A	A 120	B
				A 121	Deleted

Answer Key to the Theoretical Part B

B01		3, 4, 2
B02	a	0.05 molar
	b	0.6 molar
	c	answer 4
	d	answer 4
	e	answer 5
	f	answer 3
B03		1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 16
B04		6, 7, 5, 1, 3, 2, 9, 10, 8, 4
B05		3, 2, 4, 1
B06		UCGAUU
B07		VI, I, IV, V, II, III
B08	a	4, 12, 2, 10, 8, 9, 3, 11
	b	III, VI, III
B09	a	▲
	b	B, C, A
B10		answer 4
B11		3, 3, 2, 1, 2, 1, 1, 2, 2, 2
B12		Deleted
B13		upper: 2, 4, 1, 5 lower: 3, 6
B14		All are correct
B15		8, 9, 12, 2, 14, 10, 1,5
B16		Deleted
B17		R/C C/R
B18		Plasma proteins
B19		answer 3
B20		**G**: fever **P**: skin, mucociliary **C**: interferon, gastric, Lysozyme, bile, urine **B**: inflammation, phagocytosis
B21		Deleted
B22		answer 3
B23		Xp, 6q, 13q, 21, 1p, 17q
B24	a	answer 3
	b	answer 1
B25		7, 8, 6, 2, 1, 3, 4, 5
B26	a	answer 3
	b	answer 1
	c	50%
B27		2 & 5
B28		answer 2
B29		50 %, 0%, 50%
B30		A, A, B, B
B31		50, 50, 75, 25, 12,5
B32		answer 1
B33		Deleted
B34		Deleted
B35		Deleted
B36		Yes: B, D, E No: A, C, F
B37		Line 1: X, X, X Line 2: - , X, X Line 3: X, X, X Line 4: - , - , X Line 5: - , - , X Line 6: X, - , X Line 7: - , X, - Line 8: X, X, -
B38		2/3/7, 5, 8, 6/8/9, 4
B39		Group I: 1/3/6/8 Group II: 10/4/5 Group III: 7/9/2
B40		3, 5, 2, 1, 4

Who are the winners? Gold, silver and bronze medals are being awarded.

Individual Results and Medals Awarded

Minister F.-X. de Donnea presents a gold medal to the first laureate Ms. Thanissara Chansakul from Thailand.

Family name	First name	Country	Score%	FinalRank
GOLD MEDALS				
Chansakul	**Thanissara**	**Thailand**	**88,28**	**1**
Lin	Yen-Yu	Taiwan	86,16	2
Chang	Albert	Taiwan	82,89	3
Licheuski	Uladzimir	Belarus	82,03	4
Amini	Sasan	Iran	81,66	5
Lee	Sang Moon	Korea	80,91	6
Tong	Yi	China	80,52	7
Usenkanov	Nurmuhammed	Kyrgyzstan	80,18	8
Singh Ahluwalia	Preetpaul	India	80,16	9

Wei	Yifeng	Singapore	79,77	10
Liao	Yajing	China	79,15	11
Lekprasert	Parawee	Thailand	79,03	12
Jeong	Choong Won	Korea	78,89	13
Rychard	Wojciech	Poland	78,42	14
Lee	Dong Hun	Korea	78,28	15
Lu	Li	China	78,03	16
Teo	Shiyi	Singapore	78,03	16

SILVER MEDALS

Oyardi-Zanjanie	Leila	Iran	76,80	18
Zheng	Ia-Jian	Taiwan	76,79	19
Michaïlov	Ivan	Russia	76,30	20
Truong	Liem	Vietnam	76,16	21
Huang	Fu	Taiwan	76,15	22
Anuwatworn	Amornpol	Thailand	76,06	23
Nicolov	Luchezar	Bulgaria	75,81	24
Tsibulko	Yuri	Ukraine	75,78	25
Ng	Priscilla	Singapore	75,77	26
Fullwood	Melissa	Singapore	75,67	27
Makarenko	Viatcheslav	Russia	75,18	28
Kukharenka	Aliaksandr	Belarus	74,41	29
Sîrbulescu	Ruxandra	Romania	74,31	30
Redondo	Leandro	Argentina	73,92	31
Berezhnoi	Nikolay	Kazakhstan	73,06	32

Jühe	Stephan	Germany	72,92	33
Vijayvergia	Namrata	India	72,92	34
Gailtte	Ieva	Latvia	72,55	35
Nichikov	Yuri	Ukraine	72,17	36
Cristea	Emilian	Romania	71,43	37
Misane	Maija	Latvia	71,05	38
Choi	Jae Myung	Korea	70,77	39
Zakaria	Rasheed	UnitedKingdom	70,55	40
Loukianova	Galina	Russia	70,41	41
Chandra	Nilesh	India	70,30	42
Haapala	Antti	Finland	70,07	43
Davidson	Fiona	United Kingdom	69,56	44
Agarwal	Shikhar	India	69,42	45

BRONZE MEDALS

Achixmin	Iaroslav	Russia	68,42	46
Zawadka	Konrad	Poland	68,40	47
Tesitel	Jakub	Czech rep.	68,30	48
Yanouski	Aliaksandr	Belarus	68,04	49
Madera	Ewa	Poland	67,68	50
Abtahi	Shahab	Iran	64,05	51
Nabian	Mohammad-Hossein	Iran	67,55	52
Novotny	David	Czech rep.	67,50	53
Nguyen	Hoang Chau	Vietnam	67,43	54

Slatyer	Tracy	Australia	67,39	55
Deinum	Eva	Netherlands	67,28	56
Matilainen	Merja	Finland	67,18	57
Nguyen	Anh Vu	Vietnam	66,92	58
Preativatanyou	Kanok	Thailand	66,79	59
Fechner	Peter	Germany	66,43	60
Jansta	Petr	Czech rep.	66,23	61
Popovych	Olena	Ukraine	66,20	62
Pelser	Maaike	Netherlands	66,20	63
Wu	Wei	China	66,16	64
Bur	Stephanie	Germany	65,73	65
Meisgen	Florian	Germany	65,57	66
Custo Greig	Luciano	Argentina	65,30	67
Sergin	Ismail	Turkey	65,04	68
Lee	Min-Zhao	Australia	65,03	69
Yerokhin	Maxim	Kazakhstan	64,79	70
Saarnio	Jussi	Finland	64,76	71
Icheva	Vanya	Bulgaria	64,57	72
Babitski	Miroslav	Belarus	64,41	73
Akkaya	Münir	Turkey	64,39	74
Sedman	Laura	Estonia	64,18	75
Chan	Kenneth	Australia	64,18	76
de Groot	Reinoud	Netherlands	64,06	77
Droppa	Michal	Slovakia	63,97	78
Castillejos	Armando	Mexico	63,69	79

Burkaliova	Daryna	Ukraine	62,81	80
Terzi	Nihal	Turkey	62,41	81
Eriksson	Rickard	Sweden	62,33	82
Kadlec	Tomas	Slovakia	62,11	83
Thornton	Simon	United Kingdom	61,83	84
Bekakhmetov	Gabit	Kazakhstan	61,68	85
Benito	Dario	Argentina	61,32	86
Jappr	Ignasius Aditya	Indonesia	61,19	87
Howie	Jennifer	United Kingdom	60,59	88
Baldi	Andrew	Australia	60,43	89
Nguyen	Kim Nu Thao	Vietnam	60,28	90
Baltkalne	Martina	Latvia	60,21	91
Mierzynska	Joanna	Poland	60,03	92

OTHER PARTICIPANTS

Siyayev	Dastanbek	Kyrgyzstan	59,34	93
Padioukova	Tatiana	Sweden	59,33	94
Dagdas	Yasin Fatih	Turkey	58,17	95
Niculescu	Dragos	Romania	57,96	96
Doyle	Tomas	Ireland	57,95	97
Pizica	Baiba	Latvia	57,83	98
de Jong	Johan	Netherlands	57,71	99
Sibuea	Meirosa	Indonesia	57,44	100
Florea	Florina	Romania	57,33	101
Zabala Morales	Cintia	Argentina	57,32	102

Rahmanov	Amangeldi	Turkmenistan	56,96	103
O'Brien	Mark	Ireland	56,82	104
Kubesova	Magdalena	Czech rep.	56,35	105
Joachimsson	Carl-Olof	Sweden	55,94	106
Roddy	Karen	Ireland	54,72	107
Liiv	Ingrid	Estonia	54,49	108
Amanidinova	Gulnaz	Kyrgyzstan	54,09	109
Kerekes	Arpad	Slovakia	53,46	110
Cavadov	Orhan	Azerbaidjan	53,23	111
Wittocx	Johan	Belgium	52,58	112
Martin	Turjak	Slovenia	52,26	113
Nurili	Fuad	Azerbaijan	51,75	114
Yunus	Junaedy	Indonesia	51,70	115
Vysna	Veronika	Slovakia	51,60	116
Leppämäki	Mika	Finland	51,23	117
Monoshev	Rasul	Kyrgyzstan	50,84	118
Dzhendov	Todor	Bulgaria	49,58	119
Kambarov	Yerkebulan	Kazakhstan	49,31	120
Muhammet Nazarov	Ihlas	Turkmenistan	49,12	121
Peter	Knaflic	Slovenia	49,11	122
Preem	Jens-Konrad	Estonia	48,95	123
Maddens	Bert	Belgium	48,86	124
Green	Judith	Ireland	48,85	125
Somleva	Desislava	Bulgaria	47,97	126
Gaskov	Mikk	Estonia	47,72	127

Simeonova	Marina	Switzerland	45,63	128
Mas'ngud	Mochamad	Indonesia	45,35	129
Lauters	Pascaline	Belgium	44,75	130
Schueep	Christof	Switzerland	44,24	131
Kormann	Urs	Switzerland	43,73	132
Silva Tinoco	Ruben	Mexico	43,51	133
Blaz	Gindiciosi	Slovenia	43,36	134
Olofsson	Gabriel	Sweden	42,85	135
Enkhjargal	Damsinsuren	Mongolia	42,27	136
Alfeeli	Mohammad	Kuwait	42,12	137
Ruzicka	Nicolas	Belgium	41,86	138
Ayala Orozco	Ciceron	Mexico	40,35	139
Cevadzade	Tural	Azerbaijan	39,02	140
Velazquez Valadez	Ulises	Mexico	38,98	141
Chinbayar	Bat-Ochir	Mongolia	38,78	142
Jana	Podojstersek	Slovenia	38,53	143
Hasan	Yaser	Kuwait	38,53	144
Memmedov	Resat	Azerbaijan	37,97	145
Lienhard	Daniel	Switzerland	37,64	146
Hocageldiyev	Dayanch	Turkmenistan	35,04	147
Boland	Hajar	Kuwait	31,91	148
Norov	Davaasuren	Mongolia	29,80	149
Bukalif	Fatma	Kuwait	25,78	150
Bolortuya	Ulziibat	Mongolia	25,67	151

Results and Statistical Analysis

Catherine Dehon & Catherine Vermandele,
Université Libre de Bruxelles

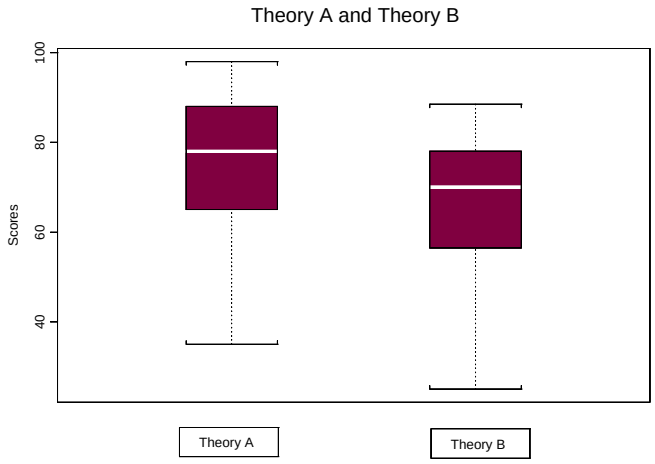
Theoretical section

The first table presents some statistics summarising information on the theoretical section, part A (multiple-choice questions). The second table refers to the theoretical section, part B (open questions). Each table is divided up according to the seven subjects.

	Number of questions	Possible maximum	Observed maximum	Observed minimum	Mean	Relative mean (percentage)	Median	Standard deviation	CV	Correlation with theory A
Theory A	**108**	**108**	**98**	**35**	**75,64**	**70,03**	**78,00**	**14,82**	**19,60**	**1,00**
Cell biology	33	33	32	8	24,87	75,36	26,00	4,89	19,67	0,89
Plant anatomy and physiology	16	16	16	5	11,11	69,41	11,00	2,78	25,02	0,85
Animal anatomy and physiology	19	19	19	3	12,91	67,93	13,00	3,28	25,43	0,86
Ethology	5	5	5	0	3,57	71,39	4,00	1,11	31,18	0,56
Genetics - Evolution	20	20	20	5	14,17	70,86	15,00	3,41	24,07	0,84
Ecology	9	9	9	0	5,09	56,51	5,00	1,57	30,94	0,58
Biosystematics	6	6	6	0	3,93	65,45	4,00	1,45	36,85	0,60

	Number of tasks	Possible maximum	Observed maximum	Observed minimum	Mean	Relative mean (percentage)	Median	Standard deviation	CV	Correlation with theory B
Theory B	**33**	**99**	**88,5**	**25**	**66,06**	**66,73**	**70,00**	**15,63**	**23,66**	**1,00**
Cell biology	6	20	20	1,5	15,12	75,61	16,00	3,46	22,88	0,80
Plant anatomy and physiology	5	19	19	3,5	13,98	73,60	14,50	3,27	23,37	0,80
Animal anatomy and physiology	6	11	11	2	8,41	76,49	9,00	1,77	21,03	0,80
Ethology	1	1	1	0	0,40	40,40	0,00	0,49	121,47	0,18
Genetics - Evolution	7	15	15	0	9,57	63,82	10,00	3,91	40,83	0,85
Ecology	4	16	14	0	8,25	51,57	8,00	3,02	36,64	0,70
Biosystematics	4	17	16	0	10,31	60,65	11,50	3,87	37,57	0,86

The maximum mark obtained by students in part A was 98 out of 108 (the theoretical maximum score), while for part B the maximum was 88.5 out of 99. This clearly shows that the level of difficulty of the theoretical section was adequate for correctly distinguishing the best students. Moreover, taking the sample as a whole, the theoretical tests achieved a good spread of the students, as we can easily see by looking at the range, which for part A goes from 35 (the minimum observed) to 98, and for part B from 25 (minimum observed) to 88.5. The quality of the spread in the two parts was also measured by the root mean square deviation and the variation coefficient. On average, students did better in part A than in part B, but the difference was not significant. The relative mean, based on a theoretical maximum of 100, was 70 % for the multiple-choice questions and 66.73 % for the open questions. The median, with slightly higher values, leads to the same conclusions. The box plots below demonstrate clearly that part B was more difficult than part A. Nevertheless, the spreads of students in the two theoretical tests were similar.



Now let us look at part A subject by subject. Apart from Cell Biology, at least one student obtained the maximum score in each. For Ethology, Ecology, and Biosystematics, some students scored the minimum, zero. As to level of difficulty, Cell Biology seems to have been the easiest, with a relative mean of 75.36 %. Ecology, however, showed a relative mean of only 56.1 % and for Biosystematics it was 65.45 %.

To measure coherence across the different subjects, we calculated the correlations between the total marks for part A of the theoretical section and the marks obtained in each subject. It seems that Ethology, Ecology, and Biosystematics diverged slightly from the other four subjects. The respective correlations were only 56%, 58 %, and 60 %, whereas for the other subjects they reached at least 84 %.

Let us recall that part A is made up of multiple-choice questions. So it was natural to check whether the answer most often chosen by the students was in fact the correct one. Of the 108 questions considered, only in 9 cases was this not the case: questions 25 (Cell Biology), 49 (Plant), 61 (Animal), 77 (Ethology), 91 (Genetics), and questions 100, 101, 111, and 113 (Ecology). So we proceeded to check that this was due to a real pitfall and not to a question that was badly formulated. In order to do this, we divided the students into 3 groups of comparable size based on the final results (both theory and practice): a strong group (50 students), a middle group (50 students), and a weak group (51 students). We then calculated the number of correct answers in each of the 3 groups for the 9 questions under examination.

IBO without Qu	Nb of students	Qu25	Qu49	Qu61	Qu77	Qu91	Qu100	Qu110	Qu111	Qu113
Good	50	18	35	18	25	22	19	25	14	12
Mean	50	9	16	13	12	15	18	16	18	18
Weak	51	6	10	9	17	12	7	6	23	10
Total		33	61	40	54	49	44	47	55	40

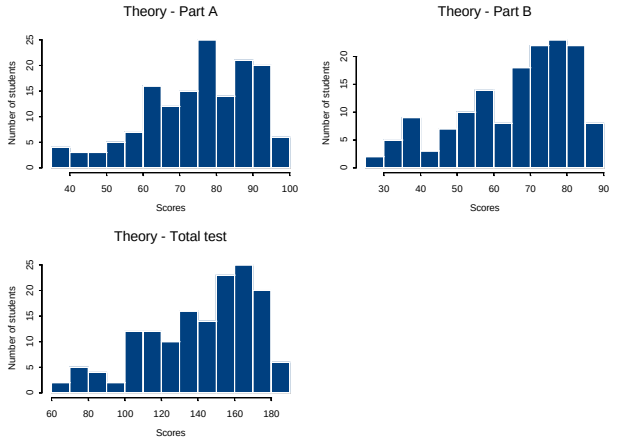
The results in the table above show clearly that only question 111 was problematical, for which reason it was decided to scrap it.

As to part B, the relative means revealed 3 types of performance:

- Cell Biology, Plant, and Animal, with a relative mean of between 73 and 77 %
- Genetics and Biosystematics, with a relative mean of between 60 and 64 %
- Ecology, with 51.5 %, and Ethology, with 40.4 %.

This raises a question about the pertinence of the Ethology questions. But this subject contained just one question where only 40% of the students answered correctly, which explains the low relative mean. Apart from the particular case of Ethology, for all other disciplines the coherence with part B was excellent, as all correlations were above 70 %.

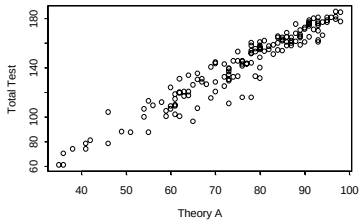
In order to make it easy to visualise the distribution of the students for the two tests separately, as well as for the theoretical section as a whole (parts A and B), we produced these three histograms.

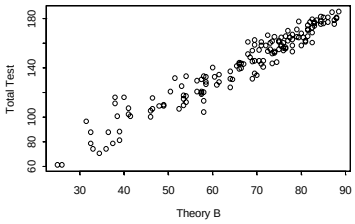


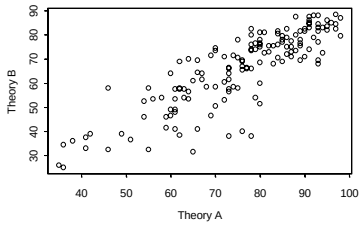
We can see on each of these three graphs that there is an asymmetry to the right, reflecting the fact that the weaker students have been better categorised than the strong ones.

The final graphics in this section demonstrate the coherence of the theo-

retical section in relation to the test as a whole (both theory and practice). It is clear from the following graphics that there is indeed a correspondence between the students with the best marks in theory and in total and the students with the lowest marks in theory and in total.







Practical section

The following table uses the same statistics as that analysed for the theoretical section, but this time the subdivisions are the four laboratories.

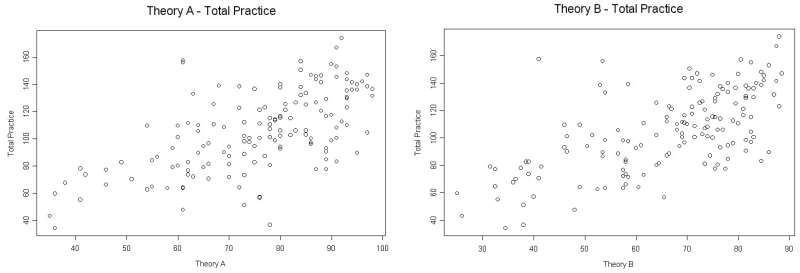
	Possible maximum	Observed maximum	Observed minimum	Mean	Relative mean (percentage)	Median	Standard deviation	CV	Correlation with practical test
Practical test	**195**	**174,0**	**34,0**	**105,25**	**53,97**	**105,50**	**29,18**	**27,73**	**1,00**
Lab. 1: Plant anatomy, morphology and taxonomy	50	48,0	3,5	27,30	54,61	26,50	10,38	38,00	0,75
Lab.2: Animal anatomy, morphology	50	50,0	0,0	30,75	61,49	35,00	14,28	46,43	0,77
Lab. 3: Plant pigment analysis	45	45,0	2,0	19,97	44,37	20,00	9,34	46,77	0,59
Lab. 4: Ethology	50	50,0	8,0	27,23	54,46	26,00	9,51	34,92	0,51

The maximum mark obtained for the four laboratories was 174 (the maximum observed) out of 195 (the theoretical maximum). On the other hand, if the laboratories are considered separately, it was only in lab 1 that no students obtained the maximum, the maximum observed being 48 out of 50. As for the minima, they were very low. The overall mean for the practical test was 53.97 %, which is considerably lower than the results of the theoretical test. The laboratory with the best marks was lab 2, with a relative

mean of 61.49 %. In contrast, the relative mean of lab 3 was below 50 % (44.37 %).
As to correlations between the results for the different laboratories and the practical test as a whole, the Ethology laboratory had the lowest correlation: 51%.

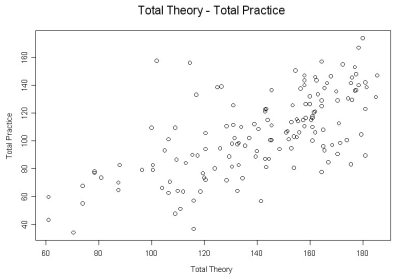
The connection between theory and practice

To study the coherence between the theoretical and practical sections, it seemed best to produce some graphics. First of all, we separated the two theoretical parts (A and B) in order to compare them to the marks for the practical section.



In these two graphics we can see that, for both parts A and B of the theoretical section, the linear linkage with the practical section is positive and quite strong. It should also be noted that there was a small group of students who obtained very good marks for practice but mean marks (4 students) or even weak ones (1 student) for part B of the theoretical section.

In the following graphic we have combined the theoretical parts.

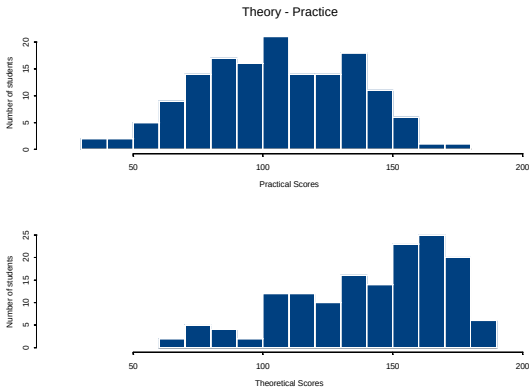


It is good to see that the linear linkage remains strong and positive between the marks obtained in the theoretical test and those obtained in the

practical test. Students who achieved very good marks in theory (160 or over) are spread over a considerable range when it comes to the practical test (from 80 to 174). The best total marks will thus be awarded to those students who have proven their merits both in theory and in practice. Once more it should be noted that there is a small group of students with good practical marks but inadequate marks in theory.

Ranking

The final ranking has for several years past posed a number of problems. The jury, wishing to give equal weight to the theoretical section and the practical section, is often unable to do so without modifying the marks obtained in the two sections. It is very difficult to set theoretical and practical examinations with the same degree of difficulty and the same spread, as we can see in the graphic comparing the theoretical and practical marks of this year's students.

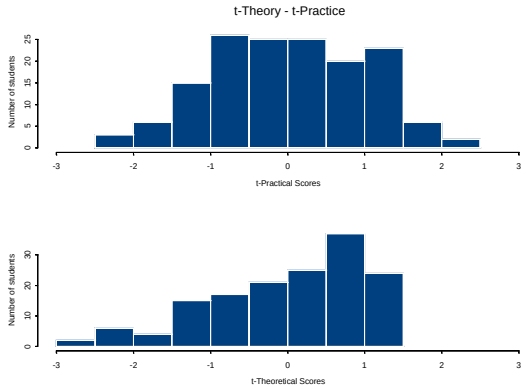


We can see clearly that the practical section was more difficult and that there is a better spread. For the theoretical section, however, we can see an asymmetry to the right, as already mentioned above.

Our basic idea, already discussed in advance, was to reduce the two distributions to a zero mean and a root mean square deviation equal to 1. For this purpose we designate as T and P the marks obtained by a student in theory and in practice. The modified marks for verifying the first two moments of the two distributions will be the reduced centred values, labelled t-Theory and t-Practice, given by:

$\frac{(T-\overline{T})}{s_T}$ and $\frac{(P-\overline{P})}{s_P}$

where $\overline{T}$ and $\overline{P}$ are respectively the medians observed for the theoretical and practical tests, and s_T and s_P are the root mean square deviations of these two tests.
These new marks are shown in the following graphic.



The name given to the score obtained as the sum of these two reduced centred values is the t-mark. These values are, however, not very intuitive, as they are about 95 % situated in the range –2 to 2. It is easier for both students and jury to be able to compare marks on a well-known scale. So we carried out a second modification, which is not based on the students' results, but on the maximum marks that a student could theoretically obtain. What we want is that a perfect student, that is, one who would obtain the maximum in both theory and in practice, would receive a mark of 100, and that a poor student, who had got a zero in both sections, would receive a mark of 0. These two constraints make it possible to obtain the two constants needed to arrive at an easily understood scale. So we multiply the t-marks by a constant and then add the value b, which gives us:

cc-mark = (t-mark . a) + b, or $a=\frac{100}{\frac{\overline{T}}{s_T}+\frac{\overline{P}}{s_P}}$ and $b=a(\frac{\overline{T}}{s_T}+\frac{\overline{P}}{s_P})$.

The cc-marks will fall between 0 and 100. The classification of the students was carried out on the basis of the cc-marks (cc-rank). This classification was exactly the same classification as that obtained on the basis of the initial marks, but the results of this new classification method were much less equal.

English test

Johan Peeters, K.U.Leuven

Aim and procedure

The following pages contain an abbreviated translation of a paper on the commented results of the 'English test' during the international Biology Olympiad 2001. It is the final part of a limited feasibility study of an English IBO-test by testing the influence of the language of the questions on students results. The study was conceived by the Belgian organisers of the IBO 2001 and was performed by a group of 4 students, under the guidance of Prof. M. Goethals, Faculty of Arts of the Katholieke Universiteit of Leuven, Belgium. A previous paper (not attached) "Pre-test bij de International Biology Olympiad" is referred to for the results and findings of a preliminary test (pre-test) and for suggestions for the final version of the actual test.
The test was made up of two parts. The first part included a selection of 16 multiple-choice questions in biology, similar to the questions of the theoretical part of the IBO competition. Half of those questions were in English, the second half in the native language. Every other participant received the first half in English and the second half in the native language, the other participants the other way round. The second part of the test contained questions for background information on linguistic difficulties and the knowledge of other languages.

Comparison with the experiment of the 9th IBO, Kiel, Germany (1998)

The differences between this test and a comparable language test with the same aim, held during the 9th IBO in Kiel, Germany are twofold.
First of all, in Kiel a test paper similar to the IBO theoretical test, comprising 22 tasks consisting of a combination of multiple-choice and other response formats was given in the 'Standard Language version' in English or Russian, the official languages of the IBO. There were no further questions for linguistic background information.
Secondly and obviously the biggest difference: in Kiel, only volunteers participated in the investigation. Although 67 competitors, more than the half of the candidates (131), were willing to take the test, it is clear that it was difficult to draw conclusions for the whole group of competitors.

The Test

1. A lady researcher grows yeast on a simple nutritive solution: the sole energy source is glucose, marked with ^{14}C. She noticed that the yeast cells use 6 moles of O_2 for each mole of glucose they completely oxidise; at the same time they produce 38 moles of ATP. In order to tell that glucose has been completely oxidised, she has to check the radioactivity of:

A. lactate.
B. ethanol.
C. CH_4.
D. CO_2.

2. The following table shows the effect of 2 cell poisons – ouabain and cyanide – on transportation processes in cell membrane. The + sign shows that the process goes on; the – sign shows that the process was stopped due to poison presence.

	Diffusion	Na-K pump	Endocytosis
Ouabain	+	-	+
Cyanide	+	-	-

The most probable explanation is:

A. cyanide directly inhibits the Na-K pump;
B. ouabain inhibits ATP production;
C. cyanide inhibits ATP production and thus stops the Na-K pump;
D. cyanide inhibits the Na-K pump and thus stops ATP production;
E. ouabain inhibits ATP production and thus stops the Na-K pump.

3. What is correct with reference to the stem of *Pinus* ?

A. the xylem consists especially of tracheids.
B. the phloem consists only of sieve tubes.
C. the secondary xylem is formed on the outside of the vascular cambium.
D. the epidermis remains in place during thickness growth.

4. The following is **not** a characteristic of the human lymphatic system:

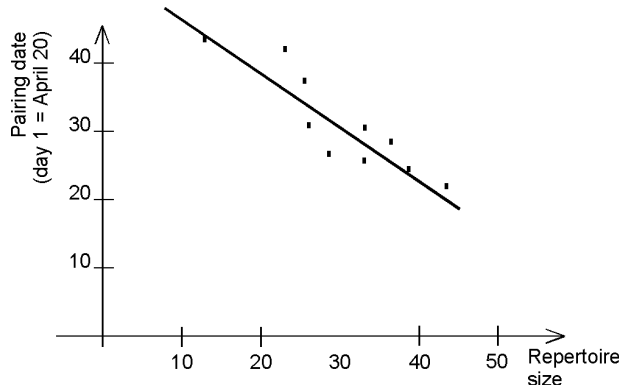
A. the human lymphatic system is formed by a net of vessels and nodes.
B. the lymphatic capillaries are part of a closed circuit.

C. the fluids lost from the blood vessels in the tissues are collected by the lymphatic vessels.
D. the infiltrated fluid in the lymphatic vessels is drained in the two subclavian (shoulder) veins.

5. The substance that is the general biosynthetic precursor of sex hormones and hormones of the adrenal cortex is:

A. inositol.
B. lecithin.
C. phosphatidyl-choline.
D. cholesterol.
E. sphingomyelin.

6. Male sedge warblers (*Acrocephalus schoeneobanus*) are little birds that inhabit marshlands. Each male has a repertoire: a set of different songs. The size of this repertoire is variable. The graph shows how the pairing date (the date when male and female definitely pair) evolves, with the size of the repertoire.



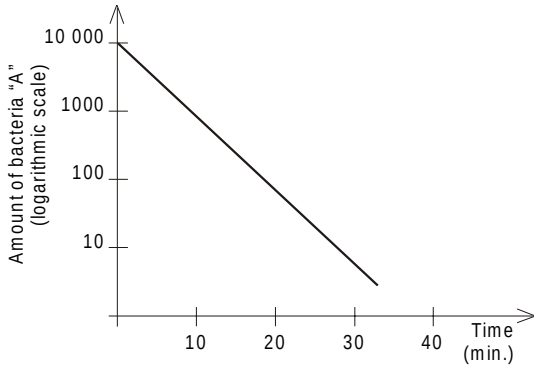
State your interpretation of this graph:

A. the louder the male sings, the sooner he is allowed to pair.
B. the larger the male's repertoire, the later he can pair.
C. the larger the male's repertoire, the sooner he can pair.
D. the sooner the spring begins, the larger the repertoire the male gets.

7. According to the cladistic theory each natural taxonomic group must be monophyletic. Which one of the following groups is a good example of that?

A. the birds.
B. the protists.
C. the monocotyledons.
D. the dicotyledons.

8. The graphics below show the influence of warmth on a bacterial strain "A". Bacteria are exposed to a 100 °C temperature.



This graph shows that:

A. exposure of bacterial strain "A" to 100 °C temperature for 5 minutes reduces the bacterial population to about 1000 individuals.
B. maximal sterilisation is obtained when bacterial strain "A" has been exposed to 100 °C temperature for 35 minutes or more.
C. the population of bacterial strain "A" is reduced by a factor 1000 after 30 minutes at 100 °C.
D. half of the "A" bacteria are killed after 20 minutes at 100 °C temperature.

10. A biologist ground up some plant cells and then centrifuged the mixture. She obtained some organelles from the sediment in the test tube. The organelles took up CO_2 and gave off O_2. The organelles are most likely:

A. chloroplasts.
B. ribosomes.
C. nuclei.
D. mitochondria.

11. The dominance of the sporophyte in the life cycle of higher plants is associated with:

A. the development of the photosynthetic apparatus.
B. a strong reduction of the gametophyte.
C. the differentiation of vascular tissues.
D. the appearance of meiosis and mitosis.

12. House dust mites (*Dermatophagoides* sp.*)* especially found in association with dust in dwellings, mattresses and furniture with cloth upholstery can cause allergies. Those allergies are produced by:

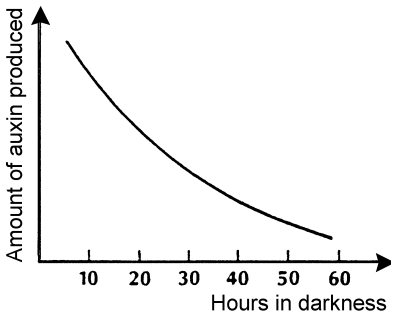
A. the painless bite of the mites.
B. the rest of the mites' food: human skin flakes.
C. the faeces airborne and inhaled by humans.
D. the larvae that just hatched.

13. The sickle-cell disease is a classic example of inherited disease. Which of the following is **not** true:

A. sickle-cell haemoglobin differs from the normal protein by only a single amino acid.
B. the cause of the sickle-cell disease is the genetic disorder of an autosomal recessive gene.
C. in a heterozygous individual there are two kinds of haemoglobin molecules.
D. a heterozygous individual has normal and sickle-shaped red cells in about the same proportion.
E. the heterozygous condition causes the individual to be more resistant to malaria.

14. Tomato plants were grown without light for up to 60 hours. The amounts of auxin produced by the plants were determined at varying times. The results are presented in the graph:

According to this graph,



A. the amount of auxin produced by tomato plants is unaffected by the presence of light.
B. auxin in tomato plants is produced in increasing amounts as time in darkness increases.
C. auxin in all plants is produced in decreasing amounts as time in darkness increases.
D. tomato plants produce less and less auxin as more and more hours are spent in darkness.
E. the production of auxin by tomato plants depends solely on the presence of light.

15. A certain type of a recessive genotype appears in 16 % of the individuals of a population. The frequency of the two alleles M and m is:

A. 0.16 of the recessive allele and 0.84 of the dominant allele.
B. 0.2 of the recessive allele and 0.8 of the dominant allele.
C. 0.4 of the recessive allele and 0.6 of the dominant allele.
D. 0.32 of the recessive allele and 0.68 of the dominant allele.

16. The definite host of a parasite is the organism:

A. that suffers by the presence of the parasite.
B. in which the parasite spends the longest part of its life cycle.
C. in which the parasite reproduces sexually.
D. that carries the parasite to other organisms.

17. The following animal phyla are mentioned in the supposed chronological order in which they appeared in the course of evolution.

1. protists (Protista)
2. sponges (Porifera)
3. cnidarians (Cnidaria)
4. flatworms (Platheminthes)
5. annelids (Annelida)
6. arthropods (Arthropoda)
7. chordates (Chordata)

State which one of the above phyla was the first in evolution that had:

A. extracellular digestion.
B. a nervous system.
C. a closed circulatory system.
D. a digestive tract with separate mouth and anus.

Answer key to the English Test

1.	d	
2.	c	
3.	a	
4.	b	
5.	d	
6.	c	
7.	a	
8.	c	
10.	a	
11.	c	
12.	c	
13.	d	
14.	d	
15.	c	
16.	c	
17.	a	3
	b	3
	c	5
	d	5

English Test – Language form

Nationality:

Year of birth:

This form is linked to the English part of the test (Q1-8 or Q10-17). Our aim is to check whether the use of the English language poses problems in understanding the correct meaning of the questions.

1. The test

1.1 Did you have problems solving the questions because they were in English?

☐ Yes - Go to 1.2
☐ No - Go to 2

1.2 What was the cause of these problems?

☐ The choice of words (vocabulary) - Fill in 1.2.1 and 1.2.3
☐ The structure of the sentences - Fill in 1.2.2 and 1.2.3
☐ Both (vocabulary + structure) - Fill in 1.2.1, 1.2.2 and 1.2.3

1.2.1 Which words did you find difficult? (English part: Q1-8 or Q10 –17)

Question 1……
Question 2……
Question 3……
Question 4……
Question 5……...
Question 6……
Question 7……
Question 8……

Which questions would have been more understandable if we had used a simpler vocabulary?

Question n° .....

Which questions would have been more understandable if we had added a definition/description in English of the most difficult words?

Question n° .....

Which questions were not understandable without a translation?

Question n° .....

1.2.2 Which questions created difficulties because of the structure of the sentences?

Question n° .....

1.2.3 How did you deal with these problems?
In the following questions I guessed at the meaning of a word / a sentence.
Question n° .....

In the following questions I deduced the meaning from the context.

Question n° .....

Question n° .....

In the following questions I deduced the meaning of the words by comparing them with known words from my own language/another foreign language.

Question n° .....

2 . Prior knowledge of the English language

2.1 Language knowledge in general

2.1.1 What is your native language?.....

2.1.2 What other languages do you know? Mark the appropriate box.

	Badly/not at all	Moderately	Well	Very well
English	☐	☐	☐	☐
French	☐	☐	☐	☐
German	☐	☐	☐	☐
Russian	☐	☐	☐	☐
Spanish	☐	☐	☐	☐

What other languages?

.....	☐	☐	☐	☐
.....	☐	☐	☐	☐
.....	☐	☐	☐	☐

2.1.3 Which languages do you use for specific biological terminology ?
(tick ALL appropriate boxes)

☐ Your native language

☐ English

☐ Latin / classic Greek

☐ Others (mention if applicable) .....

2.2 Knowledge of English

How were you brought into contact with the English language? Mark the appropriate box.

☐ It is my native language and I use it on a daily basis. If so, go to 2.3

☐ At school all my lessons were taught in English from the age of ..... If so, go to 2.3.

☐ At school the following courses were taught in English:

	From what age on?	How many hours a week in your last school-year?
English as a foreign language.....		.....
Biology	.....	.....
Physics	.....	.....
Chemistry	.....	.....
Computer science.....		.....

Other courses ....

2.3 English in your free time. Mark the appropriate box.

☐ I listen to English spoken radio or watch English spoken television.

☐ I read English magazines

☐ Weekly/monthly papers. Write down the title(s).

☐ Specialised papers. Write down the title(s).

☐ I read at least 4 English books per year

☐ I use English for e-mail and Internet at least once a week

☐ I stayed at least three weeks in an English-speaking environment.

Where? .....

When? .....

For how long?.....

What other contacts with the English language do you have?.....

Thank you for your co-operation!

Russian isn't that difficult... for Mrs. Olga Waksmann, our interpreter.

Analysis

1. Preparations for the test

1.1 *Some organisational aspects*

The useful experience of the pretest resulted in quite a number of proposed corrections to the questionnaire (both content and form). Also an important principle was also that the whole test including the questions for background information had to be conducted in the native language of the participants except for half the questions on biology that were in English. Due to various organisational problems some proposed corrections to the questionnaire could not be made and a last minute withdrawal of one of the biology questions (Q9) also caused some confusion. As a result, some answers to the non-biology questions were not reliable and consequently, were not taken into account.

1.2 *Aversion towards the 'English test'*

Less obvious but still demonstrable is the aversion towards this 'language test' among different groups. We identified three groups : the participants, the delegation co-ordinators and the people responsible for the translation. Though 'translators' and 'delegation co-ordinators' may be the same person, we would like to differentiate between the two functions.

1.2.1 The delegation co-ordinators

The intention of the English test was to study the feasibility of the gradual (!) replacement by English of the contestants' native language during the actual competition. Obviously delegations from non-English speaking countries might consider this as an apparent disadvantage for their participants but the aim of the test was precisely to establish to what extent it could influence the overall results of non-native speakers and how any resultant difficulties could be overcome. Surprisingly no native (!) English speaker was among the highest individual scores.
Furthermore some strong arguments can be brought forward in favour of English as the language for the competition.
It is apparent that nowadays English functions as a '*Lingua Franca*' among scientists all over the world and recent publications in most scientific disciplines are always available in English.
Moreover, the organisational rules of the IBO clearly state that the exchange of ideas, the promotion of contacts and the establishment of friendly relations are among their primary aims. No wonder that the participants of

each delegation were spread over different groups and that English was in fact the common language during this fraternization.

1.2.2 The translators

Even if (the co-ordinator of) a delegation raises no objections to the English test, this does not automatically imply that all problems are solved.
As a matter of fact only a limited part of the questionnaire contained English questions, whereas the major part had to be translated into the mother tongue of the participants. This was because some of the questions figured as a kind of 'control question'. Furthermore, all questions for background information were intended to be in the native language of the participants.
Apart from five delegations that offered no translation whatsoever, others decided to restrict their translation in one way or another. As a result, only 19 of the 131 non-English speaking participants (not quite 15 %) were offered a questionnaire as intended by the organisers. Instead of a questionnaire with 8 questions in English, most participants received a test in English with 8 questions in their mother tongue - clearly a fundamental departure from the original intentions!

1.2.3 The participants

Among the participants there was also some aversion to the 'English test'. This was partially the result of the time the test took place (immediately after the theoretical test) and some were obviously tired and hungry.
Another cause was certainly the poor communication of the real intentions of the test. As a result a native English speaker asked why he had to participate and prove that he spoke English while a not-native made a written remark "...do not remove the second language Russian..." which clearly demonstrates that the aims of the test were not (well) understood.
Five participants (the whole Argentine delegation and another individual) did not answer a single question. Although we are not aware of the actual motives for this, we can hardly imagine that these young participants really do not understand a single word of English.

1.3 ***Effects on the results***

Though certain parts of the test are barely affected, it is clear that certain aspects of organisation and the aversion or opposition of some groups had a negative impact on the validity and the reliability of the study. Some results were seriously compromised.
This is less the case for the first part, with the actual biology questions, as the response is definitely high and fairly consistent. Moreover the response

to the native and English questions can easily be compared. Furthermore, the circumstances also provided an excellent basis to guarantee authenticity.
For that reason, we consider the results of the first part sufficiently reliable to establish certain general tendencies.
This is not the case for questions referring to the linguistic difficulties as a full translation was only provided to15% of the participants. In addition and due to the incorrect compilation of the questionnaires, people were asked to state difficulties in questions asked in their own language rather than questions in English, which resulted in poor and useless answers that cannot be taken into account.
Questions gauging the linguistic background of the participants were also barely translated (only 15%) which resulted in a poor response. They cannot be judged sufficiently reliable and no general conclusions should be drawn from them.

2. Results

2.1 *The biology questions*

151 youngsters from 38 countries participated on the IB0 2001.
Nobody from Argentina responded to the questionnaire. Lacking any official explanation and unable to exclude any reason for certain, these results are incorporated.

Received an English test completely in English:

- 20 participants from 5 countries where English is an official language (not necessarily a native language!): Australia; United Kingdom; Ireland; Singapore; India

- 20 participants from 5 countries that did not provide a translation for their participants: Kyrgyzstan; China; Mongolia; Argentina; Mexico

Received the first 8 biology questions in English, the following 8 in their mother tongue:

- 54 participants from the remaining countries (two per country)

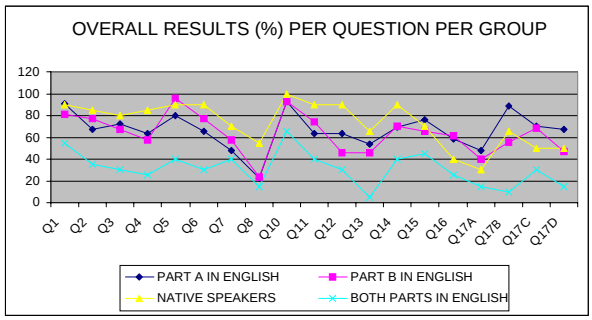
Received the first 8 biology questions in their native language, the following 8 in English:

- 57 participants form the remaining countries (two per country)

The unequal breakdown can be explained as follows:

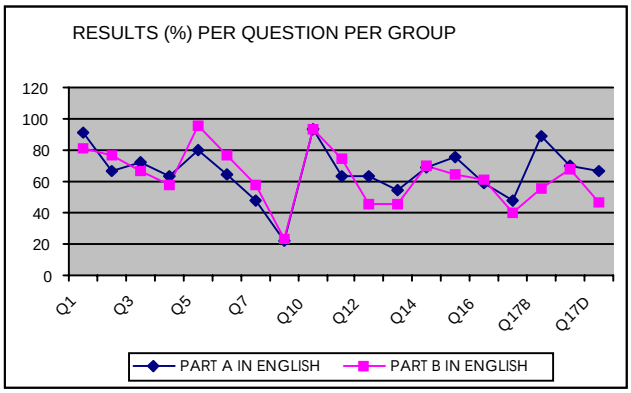
- The delegation of Kyrgyzstan had only three participants. One received the English questions first while the others got the first questions in their native language.

- Both French-speaking participants in the Belgian delegation received the same version (mother tongue first), presumably to avoid an extra translation for just 1 participant. The sole French-speaking participant of the Swiss delegation also received this version.



	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q10
Part A in English	91	67	72	63	80	65	48	22	93
Part B in English	81	77	67	58	96	77	58	23	93
Native speakers	90	85	80	85	90	90	70	55	100
Both parts in English	55	35	30	25	40	30	40	15	65

	Q11	Q12	Q13	Q14	Q15	Q16	Q17a	Q17b	Q17c	Q17d
Part A in English	63	63	54	69	76	59	48	89	70	67
Part B in English	74	46	46	70	65	61	40	56	68	47
Native speakers	90	90	65	90	70	40	30	65	50	5
Both parts in English	40	30	5	40	45	25	15	10	30	15



Ranking per country (average per delegation)

(Average on English test)				(Average on IBO 2001 test)		
ountry	**Ranking**	**English score**	**Difference**	**Country**	**Ranking**	**IBO test**
hailand	1	12,75	1	Taiwan	1	80,50
ndia	2	12,50	4	Thailand	2	77,54
etherlands	3	12,25	16	Singapore	3	77,31
ustralia	4	12,00	14	Korea	4	77,21
ingapore	4	12,00	1	China	5	75,97
elarus	4	12,00	5	India	6	73,20
ran	7	11,75	1	Russia	7	72,58
oland	7	11,75	4	Iran	8	72,52
weden	9	11,50	18	Belarus	9	72,22
aiwan	10	11,25	10	Ukraine	10	69,24
urkey	10	11,25	11	Poland	11	68,63
ermany	12	11,00	1	Vietnam	12	67,70
inland	12	11,00	8	Germany	13	67,66
nited Kingdom	14	10,75	0	United Kingdom	14	65,63
orea	14	10,75	10	Latvia	15	65,41
atvia	16	10,50	1	Romania	16	65,26
kraine	17	9,75	7	Czech Republic	17	64,60
ietnam	18	9,25	2	Australia	18	64,26
omania	19	9,00	3	Nederland	19	63,76
stonia	19	9,00	11	Finland	20	63,31
reland	19	9,00	9	Turkey	21	62,50
witzerland	22	8,75	14	Kazakhstan	22	62,21
urkmenistan	23	8,66	8	Kyrgyzstan	23	61,11
hina	24	8,50	19	Bulgaria	24	59,48
azakhstan	24	8,50	2	Slovakia	25	57,79
ndonesia	26	8,25	3	Argentina	26	57,32
elgium	26	8,25	6	Sweden	27	55,11
zerbaijan	28	7,75	7	Ireland	28	54,59
lovakia	28	7,75	3	Indonesia	29	53,92
ulgaria	30	7,50	6	Estonia	30	53,84
ussia	30	7,50	23	Turkmenistan	31	47,03
lovenia	32	6,75	2	Belgium	32	47,02
yrgyzstan	33	6,50	10	Mexico	33	46,63
zech Republic	34	6,25	17	Slovenia	34	45,82
exico	35	5,50	2	Azerbaijan	35	45,49
uwait	36	5,00	1	Switzerland	36	42,81
ongolia	37	4,50	1	Kuwait	37	34,59
rgentina	38	0,00	12	Mongolia	38	34,13

Though the utmost caution should be observed in interpreting these results, certain tendencies are noticeable:

A major loss in ranking occurs for:
- Russia (23)
- China (19)
- Czech Republic (17)
- Argentina (12)
- Korea (10)
- Kyrgyzstan (10)

Major gains in ranking are made by:
- Sweden (18)
- Netherlands (16)
- Australia (14)
- Switzerland (14)
- Turkey (11)
- Estonia (11)

A status quo is maintained by the United Kingdom.

2.2 *Questions relating to linguistic difficulties*

2.2.1 Year of Birth

Unknown	11	7,28 %
1980	1	0,66 %
1981	4	2,65 %
1982	31	20,53 %
1983	56	37,09 %
1984	41	27,15 %
1985	5	3,31 %
1986	2	1,32 %

50 % of the non-native speakers with the highest individual scores were born in 1982 or earlier. The higher proportion of older participants with better results does not necessarily point to a correlation between age and results but is presumably due to criteria such as prolonged and/or different organisation of secondary education. (However, the poor answering of those questions render the results unreliable and excludes more detailed conclusions).
Nevertheless it is undeniable that competitors from delegations with a low average on age such as Azerbaijan, Kazakhstan, Ukraine and Russia tend to obtain a weaker English score than participants from countries with a much higher average age (e.g. Germany, Finland and Poland).

2.2.2 Simpler vocabulary; Definition/description; Translation

When asked for remedies to avoid language difficulties, the following suggested solutions were preferred: (# per question)

	Easier words	Description	Translation
Q1	1	0	2
Q2	2	3	5
Q3	6	3	2
Q4	5	5	3
Q5	2	3	1
Q6	9	7	6
Q7	2	4	1
Q8	3	3	6
Q10	3	1	3
Q11	1	0	3
Q12	11	4	8
Q13	4	3	4
Q14	5	2	2

Q15	1	0	3
Q16	4	3	4
Q17	5	5	3
Total	64	46	56

2.3 *Knowledge of other languages*

22 participants that state they don not know any English but 14 of them answer some questions from the test.
The second language of the majority of the participants is English.
Remarkable exceptions are the former republics of the Soviet Union.
With the exclusion of the native speakers (!) the following languages are regarded as second language (# participants):

English	108
German	39
French	29
Russian	27
Turkish	11

Taking the linguistic levels as indicated one gets the following breakdown (native speakers excluded):

	Fair	Good	Excellent
English	53	39	16
German	27	8	4
French	18	10	1
Russian	13	4	10
Turkish	1	7	3

14 participants admit to not knowing any English at all and 8 participants do not answer the questions (which may or may not mean the same).

3. CONCLUSION

Some adaptations suggested in the pre-test could not in the end be realised and some expectations could not be met. Practical complications and resistance from several groups prevented an optimal test.
The results offer a diffuse image and both proponents and adversaries of biology questions in English may find arguments. Consequently, and in spite of the assembled volume of interesting material, no definite conclusions can be drawn from these results.
Therefore sequel studies during future Olympiads seem essential though the feasibility of a contest conducted in English probably has to be fought from within. It is evident that in a strong competitive environment every effort is made to avoid any disadvantage for a nation's own candidates. At the same time English seems unavoidable in contemporary international scientific contacts. It would therefore seem somewhat irresponsible not to comfort promising young scientists with this present-day reality.

Closing Ceremony

Programme

Moderator: Mrs. Yannick Siebens,
Royal Belgian Institute of Natural Sciences, Brussels
Musicians: Mrs. Alice Descamps (violin), Mrs. Marie Descamps (piano), Mrs. Aurore Graillet (harp)
Visual presentation: Mr. Stéphane Van Israël

Adresses

- Prof. Dr. Louis De Vos, Chairman of the IBO 2001 International Jury
- Mr. F.X. de Donnea, State Minister, Minister President, Brussels-Capital Region, Chairman of the European Research Council
- Mrs. Françoise Dupuis, Minister of Higher Education, French Community
- Mr. Leo Guns, General Secretary, Dept. Science, Innovation and Media, Ministry of Flanders
- Mr. Robert Sacré, representing Mr. Pierre Hazette, Minister of Education, French Community

Interlude

- Mr. Hans Morélis, chairman of the IBO co-ordinators
- Prof. Dr. Pierre de Maret, Rector, Université Libre de Bruxelles

Award ceremony

Interlude

- Mr. Christof Schuepp (Switzerland): a student's vision of the IBO
- Snapshots "The best of IBO 2001"

Certificates ceremony

Interlude

- Handing over the IBO trophy to Latvia
by His Royal Highness Prince Laurent of Belgium

Farewell words
- Mr. Gérard Cobut & Dr. Hugo Vandendries, IBO 2001 co-ordinators

Reception in University main hall

The Vietnamese jury members, checking if their students are already present for the closing ceremony

His Royal Highness Prince Laurent of Belgium at the closing ceremony

Speeches

Mr. François-Xavier de Donnea,
President of the European Research Council,
State Minister,
Minister-President of the Government
of the Brussels-Capital Region.

Ladies and Gentlemen,

The 2001 International Biology Olympiad is already coming to an end. This first Olympiad of the third millennium was clearly a success. All the mutually-enhancing ingredients of success were at hand: enthusiasm, science and youth, creating an energetic mixture which could only delight everyone present, scientists and laypersons alike.
Nevertheless, we still have to share a few long minutes of suspense before learning the names of our young prize winners.
I will therefore try to make these minutes pass as quickly as possible.

As you know, the Brussels-Capital Region is actively participating in the Belgian Presidency of the European Union, in particular by acting as President of the Research Council. This European responsibility puts our Region at the heart of major scientific challenges that know no borders.
The key to success for the future of European science and research will be a broad openness to the world. Young people are one of the essential concerns of a scientific Europe and an international scientific community which needs to improve its overall attractiveness.

In this connection, I am pleased to note that the International Biology Olympiad, whose influence largely surpasses Europe's borders, indirectly addresses three of the five themes forming the focus of the Belgian Presidency of the Research Council.

Firstly, making Europe a model of openness to the world.
The Belgian Presidency wishes to encourage the reinforcement of links in research and technological development with countries outside the EU. Europe's ambition is to improve reciprocal scientific contributions between the economies of the countries concerned. In particular, its approach is based on dynamic exchanges within the international community. In their own way, the young people of all nationalities who are present here, who have a passion for science -and above all for biology -, are initiating this broad international openness which Europe is seeking to develop. If we forget for a moment that the IBO is a competition and an intellectual challenge, we see what really counts: a fruitful get-together of budding

young scientists from the four corners of the world. The sciences, particularly biology in this case, act as a catalyst: they bring people together and permit beneficial cultural exchanges that will undoubtedly form the basis of
constructive scientific exchanges in the future.

Secondly, to reinforce the relationships between science, society and citizens.
The Belgian Presidency seeks to place science at the heart of our society. Europe must reconcile its citizens with science and technology as well as increase the attractiveness of scientific careers for young people. On this closing evening, I am especially pleased to note within this context the relevance of an initiative such as the IBO, which places biology at the heart of a humane, fun and motivating challenge. For many participants, this Olympiad will remain an enriching experience, and above all constitute the beginning of a great adventure. And "adventure" is indeed the right term. We often forget or fail to emphasise that the adventurers of the 21st century will be scientists. Today, the exploration of the unknown is the prerogative of researchers, and all such work will take place in networks of excellence with a global scope. The adventurers of the 21st century are the young people here this evening, who already have a passionate interest in biology, a science which harbours as much hope as it does fear and the unknown. I hope that many of these young people will find a rewarding future in biology, in line with the increased needs and major challenges of our societies. European research in particular must constantly improve its ability to respond to people's day-to-day concerns.

Thirdly, to create a European research and innovation area.
Opening up European research to the worldalso (and above all) and bringing it closer to people, requires the creation of an internal area for exchanging knowledge and facilitating the mobility of researchers. During the Belgian Presidency, the Member States will work together to identify and develop the tools that will help to create the European research and innovation area. This approach will involve a major role for its participants: we must encourage initiatives aimed at putting scientists, industrialists and financiers in contact with one another at all levels.

As a result, this first international Olympiad of the century fits perfectly into Europe's scientific situation. Bringing tomorrow's scientists together to learn and exchange information or simply to have fun, represents a first step towards a better understanding of scientific research, vehicle of innovation, development and progress. The young people of Brussels, Europe and the world represent a formidable human, scientific and technical capital whose future merits the greatest possible attention.

During the Belgian Presidency of the EU, and in the same spirit that has characterised the IBO, the Brussels-Capital Region is conducting a campaign to raise awareness among young people and the general public about the sciences and scientific careers: Operation ISHANGO. This is a campaign which should be of interest to biologists, because its common theme, which is also the emblem of research in the Brussels-Capital Region, is the ISHANGO bone. This object, which is housed at the Belgian Royal Institute of Natural Sciences, is in fact a 10-cm long bone engraved with a series of notches representing numbers. It is said to be the oldest proof of the mathematical acuity of our remote ancestors: a prehistoric pocket calculator that is 15-20,000 years old. Operation ISHANGO is meant to be fun and will offer to the young people of Brussels a variety of initiatives, such as the publishing of a CYBERBOOK, scientific reports on the Internet (the ISHANGO Journal), a science prize, a comic book (The Secret of ISHANGO) and more. We believe that this Operation will generate as much enthusiasm as the IBO, and that it will lead a few more young people to pursue fascinating careers in scientific research.

Thank you for your attention.

Mrs. Françoise Dupuis, Minister of Higher Education, French Community

Some reflections on the Biology Olympiad

The Olympiad

Belgium has participated in the Biology Olympiad since its first edition. We are delighted with the extent to which the event has grown and with the quality of the work done by the students.
Taking part in the Olympiad is a key to understanding the world, science, and biology in particular.
Participation enables students to consolidate their choice of a particular discipline, it is a prelude to the highway of research, opening the way to scientific education, and guaranteeing success in their studies.
Prizewinners in the first generation of Olympiads have gone on to brilliant careers in research; of the second generation, one prizewinner is finishing a doctorate at the ULB's Institute of Molecular Biology and another a doctorate in pisciculture at the University of Liège.

Biology

What unites those young people taking part is the love of biology. The level of knowledge they have attained, despite their youth, bears witness to their enthusiasm for their subject. It is often said that physics was the science of the first half of the twentieth century. It is biology that has clearly dominated the second half, and the prospects opening up at the dawn of the twenty-first century are so vast that we can see no limit to them. A discipline that only a few decades ago was largely descriptive, biology has diversified considerably, allowing us to go from the molecular level to the study of the most complex ecosystems. The technological applications of biology are to be found everywhere, introducing molecules of life into the very heart of our computers. As a result, the importance of biological knowledge in the economy has grown steadily.

Biology and society

The development of biological knowledge has, of course, posed a number of problems. Thus, we are obliged to reflect on the ethics of discoveries and above all of their application in a field that so deeply affects the very identity of humanity. But these fears cannot be used to justify a freeze in the acquisition of knowledge. There are indeed major challenges facing us. The pressure that humanity is putting on the environment, both by the sheer number of individuals as well as by their economic choices, is such that it disturbs the balance of nature. Biodiversity, for example, is under real threat. We need to do lot of work, and a lot of studying, if we want to see humankind integrate harmoniously into nature and succeed in creating a society that will be fair and will be capable of sustainable development. More than ever, the future remains to be invented, and it is in young people like you, most of all, that society's hopes rest.

Opening up to the world

This event bears the name of Olympiad. This places it clearly in the context of an ideal of fraternal and happy encounter and competition. The Olympic spirit, in its origins, aimed at bringing people together through sport. Science too is a powerful engine for bringing people together, and the sharing of knowledge is an essential condition for the creation of a peaceful world. This Olympiad offers a unique opportunity for young people to meet other pupils of the same age, from all over the world, to share a common passion.

Mr. Leo Guns, General Secretary,
Dept. Science, Innovation and Media,
Flemish Community

Monseigneur,
Mesdames et Messieurs les Ministres,
Ladies and Gentlemen,

First of all I would like to apologise for the absence of Minister Vanderpoorten, Flemish Minister of Education, and Minister Van Mechelen, Flemish Minister, responsible for Science Policy.

Both of these Ministers would have gladly participated in this event, but they could not attend today.

Ministers Vanderpoorten and Van Mechelen are very interested in science education and in the popularisation of science and technology. They are key drivers in a tremendous effort to increase awareness of science and technology and do so by way of a yearly action plan.

In all of Europe, the "**popularisation** of science and technology" is recognised as an important element in society, as our economy and science move towards a knowledge-based environment.

Our scientific knowledge and technological achievements are increasing at a rate that is accelerating every day.
On the one hand, in such an environment, there is the risk that a dual society emerges (know versus don't know).
On the other hand, in order to function "normally" in such an environment, a minimal amount of scientific and technological knowledge and skill is essential.

Another important issue is the fact that in a knowledge-based society, more and more scientifically and/or technologically knowledgeable workers are needed in order to sustain the level of prosperity.

In Europe, as in the entire western world, the demand for such skilled workers is increasing, whereas the (potential) supply of such workers is decreasing.
In the long run, such an evolution could lead to economical regress.

One of the main causes for this discrepancy between supply and demand seems to be the loss of interest in science and technology, especially in youngsters.

If society wants to establish a firm support for science and technology as a necessary asset for our future prosperity, certain measures will have to be taken.

Not only is it necessary to generate more interest in science and technology, it is also necessary to motivate youngsters to follow higher education and preferably to choose a career in science and technology.

In this respect, a science competition such as this one, where youngsters from all over the world compete in an amieable way, is something we should treasure and continue to stimulate.

I congratulate you all on your results, especially our Belgian contestants, and hope that you have all felt the magic of science.
Hopefully, in the near future, we may indeed welcome you as our youngest scientists.

I thank you.

Mr. Robert Sacré, Inspector
representing Mr. Pierre Hazette,
Minister of Education, French Community

Your Honours,
Ladies and Gentlemen,
Dear Colleagues,
Dear Fellow Students,

My speech will be short, Mr. P. Hazette a Minister of Education of the French Community of Belgium wished very much to be here and to congratulate himself the students, the nominees and the prize-winners of this contest… He has a busy schedule and could not make it… It is my great pleasure, in his name, to do it myself… It is a great pleasure indeed because I am one of you, I have a degree in Chemistry and I work in the field of Biology.
So, I know what I am talking about when I say that everyone of you bravely took up the challenge, and that most of you demonstrated yourselves to be well versed in Biology already. You are ready to take up successfully Scientific studies in Colleges and Universities.

Let me say we are proud that an event like this Olympiad took place in little Belgium but, as you all know after spending a week with us, Belgium is an important partner in the ECC; our Prime Minister is even, right now, the

President of the European Community for six months…

Also we are proud to have had a chance to meet each of you coming from so many different countries but with so much in common.
We are happily amazed at how enthusiastic you are, how great your passion is for science in general and for biology in particular.

YOU are what the world needs MOST now; the high level scientists that most of you will be, in a field which is so promising for Humanity's health and better livingconditions, for the eradication of genetic diseases, for a better and thorough knowledge of the human genome, for the best possible use of genetic engineering, and so on…

I won't repeat what the distinguished speakers have said before or will say after me, just let me conclude with Minister P. Hazette's and my congratulations to the organisers of the Olympiad for their work, to the students for their participation in the contest, congratulations to the nominees and congratulations to the winners of the contest for their excellence and strong determination.

I hope you'll be back in Belgium some day, either to work in our universities and laboratories or as tourists.
As you probably discovered yourself throughout this week you spent up and down the country, Belgium has much to offer in that field.You'll be most welcome.

Thank you.

IBO 2001 is over. A last souvenir in the presence of VIP's

Drs. J (Hans) Morélis, Chairman of IBO co-ordinators

Dear Friends

Be aware that I don't call you colleagues or participants. One of the practical tasks for this week was "make new friends". As far as I understand all of you won a medal in this task, so congratulations. That's why I call you "dear friends" and I'm delivering this speech also on behalf of my friend and colleague Tomas Soukup of the IBO Co-ordinating Centre in Prague.

I would like to focus a little bit on the tasks, especially the practical tasks. Several students stated that it was easy, but look at the results. For some students the cockroach proved to be a bug and the computer fans know exactly what this means.
All students received a nice present, however….nice….. also a little tricky. Six students used the dissection tools the wrong way causing a bloody story.
Among them werethree of the four girls from Latvia. So I presume that next year in Latvia we will not have a dissection task.

Some delegation leaders had objections to the video task. They complained that they didn't train their students to observe video. Rather strange if we imagine that the average youngster watchesTV for at least 12 hours a week.

Often disappointment and happiness are close together. Soon 40 % of you will have to face and to cope with the fact of not winning a medal, so sad feelings. But 60 % will be happy: bronze, silver or even gold. To those not in the medal position my message is: don't worry. Good scientists often fail and learn a lot by doing so. Without failure there is no progress.

Rate of flow was an interesting feature in this Olympiad. Not only in the tasks, but it proved also to be a limiting factor for the organizers. Think about the rate of flow during the shifts in between our practical tasks. This rate of flow was low due to the need for reinstalling and refreshing all practical materials, but this wasn't really a problem.
Think also about transport: some buses left late causing delay, however late……. For one sleepy student the bus left too early!

We don't blame the organizers. Oh no, it's the other way around, we compliment them as it is obvious that we all had a fantastic week. The discussions in the International Jury went very smoothly. In a relaxed atmosphere our president Prof. Louis De Vos got, like we say it Dutch, all noses in the same direction. Now you may think that is an easy trick, you just put one

speaker in front of a big group like we are now and there you are: all noses in the same direction. But I assure you that we really had good discussions.

It deserves our admiration how the Belgian organisers managed to offer us such a varied programme of tasks, culture and nature. Many teachers, scientists, student guides, authors, organisers and interpreters contributed to this IBO week. They were wearing a yellow shirt. I like to compare this with the famous cycling contest Tour de France. The nr. 1 in this tour, who is really the best is wearing a yellow shirt. Now please join me in applause for the yellow shirts.

The whole IBO program was a nice mixture of pieces fitting beautifully together. This may be symbolised by the famous art of Escher. Look here at *Day & Night.* All aspects of the picture are nicely arranged and form a perfect composition like our IBO in Belgium. So please accept this as a gift. Red for Mr. Cobut, blue for Mr. Vandendries, but you may exchange if you like.

C'était merveilleux, es war wunderbar, het was fantastisch.

Mrs. Irène Popoff, one of the pioneers of the Belgian IBO, enjoying Russian atmosphere.

Mr. Christof Schuepp: a student's vision of the IBO

Dear friends from all over the world, dear Co-ordinators and organisers, dear excellencies,

I'm very glad to make this speech in front of you as a happy competitor of the IBO 2001 in Belgium. First of all, I have to express my thanks to all of you who have made this week so unforgettable. On the one hand, the organisers composed such a varied and interesting program including sightseeing all over Belgium. On the other hand, the organisers by themselves are unforgettable as well, especially our front man Herman Snoeck the white-bearded man.
Apart from the biological test, the main reason we are here is the exchange of ideas and points of view between participants of different countries and even different cultures. This exchange showed us that there exist different points of view but they can't be judged as right or wrong; there are just different ways of thinking due to the different ways of living.
There exist also a lot of other examples like this one which should teach us to accept our neighbour's opinion and the neighbour himself or herself. In order to find a common answer to difficult scientific questions and to find a common way to live together you shouldn't only exchange addresses but also stay in contact with the world's different future biologists.
When I really think about the fact that in this room there are a lot of famous biologists of the future, it occurs to me what a large responsibility we all have for our future and our children's future.
As a biologist or even in all science you haven't only to know but also to think about the uses of your knowledge. Do you already know what your area of scientific research is? Do you all know what your aim in biology is and are you sure to make a better world with your work?
We have to remember that biology as the science which is nearest to our lives is the most responsible science for changing nature on this planet. The behaviour of mankind towards nature in the last centuries seems to me almost unbelievable. How can our species as a part of the world-wide biosphere have such an egoistic way of life. Sometimes there seems to be no feeling for other creatures at all. In the last years new ecological movement have begun in science and we should all think about observing the protection of nature which could maybe rebalance our world. I hope that you as scientists can feel the responsibility of the human race, and you know also the importance of giving your knowledge about nature to other people in order that the lack of information exchange between science and people can be rectified.
Thank you for listening to me and I hope you will think about my words.
Believe in a better world, but don't just dream of it. Begin now to make it so.

Mr. Gérard Cobut & Dr. Hugo Vandendries,
IBO 2001 co-ordinators

Monseigneur, Excellencies,
Dear Participants, dear Colleagues, dear Friends,

At the end of 1996, in a moment of overconfidence, we promised the Jury of the IBO that Belgium would organise the IBO in 2001. At that time, it seemed really remote, almost 'virtual': we had no support, no money, just hope, strength and a subtle mix of faith and recklessness.
Thanks to the support of our scientific committee, composed of experts from all the Belgian universities and our patronage committee, chaired by his Royal Highness Prince Laurent of Belgium, chairman of the Royal Institute for the Sustainable Management of Natural Resources, and thanks to the financial support of the Federal Government, the Community governments and the Government of the Regions, the IBO 2001 became more and more a dream to be realised.

Four and a half years later, it's all over… The IBO in Belgium has been a reality, the competitors have met; they had a fierce competition, though a fair and peaceful one. They have made friends, they discovered a small country where the various Communities have co-operated to organise such a brilliant event, instead of fighting one another.

A wonderful team of colleagues, guides and many people behind the scenes has worked hard, spending an incredible amount of time – mostly their free time – to have you all here for the pride of Biology and Friendship. This is what we call the Olympic miracle, the Olympic spirit.

Dear participants, we hope that you will always remember this IBO week where you met, maybe for the first time, friends from all over the world with the same scientific spirit. Some of the laureates from former IBO's are now members of the Belgian Experts Team, some have become Delegation Leaders. Join the club; keep in touch, we count on you, the scientists of the next generation. Our society needs you. But above all remember: Friendship surpasses everything.

Evaluation

This is the organiser's own evaluation of the IBO 2001 event.

1. Organisation

As soon as 1998 we set up an **non-profit association "IBO 2001"**. The aim was to protect individual organisers against personal responsibility in case of bankruptcy. The members of IBO 2001 association were members of the national biology teachers organisations.

We split the IBO 2001 organisation committee into **different task forces** (see organisation chart,page.....).
Each task force had specific organisational tasks (see list, page .....).
Each month the organisation committee had a general co-ordination meeting.
The working method included a time-schedule of tasks to be done.

2. Promotion

Launch
A press conference (May 2001) was held to launch IBO 2001 in Belgium. The framework of it was 'The lack of scientists, a challenge for the future?'. On the one hand this allowed governmental representatives (Europe, Federal, "states") to highlight their projects aiming to stimulate youngsters in studying science, on the other hand it set the Olympiad in a broader prospective.
Before the event
Press contacts were maintained, resulting in some papers and a one-hour radio interview.
During the Olympiad
Strong press contacts were obtained, covering the event.

3. Funding

Funding for organising the IBO was obtained mostly from Goverment authorities. Although all large companies complain about a lack of young scientists in Sciences Faculties, we were unable to motivate most of them in order to support the IBO.

4. New during IBO 2001

- separate boarding had to be used for guides and students (because of

boarding school capacity limits)
- the tests got a newlay-out: space for translation was provided in full blocks, not between the printed lines
- one practical test (ethology) was based on video recordings
- one socio-cultural excursion (afternoon) was divided in 4 options
- opening and closing ceremony:
  . simultaneous translation was used to try to save time;
  . a student contributed in the closing ceremony (spontaneous suggestion)
- English test: it was aiming at testing the influence of the questions language on students results.

Friendship, more than a medal, surpasses everything.

List of countries that have sent theoretical test questions

Argentina	India	Thailand
Belarus	Indonesia	Turkey
Belgium	Kuwait	Turkmenistan
Czech Republic	Latvia	United Kingdom
Estonia	Mexico	Vietnam
Finland	The Netherlands	
Germany	Romania	

Press clipping

Le Soir

Sciences | Les graines de chercheurs de 41 pays convergent vers nos laboratoires

Les Olympiades internationales de biologie sous pavillon belge

La Belgique accueille les Olympiades internationales de biologie durant une semaine. Les candidats feront largement escale en Hainaut, notamment à l'IBMM à Gosselies.

OLIVIER COLLOT

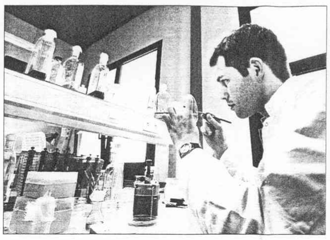
Depuis ce dimanche, et jusqu'au 15 juillet prochain, la Belgique accueille pour la première fois les Olympiades internationales de biologie, un rassemblement prestigieux, qui réunit dans un même élan des étudiants de 41 pays et leurs accompagnateurs et qui leur permet de participer non seulement à une série d'épreuves mais bien évidemment à des échanges ainsi qu'à des visites culturelles et scientifiques.

L'idée, née au début des années 90 dans l'ex-Tchécoslovaquie, a d'abord mobilisé les pays de l'Est avant de séduire les autres continents. Ce qui explique que les deux langues officielles de la rencontre sont le français et... le russe. Cette année, le Mexique, l'Australie, l'Argentine, la Thaïlande, la Chine et Taïwan seront de la partie. Le Mozambique enverra pour la première fois une équipe d'observateurs. Concrètement, quatre candidats de dernière année secondaire sont sélectionnés par chaque nation pour disputer des épreuves théoriques et pratiques. *Un programme musclé, de très haut niveau, qui dépasse le programme classique des humanités,* confirme Gérard Cobut, responsable du comité scientifique du musée des Sciences naturelles.

Les participants seront confrontés aux épreuves pratiques, ce mardi matin, aux théoriques, jeudi matin. Comment ont-elles été préparées? *En ce qui concerne la théorie, les pays participants envoient une série de questions au pays organisateur qui assure la sélection et finalise une épreuve écrite de quatre heures. Pour la pratique, ce sont les professeurs des différentes universités du pays organisateur qui sont sollicités; ils préparent quatre épreuves de laboratoire d'une heure chacune,* continue Gérard Cobut. *En ce qui nous concerne, le comité organisateur belge est présidé par Hugo Vandendries, vice-responsable du service éducatif de l'Institut des sciences naturelles de Belgique; il faut souligner l'excellente collaboration qui a régné entre responsables des universités flamandes et francophones.*

Prisées, les Olympiades? *Sans aucun doute. Compte tenu de la qualité des épreuves, les concurrents y attachent de l'importance. Dans certains pays, beaucoup de portes s'ouvrent aux lauréats.* Lesquels sont en outre récompensés par diverses médailles: 10 % en or, 20 % en argent et 30 % en bronze. Il faut ajouter que, grâce à l'intervention de sponsors, la participation est entièrement gratuite, les concurrents ne devant acquitter que le prix du voyage vers le pays organisateur. Le reste est pris en charge par le comité national. En Belgique, le budget consacré à la manifestation est de 13 millions.

Durant leur séjour dans notre pays, les étudiants logeront dans un internat de la Communauté française. Diverses excursions les conduiront au Zwin, au Pass à Frameries ou encore à l'Institut de biologie et de médecine moléculaires (IBMM) de l'ULB, sur l'aéropôle de Gosselies, où ils seront reçus jeudi après-midi. Ils y entendront un exposé sur la génétique évolutive avant de visiter les laboratoires où travaillent 250 chercheurs de haut niveau. ●



Neuf ans après avoir concouru aux Olympiades, Florent Bernard recevra les candidats de la cuvée 2001 à l'IBMM. Photo Visio-Press.

« Une expérience fabuleuse »

ENTRETIEN

Nom. Bernard.
Prénom. Florent.
Age. 26 ans.
Formation. Biologiste. Licencié en sciences zoologiques, option bio moléculaire.
Particularité. Doctorant à l'IBMM de l'ULB.

OLIVIER COLLOT

Florent Bernard est un «ancien» des olympiades internationales de biologie. Il termine une thèse de doctorat dans la section «levures» du professeur Bruno André dans les laboratoires de physiologie cellulaire de l'IBMM que dirige le professeur Gisèle Van de Vyver.

Dans quelles circonstances avez-vous participé aux olympiades?

C'était lors de la deuxième participation belge en 1992 en ex-Tchécoslovaquie. Chaque pays devait engager quatre étudiants (deux néerlandophones et deux francophones). J'étais en rhéto au Lycée Dachsbeck à Bruxelles. Il y a eu une première sélection qui a dégagé douze candidats sur plusieurs centaines de participants aux épreuves. Au terme d'un stage d'une semaine au centre de l'écologie de l'ULB à Vierves sur Viroin, nous sommes restés quatre.

Quel souvenir en gardez-vous?

Fabuleux; une ouverture humaine et intellectuelle d'une richesse intense; une grande rencontre extrêmement enrichissante avec des jeunes d'autres pays. Un défi qui remonte un peu l'horizon...

Vous souvenez-vous encore des épreuves?

Pas de toutes, le temps a passé. Mais je me souviens avoir été confronté à une dissection de fleurs...

Et du résultat?

J'ai obtenu une bonne cote aux épreuves de laboratoire, moins à l'écrit. La moyenne des deux n'a pas suffi à obtenir une médaille.

Avez-vous gardé des contacts avec d'autres concurrents?

Pas avec des étrangers, mais il faut préciser que les échanges internationaux n'étaient pas aussi développés il y a dix ans qu'aujourd'hui. Par contre, l'expérience de l'ultime sélection entre les douze jeunes Belges présélectionnés reste quelque chose d'extraordinaire, une chimie incroyable. Nous ne nous connaissions pas, et quelques heures plus tard nous étions devenus les meilleurs amis du monde. J'ai gardé des contacts avec quelques-uns d'entre eux qui sont aujourd'hui devenus médecins ou biologistes.

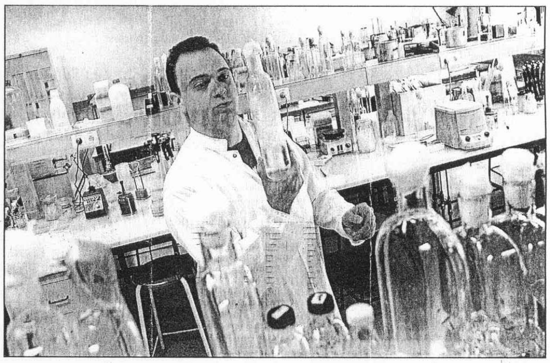
Comment se dessine votre carrière?

Je termine ma thèse de doctorat ici à l'IBMM. Cette étape franchie, on fait souvent un post-doctorat à l'étranger avant de se stabiliser. ●

GOSSELIES Aéropole

Les Olympiades internationales de biologie passent par l'IBMM

Les Olympiades internationales de biologie se déroulent actuellement en Belgique. Ses participants se sont arrêtés hier à Charleroi.



La première joute, qui opposait alors la Tchécoslovaquie et la Pologne, s'était déroulée en 1985. Cinq ans plus tard, six pays, dont la Belgique, portaient sur les fonts baptismaux les Olympiades internationales de biologie (IBO). Depuis, le cercle n'a cessé de s'élargir. Cette douzième édition rassemble 41 pays , dont trois observateurs, à savoir Chypre, les Etats-Unis et le Mozambique (qui deviendra l'an prochain le premier pays africain à s'inscrire officiellement au générique de la manifestation).

Mais chaque chose en son temps. Pour l'heure, notre plat pays orchestre pour la première fois cette épreuve. *«Son organisation a nécessité quatre ans de préparation»* précise Gérard Cobut, coordonnateur de l'événement *made in Belgium.*

Depuis le 8 juillet, les épreuves s'enchaînent donc pour les 150 élèves de dernière année secondaire. Elles sont de haut niveau et débordent largement du programme classique des humanités. Elles comprennent un chapitre théorique (où l'on mesure les connaissances des compétiteurs) et un volet pratique (où l'on teste, en laboratoire, leur capacité à appliquer un mode emploi fourni, à prendre des initiatives, etc.).

Chaque pays participant a délégué quatre représentants. Parité linguistique oblige, deux candidats francophones -en l'occurrence un Bruxellois et un Liégeois- et deux néerlandophones défendent les couleurs belges. Il n'y a pas place ici pour l'improvisation. Les candidats ont d'abord dû se classer en ordre utile au niveau national, avant de se frotter à la crème internationale.

Les Belges ont-ils la bosse...biologique? Pas vraiment si l'on s'en réfère aux précédents palmarès de l'épreuve. Ce sont les Asiatiques qui affichent les meilleurs résultats. *«Les Chinois sont très forts. Ils ont d'ailleurs décroché l'or à l'occasion des deux dernières épreuves. La Thaïlande est également très performante. De même d'ailleurs que les représentants des Pays de l'Est»* précise Gérard Cobut. On épinglera tout de même une remarquable performance belge enregistrée en 1994. Laurent Minet avait obtenu la médaille d'argent. Ce brillant candidat est aujourd'hui doctorant à l'Université de Liège.

Pas question à ce stade de la compétition de donner la direction du vent. Le palmarès de la 12ème édition sera proclamé samedi après-midi en présence du prince Laurent. Mais au-delà de cette saine émulation, ces Olympiades auront aussi rempli un autre objectif: celui de placer les sciences en haut de l'affiche. Et pourquoi pas d'avoir suscité des vocations.

M-G.DESCAMPS

Ces Olympiades se prêtent aussi aux échanges culturels et aux visites scientifiques. Fleuron wallon de la biologie, l'IBMM accueillera cet après-midi ces 150 graines... de scientifique.

L'ancien candidat a tracé son chemin

Si ces Olympiades permettent aux compétiteurs de se mesurer sur le terrain de la biologie, elles laissent aussi la place à d'autres plaisirs. Le programme intègre en effet des visites culturelles et scientifiques.

Cet après-midi, par exemple, l'Institut de Biologie et de Médecine Moléculaire (IBMM), installé sur le site de l'aéropole de Gosselies, ouvrira ainsi ses portes à ces jeunes étudiants. Inauguré voici deux ans par l'ULB, ce pôle d'excellence scientifique emploie quelque 250 chercheurs qui travaillent dans les domaines de la biologie cellulaire, de la virologie, de la bactériologie, de la parasitologie, de l'immunologie, de la génétique,...

«C'est un des fleurons de la biologie. L'étape s'imposait donc» déclare Gérard Cobut. D'autant qu'un ancien candidat belge aux Olympiades internationales de biologie figure au nombre des chercheurs de l'IBMM. Originaire de la région bruxelloise, Florent Bernard avait participé à l'édition 1992. Biologiste, licencié en sciences zoologiques (option bio moléculaire), il achève aujourd'hui sa thèse de doctorat au laboratoire de physiologie cellulaire et génétique des levures de l'IBMM.

M-G.D.

Le Soir

«LE SOIR» ENCOURAGE Olympiade de biologie

La tête pleine de questions

Pari gagné pour l'association des professeurs de biologie Probio. L'Olympiade internationale s'est épanouie pendant une semaine dans notre pays («Le Soir» des 9 et 16 juillet). Les concurrents ont regagné leur pays, la tête chargée d'excellents souvenirs et des 160 questions posées à la compétition parrainée par les Communautés française, flamande et germanophone, les Régions bruxelloise et wallonne, les services fédéraux des Affaires scientifiques, l'Institut royal des sciences naturelles, l'Institut royal pour la gestion durable des ressources naturelles, l'ULB et la VUB.

Le comité scientifique belge a dû faire un tri parmi les quelque 270 énoncés rédigés par les spécialistes des pays qui ont participé à l'aventure, nous raconte Irène Popoff, coordonnatrice de Probio. *Nous avons gardé plusieurs questions faciles pour ne pas démoraliser les étudiants et leur permettre de souffler un peu pendant les quatre heures de l'épreuve théorique.*

Deux innovations. La dissection d'un cafard et des vidéos étaient au menu de la partie pratique concoctée par la Belgique.

L'Olympiade couvre toutes les disciplines de la biologie, explique le Pr Louis De Vos, président du jury. *Il faut qu'il y ait une subtile répartition entre des aspects de biologie animale, végétale, moléculaire,... Les séquences vidéo ont permis de poser des questions à choix multiple sur le comportement animal.*

Ne rêvons pas...

Cette année, nos biologistes sont moins chanceux que les chimistes: l'Arlonais Alexandre Depouhon vient de décrocher le bronze à Bombay... *L'important,* dit Irène Popoff, *c'est de participer. De rencontrer des jeunes de différents pays. De lier des amitiés.*

Le message d'au revoir du Suisse Christof Schuepp aux autres participants et aux organisateurs des Olympiades est éloquent: *Une des raisons principales de notre présence, c'est d'avoir l'occasion d'échanger des idées entre jeunes. Pendant cette semaine inoubliable, nous avons vu que nos façons de penser étaient liées à nos différents modes de vie. Comme futurs biologistes, nous avons notre part de responsabilité dans l'avenir de la planète. Ne rêvons pas seulement d'un monde meilleur, commençons à le rendre meilleur!*

Le dernier livre des éditions Bayard est une mine de renseignements pour les esprits curieux. Il reprend les 330 questions posées pendant plus de quatre ans au magazine scientifique français «Eurêka» (1). Des experts de tous horizons proposent des réponses claires et circonstanciées aux interrogations, des plus folles aux plus graves. *L'eau d'une baignoire s'écoule-t-elle toujours dans le sens des aiguilles d'une montre? Comment les plantes se défendent-elles contre les virus? Si les dinosaures n'avaient pas disparu, l'homme serait-il apparu?*

Le livre répond aux questions fondamentales sur notre environnement et sur la technologie qui est à son service. Il nous libère d'interrogations qui touchent la santé: se coucher avant minuit favorise effectivement le sommeil, tous les microbes ne sont pas dangereux mais faire des têtes au football présente un danger... Il donne la clé de bizarreries alimentaires: c'est la migration du beurre de cacao qui provoque le blanchiment du chocolat... *Ce volume est superbe,* souligne le paléontologue Yves Coppens. *J'espère beaucoup qu'il sera suivi par d'autres: il y a tant de questions à poser à la science!*

RAPHAËL DUBOISDENGHIEN

1) «Tout ce que vous avez toujours voulu savoir sur les sciences», éditions Bayard, 610 p., 18,14 euros.

Science | Olympiade de biologie

Un bouquet de médailles

RAPHAËL DUBOISDENGHIEN

Première en Belgique. La fine fleur des biologistes a disputé la 12e Olympiade internationale sur les campus de l'ULB et de la VUB. Originaires de 38 pays, 151 étudiants des dernières années du secondaire ont disséqué pendant deux matinées des questions théoriques et pratiques pas piquées des vers.

Les Prix Nobel Christian De Duve et Ilya Prigogine faisaient partie du comité universitaire de la compétition, placée sous la présidence d'honneur du prince Laurent.

J'admire l'habileté avec laquelle les concurrents arrivent à gérer le temps, nous confie le Pr Louis De Vos, président du jury. *En quatre heures, les rhétoriciens ont dû répondre à 160 questions théoriques pour lesquelles cinq experts ont parfois passé une demi-heure à trouver la bonne réponse!*

A l'issue des épreuves, la Thaïlande arrive en tête avec Thanissara Chansakul. Au total des médailles, trois des quatre biologistes chinois décrochent l'or. Comme les concurrents coréens. Deux médailles d'or sont attribuées à Singapour, Taiwan et la Thaïlande. Une à la Biélorussie, l'Inde, l'Iran, le Kirghizistan et la Pologne.

Et la Belgique? Cette année, nos quatre ambassadeurs ne récoltent pas une seule médaille. Cela ne chagrine pas nos talentueux candidats francophones. *Nous avons passé des journées vraiment fantastiques,* raconte la Bruxelloise Pascaline Lauters. *Ce ne sont pas les trois heures de biologie par semaine qui nous propulseront aux premières places!*

Le Liégeois Nicolas Ruzicka renchérit: *Notre résultat n'aurait pas pu être meilleur. Nous avons exploité au mieux les connaissances que nous avons reçues ou que nous avons glanées. La rencontre avec d'autres délégations nous a ouverts à leur culture.*

L'aboutissement heureux de l'événement ravit la quarantaine de bénévoles qui ont travaillé à sa réussite. *Nos collègues des quatre coins du monde ont apprécié la qualité scientifique des tests que nous avons proposés aux jeunes,* dit Gérard Cobut, coordonateur de l'association des profs de biologie Probio. *Le score de nos rhétoriciens? Une année sur deux, les Belges obtiennent une médaille de bronze. Notre enseignement secondaire se veut un enseignement général. Il ne cherche pas à former des spécialistes mais des jeunes qui peuvent s'orienter vers n'importe quelles études supérieures. Il ne prépare pas des élèves qui brilleront aux Olympiades internationales.*

Nous reviendrons sur cette compétition de haut niveau dans «Le Soir encourage». ●

Belgium, July 8 - 15, 2001

De Standaard

Dreigend tekort aan wetenschappers

Olympiades moeten studenten naar wetenschappelijke richtingen lokken

België zal in 2007 met een tekort aan wetenschappers kampen. Dat vertelde Europees commissaris Philippe Busquin dinsdag op een persconferentie naar aanleiding van de twaalfde Internationale Biologie Olympiade (Ibo), die dit jaar in Brussel georganiseerd wordt.

Brussel
Eigen berichtgeving

De competitie voor laatstejaars humaniorastudenten uit 41 landen vindt van 8 tot en met 15 juli plaats in onze hoofdstad en heeft als doel jongeren warm te maken voor wetenschappen. Omstreeks 2007 gaat immers een groot deel van het onderzoekersbestand met pensioen en steeds meer jongeren die een wetenschappelijke richting volgen, kiezen voor een baan in de industrie.

"Een nieuwe generatie wetenschappers ontbreekt om het roer over te nemen van de oude, met een aftakeling van wetenschappelijk onderzoek en opleiding als gevolg." Volgens Philippe Busquin moet er dringend gereageerd worden. "Nu volgen er, bijvoorbeeld in Frankrijk, 12 procent minder jongeren een wetenschappelijke richting in vergelijking met 1996", aldus Busquin. "We moeten dus de wetenschappen populairder maken voor de jeugd en het wetenschappelijk imago opkrikken. Dat is een belangrijk luik in mijn poging om een Europese Ruimte voor Onderzoek te creëren." Volgens Busquin moet er dringend werk gemaakt worden van de versterking van het wetenschappelijk onderricht. Voorts mag men niet ophouden met het organiseren van verschillende wetenschappelijke manifestaties. "Wetenschap moet nog meer aan bod komen in televisieprogramma's, internetsites en musea", besluit Busquin.

Professor Jean-Jacques Cassiman van de Leuvense universiteit trekt ook aan de alarmbel. "De beperkte carrièremogelijkheden aan de universiteiten zorgen voor een braindrain naar de industrie, aldus Cassiman. "De universiteiten moeten reële en aantrekkelijke doorgroeimogelijkheden aanbieden en ze moeten jonge onderzoekers de mogelijkheid geven hun eigen ideeën te laten uitwerken met een minimum aan middelen en ruimte, die nu meestal niet beschikbaar zijn. Er zijn immers weinig takken van de industrie die deze eeuw zullen overleven zonder te kunnen putten uit de resultaten van het fundamenteel onderzoek."

'Niet enkel de bollebozen van de klas nemen deel aan een olympiade'

Ondanks de matige belangstelling voor wetenschappelijke richtingen, kennen de verschillende olympiades veel succes. Deze zomer laten de Belgische biologen van zich horen. Voor 41 delegaties, afkomstig van de vijf continenten, organiseren ze de Internationale Biologie Olympiade. Elk land stuurt vier laureaten van de eigen olympiade. Die moeten dan op de internationale olympiade een theoretische en praktische test afleggen waaraan alle universiteiten van ons land meegewerkt hebben. Volgens Hugo Vandendries, hoofdcoördinator van het project Ibo 2001, zal vooral de reis de jongeren bijblijven. "Het eigenlijke examen neemt maar één dag in beslag. De rest van de week worden er heel wat socio-culturele activiteiten en bezoeken georganiseerd", zegt Vandendries. "Onze organisatie beschikt over een budget van 322.340 euro (13 miljoen frank), waarmee we onder andere excursies naar Vlaanderen en Wallonië maken. En ik kan je verzekeren, naast het wetenschappelijke gedeelte zal er ook plezier gemaakt worden", aldus de coördinator.

Vlaams laureaat van 1996, Ching Man Choi, beaamt de woorden van Vandendries. "Om mee te doen hoef je echt geen bollebozen te zijn. Je moet niet de eerste van de klas zijn, interesse en passie voor biologie is veel belangrijker. In ons land wordt er ook niet op zo'n hoog wetenschappelijk niveau les gegeven. Nederland heeft bijvoorbeeld 4 uur biologie in de week terwijl dat bij ons maar hoogstens 2 uur is. Op de Internationale Biologische Olympiade zijn het dan ook vooral de Aziatische landen die de prijzen binnenhalen. Daar selecteert men de finalisten echt om hoog te scoren op de Internationale Olympiade. Wij, Belgen, doen vaak enkel en alleen mee voor de lol", lacht de 23-jarige doctorerende student in de biochemie.

(KVDS)

27/06/01

„Europa moet wetenschappers lokken"

Van onze redacteur
Bernard Bulcke

BRUSSEL — Philippe Busquin waarschuwt de EU voor een tekort aan technologie-wetenschappers. De EU-commissaris voor Onderzoek pleit voor Europese migratiequota voor onderzoekers. In België dreigt er volgens hem een tekort aan afgestudeerde geneesheren.

Busquin zei dat bij een toelichting van de agenda voor de EU-ministerraad-Onderzoek, die vandaag in Luxemburg plaats heeft. Daar wordt het voorstel van Busquin voor een nieuw Europees kaderprogramma voor het eerst besproken, samen met de stand van zaken in de vorming van één Europese onderzoeksruimte. Het zesde kaderprogramma voor onderzoek, dat loopt van 2002 tot 2006, is goed voor 706 miljard frank (17,5 miljard euro), 17 % meer dan het huidige.

Busquin waarschuwt intussen onder meer België dat er een tekort dreigt aan geneesheren. Volgens Busquin zijn de bestaande remmen op de toegang tot die studierichting er alleen gekomen uit zorg om de eigenlijke gezondheidszorg en om de betaalbaarheid ervan.

Er is echter ook grote nood aan geneesheren voor wetenschappelijk onderzoek en daarmee is geen rekening gehouden.

Daarnaast houdt de commissaris een opvallend pleidooi voor selectieve immigratie-quota van wetenschappers uit niet-Europese landen. De EU kan voor wetenschappelijk en technologisch onderzoek maar een beroep doen op 250.000 onderzoekers minder dan de VS. De achterstand is te wijten aan oninteressante werkvoorwaarden voor onderzoekers, aan emigratie en aan een tekort aan studenten die voor technologie-studies kiezen.

De VS voerden onlangs tijdelijke, hernieuwbare visa in van drie jaar voor experts, wetenschappers en andere werknemers van innovatie-ondernemingen. De voorziene immigratiequota's worden daar door de federale overheid voortdurend opgetrokken: van 60.000 per jaar in 1995 naar 140.000 dit jaar en 195.000 in 2003.

Busquin pleit voor gelijkaardige Europese initiatieven voor wetenschappers. Hij verwijst naar de *green cards* van de Duitse regering-Schröder. Van de 6.600 visa die de Duitse overheid in dat kader sinds februari 2000 uitreikte, gingen er 5.000 naar niet-Europeanen: vooral Indiërs, Pakistani maar ook inwoners van de Balkanlanden.

„Dit is moreel gesproken niet zeer hoogstaand maar toch noodzakelijk," zei Busquin.

Website of the Zoo

Internationale Biologie Olympiade

Op 10 juli a.s. ontvangt de Antwerpse Zoo zo'n 300 internationale prijsbeestjes uit de hele wereld met hun begeleiders. Voor de eerste maal wordt namelijk de Internationale Biologie Olympiade in België georganiseerd. Elk land vaardigt zijn beste knappe koppen af in de discipline biologie, in de hoop dat ze met een medaille terugkeren.

De deelnemers komen uit bijna 40 landen verspreid over de 5 continenten en voor de allereerste keer vindt deze Olympiade in België plaats. De organisator, de vzw International Biology Olympiad, is de vereniging van Vlaamse leraars Biologie van het Secundair Onderwijs (VOB) en hun Waalse collega's. Zij willen deze studenten de bezienswaardigheden in Vlaanderen laten zien en kozen daarom om de Zoo van Antwerpen op te nemen in hun programma. Ook alle Belgische universiteiten werkten mee aan dit initiatief.
Voor meer informatie over dit initiatief, kunt u terecht bij Hugo Van den Dries op 02/ 627 42 47.

Monday, July 16th, 2001

ONLINE TAIPEI 台北時報 TIMES EDITION

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Taiwan nabs gold and silver at 12th Biology Olympiad

CNA, BRUSSELS

Four Taiwan high school students claimed two golds and two silvers Saturday at the 12th International Biology Olympiad after six days of intense competition.

Lin Yen-you (ªL«Û¦ö), a student from Taipei Chien Kuo Senior High School («Ø°ê¤¤¾Ç), won a gold medal and ranked second in total scores after successfully tackling a series of theoretical problems and practical laboratory experiments.

Only 17 out of the 151 competitors from 38 countries received gold medals. All four students from the Taiwan team were placed in the top 25.

Lin's classmate, Chang Hao-mu (±iµq[st]), also received a gold medal, while, Cheng Ya-chien (¾G¶®°·), won a silver.

Taichung Stella Matutina Girls' High School¡@(¾â©ú¤k¤¤) senior Huang Fu (¶ÀÃL) also received a silver in the competition.

Last year's Taiwan team claimed three golds and one silver, when the competition was held in Turkey.

This story has been viewed 424 times.

Belgium, July 8 - 15, 2001

Bangkok Post
TUESDAY, JULY 17, 2001 • 20 BAHT

STUDENT GOLDS

Prasert

Tanisra

Young Thais excel in world competitions

After 11 years of trying, Thailand has won its first gold medal at the annual International Olympiad in Chemistry.

Prasert Sinsermsuksakul, from Wat Sutthiwararam school won gold in this year's competition held in India, which attracted 210 contestants from 54 countries.

Three other Thai students also took medals — Paphon Tanomkiart from Srinakharin Wirote Pathumwan demonstration school and Chalida Nakornchai from Chulalongkorn University demonstration school both won silvers, and Aroonrat Saengalangkarn from Triam Udom Suksa school took out a bronze.

The concurrent International Olympiad in Biology held in Belgium brought a similar joyful result.

Tanisra Jansakul from Triam Udom Suksa earned the highest score and a gold. Her schoolmates Parawee Lekprasert won a gold and Kanok Pruttiwatanyoo won a bronze. Another Thai, Amornphon Anuwatworn, from Suan Kularb college, received a silver.

Thailand has taken part in the Biology Olympiad since 1991, and has so far reaped 8 golds, split evenly between boys and girls.

A Thai youth brassband from Serasakmontri school also brought home two gold medals — from the 50th Anniversary World Music Contest held in Kerkrade, the Netherlands.