One World, One Medicine

Harvard Medical International

Lisbon, Portugal

April 16, 2007

Robert K. Crone, MD
Guiding Philosophy

Every citizen of the world should have access to high quality, cost-effective health care of a world standard.

Clinical Care
Education
Research

Integrated and Well-Managed With a Culture of Quality
Background

- Established 1994
- Non-profit subsidiary, self-supporting corporation of Harvard University
  - Interlocking board with Harvard Medical School and Harvard University
- 40 Programs in 30 Countries
- 60 Staff
- Commitment to infrastructure building and long-term partnerships & collaborations
Structure at Harvard University

Harvard Non Profit Corporation: 7 Members

Harvard Schools

- Medical School
- Dental School
- School of Public Health
- Business School
- Kennedy School of Government
- School of Education
- School of Design
- School of Divinity
- Faculty of Arts & Sciences
- Extension School
- Law School

HMI Board

Global Network
30+ International Institutions

HMI Gulf
Harvard Medical School

- Established 1782
- Private, Non-Profit
- 9000 + Faculty
- 7,235 Post Graduate Trainees
- 739 MD, 580 PhD Students
- Annual Budget $500 M
- Campus-Wide Research
  Approx $2B
- Endowment $2.8 B
17+ Harvard-Affiliated Medical Institutions

- 17 Major teaching hospitals
- 100 Primary care centers
- 7,000+ Faculty
- 3,000+ Beds
- 1 HMO = 2 million covered

Beth Israel-Deaconess Medical Center
Brigham and Women’s Hospital
Children’s Hospital
Dana Farber Cancer Institute
Harvard Pilgrim Health Care
Joslin Diabetes Center

Massachusetts Ear and Eye Infirmary
Massachusetts General Hospital
McLean Hospital
Spaulding Rehabilitation Hospital
HMI’s Programs

- **Education**
  - Undergraduate
  - Postgraduate
  - Continuing Professional Development

- **Research**
  - Basic Science
  - Biotechnology
  - Applied & Clinical Research
  - Health Systems Research

- **Healthcare Delivery**
  - Inpatient & Outpatient
  - Primary through Tertiary
  - Prevention & Rehabilitation

- **Management**
  - The Business of Healthcare
  - Administration
  - Healthcare Financing
  - Quality
  - Systems Development

Provides Access to the Faculty and Infrastructure of Harvard Medical School and Harvard University
HMI’s Program Sites 2001-2006
HMI’s Medical School Collaborations

- Heidelberg University *
- Munich University
- Mannheim Faculty of Medicine *
- Dresden University *
- Tokyo Medical & Dental University *
- Hong Kong University
- Sri Ramachandra Medical College, Chennai, India *
- O & M University, Dominican Republic
- Xinjiang University, China
- National University of Taiwan *
- National University of Singapore
- Cornell-Qatar Medical School
- Karolinska Institute, Sweden
- Al Faisal University, KSA
- University of Zagreb, Croatia *
- Ulsan University College of Medicine, Korea *
- University of Tikrit College of Medicine
- Kuwait University College of Medicine
- University of Nice
- Peking Union Medical College
- Catholic University of Lisbon
- St Mathews Medical College
- Royal College of Surgeons of Ireland
- Lebanese American University of Beirut
- University of Laussane
- Al Ain University, UAE
- Gulf Medical College, UAE
Developing Health Care Systems

- Strategic Planning
- Clinical Program Planning
- Business Planning
- Facilities & Capital Equipment Planning
- Technology & Systems Development
- Professional Staff Development
- Quality Management
- Network Development
Goals of HMI’s Programs

• **Create** institutions that meet global, regional and local needs, present and future

• **Design** facilities that are flexible, meet present and future programmatic needs

• **Integrate** education with the research, clinical and societal mission of academic medical centers cost-effectively

• **Support** faculty, physicians, researchers and students in the biomedical sciences

• **Monitor** educational and clinical benchmarks to assure world-class quality

• **Foster** collaboration through global networks, sharing ideas & information, for innovation
The Associate Laboratories are research institutions highly recognized by external evaluations, according to international quality criteria, which have achieved their status after presenting a request to the Minister of Science and Technology.

The capacity for cooperation, in a steady, competent and effective way, pursuing the specific aims of the national policy for science and technology is a determinant aspect in the evaluation of the Associate Laboratories.
The status of Associate Laboratory was given for the first time in November 2000 to four institutions, which incorporated, through partnerships, a total of seven research units that were classified as *Excellent* by panels of foreign scientists, within the evaluation of research units promoted by FCT in 1999.

In December 2006, there were 25 research units that had achieved the status of Associate Laboratory, integrating almost 2500 doctorates, in a total of about 5500 researchers.
The main objectives of the scientific policy are:

- Complement the research institutions at the state service with a set of highly international competence institutions
- Proceed with the reinforcement of the scientific and technological institutions introducing a more exigent and steady institutional framework
- Orient the institutions’ activities for a precise set of thematic guidelines
- Stimulate the integration of research, scientific education and transfer of knowledge and technology for non academic sectors, and the construction of bridges between disciplines, institutions and other sectors
- Promote the transdisciplinarity of the internal organization and evolve for organization and management forms more adequate to the new forms of production of knowledge
- Reinforce the opportunities for scientific jobs with high demands and qualifications
A Portuguese initiative for scientific and technological culture
OUR MISSION

CIENCIA VIVA IN SCHOOLS
Science Education, practical work in partnership with research institutions

NATIONAL SCIENTIFIC AWARENESS CAMPAIGNS
Conferences, exhibitions, scientific film festivals...

CIENCIA VIVA SCIENCE CENTRES
A national network of interactive science centres
CIENCIA VIVA NETWORK OF SCIENCE CENTRES
OUR MISSION

HEALTH IN THE XXI CENTURY
A vision from the European Youth
(Year 2000)

THE HUMAN GENOME PROJECT
Perspectives for Public Health
(Year 2001 – 2004)

VOLVOX PROJECT
(Year 2006-2007)
Health in the XXI Century: a vision from the European Youth

Students learn recent developments in Science and Technology in the area of Health Sciences:

Developed in the year 2000 with 22 Portuguese and German high schools

Scientific community support:
22 researchers from 6 research institutions and one learned society:
CMDT, IBMC, IPATIMUP, CNC, IBILI, IGC, Portuguese Society of Neurosciences

Project also supported by journalists and it was presented in Hannover (Pavilion of Portugal, EXPO 2000)

Students’ Activities:
• Visits to laboratories
• Interviews to researchers
• Articles on recent scientific research and technological developments on health issues
Health in the XXI Century: a vision from the European Youth

- Student in the project talks to Bill Clinton
- Malaria research presented by a scientist and students
- EXPO Hannover: Portuguese and German students present their work in the project
The Human Genome: Perspectives for Public Health

An international project on prevention, diagnosis and treatment of genetic diseases in light of the research into the Human Genome.

- High schools Portugal, Germany, Mozambique and Sweden.

- Researchers from 14 scientific institutions

- Science journalists

- 4 different editions (from 2001 to 2004).

Videoconference with Brazil
The Human Genome: Perspectives for Public Health

Groups from different schools:
- visited scientific institutions, interviewed researchers and created articles on genetic diseases.
- created science fiction texts under the topic Genetics in the Year 2020 (collaboration with language teachers)
- carried out experiments based on a science Kit produced by NCBE (Portuguese version provided by Ciência Viva) and shared results.
- ask a scientist
- videoconference between Portuguese and Brazilian students on genetics during the S&T Week.
- discussion forum: Controversial aspects of the Human Genome research. The forum is still online.

Pavilion of Knowledge – Ciencia Viva, 16 April 2007

www.pavconhecimento.pt
The Human Genome: Perspectives for Public Health

The Human Genome
Perspectives for Public Health
The Project in 2001

Schools | Researchers | Activities | Support Materials
Topics | Partnerships | Discussion Forum | Products

Articles created by the schools

Haemophilia: The blood-loss-disease
School: Scholzentrum Alwin-Loehrke, Germany
Teacher: Astrid Roschke
Researcher: Volkhard Rippe, Center of Human Genetics, University of Bremen

Lupus: the one thousand faces illness
School: Baixa de Banheira secondary school
Support: Marta Barreto, Gulbenkian Institute of Science
The Volvox project

An ongoing European project for the creation of materials to encourage good practice in bioscience education in European schools

Participants: Biologists and teachers of Biology from nine European countries

Involvement of Portuguese health science institutions:

1. Institute of Molecular Medicine (IMM)

Daily threats to our genome: mutagenic effects of tobacco

2. Immunology Department, Medical Science Faculty

Imunology
A Portuguese initiative for scientific and technological culture
Portugal and Harvard

1. Health publications for the general public

2. Training programs in clinical research
Health Information for Public

- **Books and monographs:** 75 published
- **Newsletters:** 5 monthly newsletters
- **Magazines:** *Newsweek, Better Homes & Gardens*
- **Weekly Newspaper column:** In 60 newspapers, worldwide
- **Total of 6 million words of information, and thousands of pictures**
Portugal-Harvard
Health Publications for the General Public:
In the Doctor’s Office
Centro de Educação de Pacientes
Portugal-Harvard

Health Publications for the General Public:

On the Internet
Content on Internet Translated into Portuguese

- Healthy lifestyle: Nutrition, exercise, stress management, addictions
- Adult Diseases: Over 500 diseases
- Children’s Health (Growth and development, diseases)
- Symptom decision guides (for the 100 most common symptoms in adults and children)
Content on Internet
For People Who Cannot Read

- The Internet allows information to be delivered by voice and pictures. This is a way to reach people who cannot read.
- Such information could be delivered on cell phones with Internet connections. Does not require a computer.
- An increasing number of people who cannot read have such cell phones.
Harvard’s Training Program
For Clinical Research:
Program in Clinical Effectiveness
Courses

- Epidemiology
- Biostatistics
- Decision analysis/ cost-effectiveness analysis
- Social/behavioral research
- Clinical trials
- Ethics
- Health policy
- Health system research
- Quality Improvement
- Analysis of large databases
Number of Entering Students

Year:
- 1987
- 1990
- 1993
- 1996
- 1999
- 2002
- 2005

Number of Entering Students:
- 0
- 20
- 40
- 60
- 80
- 100
- 120
- 140
- 160
Satisfaction with Program

- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

0% 20% 40% 60% 80% 100%
Number Papers Published Since Completing Program

- > 100: 51 papers
- 51 - 100: 26 papers
- 26 - 50: 11 papers
- 11 - 25: 6 papers
- 6 - 10: 1 paper
Students

- Age when taking program
  - Age 25 - 39: 86%

- Academic rank when taking program
  - Fellow/resident: 64%
  - Assistant professor: 29%
  - Associate professor: 4%
  - Professor: 2%

- Live and work
  - United States / Outside U.S.: 89% / 11%
  - From Harvard / From Elsewhere: 74% / 26%
Number of Entering And Returning Students

![Bar chart showing the number of entering and returning students from 1998 to 2006. The chart indicates an increasing trend in the number of students each year, with a notable increase in the number of returning students.]
## Research Fields

<table>
<thead>
<tr>
<th>Research Field</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidemiology</td>
<td>55%</td>
</tr>
<tr>
<td>Social-behavioral</td>
<td>11%</td>
</tr>
<tr>
<td>Clinical trials</td>
<td>43%</td>
</tr>
<tr>
<td>Medical education</td>
<td>11%</td>
</tr>
<tr>
<td>Health financing and organization</td>
<td>42%</td>
</tr>
<tr>
<td>Informatics / computers</td>
<td>8%</td>
</tr>
<tr>
<td>Translational research</td>
<td>16%</td>
</tr>
<tr>
<td>Laboratory sciences</td>
<td>3%</td>
</tr>
</tbody>
</table>
Highest Rank Achieved
By Graduates, as of 2006

<table>
<thead>
<tr>
<th>Rank</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>13%</td>
</tr>
<tr>
<td>Associate professor</td>
<td>25%</td>
</tr>
<tr>
<td>Assistant professor</td>
<td>51%</td>
</tr>
</tbody>
</table>
Fostering the public understanding of Science

- Undergraduate students in the lab
- High school students in the lab
- High school teachers
- The challenge: To commit the university to these activities

HMS/Portugal Collaboration - 16 April 2007
Center for Neuroscience and Cell Biology (CNC)  
University of Coimbra
1st day: Visit to the University

University library

University chappel
Students meet principal investigator
Students learn from graduate student
Students now work individually
Students obtain results
Students present their results at a seminar

- Students attain a high understanding of the research process
- Students acquire a grasp of the problems investigated
- Students develop a realistic view of research
Students leave happy!
Fostering the public understanding of Science

• Undergraduate students in the lab
• High school students in the lab
• High school teachers
• The challenge: To commit the university to these activities

HMS/Portugal Collaboration - 16 April 2007
Faculty of Medicine of the University of Porto
<table>
<thead>
<tr>
<th>2005/2006</th>
<th>St. Admissions</th>
<th>St. Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Undergraduate students: 250&lt;br&gt;(admission classification: 18.1-19.6)</td>
<td>Undergraduate students – 1,378</td>
</tr>
<tr>
<td></td>
<td>Post-graduate students: 252</td>
<td>PhD students – 156</td>
</tr>
<tr>
<td></td>
<td>St. Total Number</td>
<td>Master students + other – 598</td>
</tr>
<tr>
<td></td>
<td>Faculty</td>
<td>358 (159 PhDs)</td>
</tr>
</tbody>
</table>
## Doctoral Programs
- Metabolism: Clinics and Experimentation
- Public Health
- Clinical and Health Services Research
- Forensic Sciences
- Molecular Medicine and Oncology
- Neuroscience
- Genetic Pathology
- Bioengineering
- GABBA

## Master Programs
- Bioethics
- Forensic Sciences
- Orthognatic e Orthodontic Surgery
- Epidemiology
- Evidence and Decision in Heath
- Economics and Health Management
- Medical Informatics
- Emergency Medicine
- Molecular Medicine and Oncology
- Microsurgery
- Psychiatry and Mental Health
- Public Health

## Post-Graduate Courses
- Forensic Medicine
- Hydrology and Climatology
- Heath Education
- Pain Medicine
- Sports Medicine
- Occupational Medicine
- Orthodontia
- Oral e Extra-Oral Rehabilitation
- Renal Therapeutic Support
Outreach

- Lab Visits (mainly high school students)
- Faculty visits (last year of high school)
- School visits (from elementary to high school) at the “Brain Awareness Week”
- “Brain Awareness Week” presentations at public places
- Participation in the University of Porto fair
- Junior University
- “Ciência Viva”
E-learning

Dominant technology in supporting new approaches to teaching and learning.

Unique ability to bring together a community of learners unrestricted by time or place: offers the means of creating an educational experience long idealized.

Creates learning environments that facilitate higher order cognitive abilities and encourage these to thrive “Transactional perspective of teaching and learning embedded in a critical community of learners”

Garrison and Anderson 2003
Aims

Develop a virtual learning environment to blend with the traditional learning scenario

Provide interactive, multimedia learning materials covering special parts of the curriculum

Create a forum for clarification and discussion of curriculum contents and related subjects

Open public access to teaching and research material
From course syllabus to e-learning - I

- **Course syllabus** (Information on the objectives, teaching methods and study plans)
  - All 349 undergraduate and postgraduate subjects offered regularly are at the Faculty web site ([http://med.up.pt](http://med.up.pt))
  - 41 subjects not offered in a regular basis (eg. Spring Courses or Summer School) provide information at their own web sites
  - Portuguese and in English for most of the subjects

- **Online learning materials** (online study materials such as HTML, Word, Excel, PowerPoint or PDF files)
  - 65% (27 out of 42) of the undergraduate subjects (Medicine Course)
    94% for basic subjects / 44% for clinical subjects
    (At the Faculty (19) or the University (8) web infrastructure)
  - Less than 15% of the postgraduate subjects (5 out of 21 Master and other postgraduate courses)
From course syllabus to e-learning - II

- **E-learning (Moodle @FMUP e WebCT @UP)**
  - 20% subjects (11 out of 42) of the Medicine Course
    (Moodle – 3; WebCT – 8)
  - 5 post-graduate courses (Moodle)
  - Wiki is currently being used to support teachers and students interactivity

- **E-learning functionalities**
  Course contents, events scheduling, exercises, automatic exam corrections, assignment’s submissions, evaluation statistics, chat, news and forum

- **Internet access**
  - Nearly 100 computers available for students at Faculty labs
  - Wireless free access provided at most of Faculty and University premises
Subjects and E-Learning functionalities

<table>
<thead>
<tr>
<th></th>
<th>Static online learning material</th>
<th>Interactivity Lecturer / Student</th>
<th>Automatic correction exercises and exams</th>
<th>Simulation exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate subjects (n=42)</td>
<td>62% (26)</td>
<td>12% (5)</td>
<td>12% (5)</td>
<td>2% (1)</td>
</tr>
<tr>
<td>Master subjects (n=195)</td>
<td>8% (16)</td>
<td>1% (2)</td>
<td>0,5% (1)</td>
<td>0</td>
</tr>
<tr>
<td>Other post-graduate subjects (n=112)</td>
<td>17% (19)</td>
<td>0</td>
<td>1% (1)</td>
<td>0</td>
</tr>
<tr>
<td>Other subjects (n=41)</td>
<td>20% (8)</td>
<td>0</td>
<td>5% (2)</td>
<td>2% (1)</td>
</tr>
</tbody>
</table>
Course Syllabus (e.g. Molecular Cell Biology)

Curricular profile

Annual discipline of the 1st year of the courses of Medicine of the Faculty of Medicine of the University of Porto (FMUP) and of Dental Medicine of the Faculty of Dental Medicine of the University of Porto (FMDUP), with a total load of 150 hours.

CONTENTS AND PURPOSES

The discipline of Cellular and Molecular Biology is focused on the aspects of the structural and molecular organization of the animal cell that are related to its normal functioning, as well as to the molecular mechanisms during development and aging. As an indispensable base to the understanding of developmental biology, the discipline includes in General Embryology. The basic purposes of the discipline aimed at providing students with theoretical and practical knowledge on (i) the structural and molecular organization of the cell and the underlying mechanisms to its normal function, (ii) the processes that govern the embryonic development and aging and (iii) the methodology and tools used in the study of the cell. The student should be enabled to practice several techniques of microscopic observation and laboratorial protocols, to
TEMAS EM INVESTIGAÇÃO

CARACTERIZAÇÃO DO PAPEL DO FACTOR DE TRANSCRIÇÃO DRG11 NO DESENVOLVIMENTO EMBRIONÁRIO DO SISTEMA NOCICEPTIVO
Dedalina Lima, Sandra Bateia, Carlos Regueira, Cláudia Lopes

O DRG11 foi recentemente identificado pelo grupo, em colaboração com David Anderson, CalTech, como um gene primariamente implicado no desenvolvimento embrionário do sistema nociceptivo. O trabalho em curso, relativo ao seu real papel no desenvolvimento do sistema nociceptivo, está em curso.

"Biologia de microambientes levar para o estudo dos mecanismos de controlo do estado celular" (2006-2007) Programa Outubra de Estudos de Investigação - Hélder Basto

"Efeitos do efeito de umidade e da expressão de factores de crescimento vascular no órgão cromosomático na hipertensão arterial elétrica do rato tratado com antagonista da angiotensina II, bloqueador e antagonista dos receptores da angiotensina-1 na progressão da distrofia miocárdica" Bolso APA 2005 - Delmiro Neves, Pedro Nascimento

PUBLICAÇÕES SELECIONADAS


Pinto, A.; Lima, D. y Teixeira, I. Correlation of astrocytosis-related tiss expression in areas of the transencephalic system during chronic pain involvement of spine modulatory and intra-modulatory connections. Neuroscience Letters (em print)


Monteiro, C.; Lima D. & Galhardo V. (2008) Switching on and off of histone
Online learning materials (eg. Molecular Cell Biology)

Biology Cellular and Molecular / Intranet

2006 / 2007

Seminars | Teóricas | Práticas
--- | --- | ---
Aula nº 1 - 25 Out. | 28 Out. | 28 a 31 Out.
Aula nº 2 - 30 Oct. | 05 Out. | 02 a 05 Out.
Aula nº 3 - 07 Nov. | Aula nº 5 - 12 Out. | 09 a 12 Out.
Aula nº 5 - 19 Out. | Aula nº 6 - 26 Out. | 16 a 20 Out.
Aula nº 6 - 26 Out. | Aula nº 7 - 02 Nov. | 20 Out. a 03 Nov.
Aula nº 7 - 03 Nov. | Aula nº 8 - 09 Nov. | 05 a 09 Nov.
Aula nº 8 - 10 Nov. | Aula nº 9 - 17 Nov. | 06 a 17 Nov.

Aula Prática 1L
Manejo do microscópio e práticas laboratoriais

1. Estrutura do microscópio
   - Estructura óptica e estrutura mecânica do microscópio

2. Observação de preparações a fresco
   - Células da manada ural.

3. Coloração e observação de um estigma saudável
   - Efectuar e secar estigma. Método de coloração: Seguir a liminar com a pín-gu-date e depositar o estigma - 2 min. Depositar gotas de água destilada - 6 min. Limar na partícula, secar e observar estruturas.

4. Observação de preparações definitivas
   - Módulos de ouro do mar
   - Placas uterina (Gat EP) - coloração HE
   - Estigma de sauge - comar da viagem
   - Corte objectivos 10x, 40x e 100x e (máximo) as medidas de iluminação e manuseio de di

5. Determinação da ampliação e do limite de resolução.
**Introdução à Medicina**

**AVISOS**

Na 6ª feira, dia 30 de Março, haverá aula teórica de Introdução à Medicina (Normas em Informática Médica). Esta aula será dada na 3ª feira seguinte, dia 3 de Abril, no lugar da aula de História da Medicina. A evolução dos instrumentos cirúrgicos.

******************************************************************************

**Atenção**

Os alunos que faltarem com justificação a algum mini-teste, ao longo do ano, podem realizar-lo(s) na semana a seguir à queima das fitas (em data e hora a indicar), desde que entretanto terão entregue no SBM a respectiva justificação.

Durante a semana da queima será ativado no moodle a lista de alunos autorizados a realizar os mini-testes em atraso.

******************************************************************************

**Links úteis para os trabalhos anuais:**

- Temas dos trabalhos anuais 2006/2007
- Datas e objetivos das próximas apresentações
- Papelweb: acesso à Medicine
Aprendizagem on-line
Biologia Celular e Molecular

Aviso
As questões colocadas na aprendizagem on-line de Biologia Celular e Molecular só serão respondidas se foram enviadas até 30 de Janeiro
A actividade normal será retomada a partir de 5 de Fevereiro (2º semestre)

Modador : RM
Utilizadores a ler este fórum: Nenhum

<table>
<thead>
<tr>
<th>Tópicos</th>
<th>Respostas</th>
<th>Autor</th>
<th>Vistos</th>
<th>Última Mensagem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inamovível: Como participar no fórum de Biologia Celular e Molecular</td>
<td>3</td>
<td>mnamas</td>
<td>1126</td>
<td>Qua Jan 24, 2007 4:50 pm</td>
</tr>
<tr>
<td>Metodologia do estudo da célula</td>
<td>9</td>
<td>Deolinda Lima</td>
<td>2221</td>
<td>Sab Jan 27, 2007 5:20 pm</td>
</tr>
<tr>
<td>Constituentes químicos da célula</td>
<td>1</td>
<td>Deolinda Lima</td>
<td>1197</td>
<td>Sex Jan 31, 2007 6:51 pm</td>
</tr>
<tr>
<td>Estrutura dos macromoléculas biológicas: DNA, RNA, proteínas</td>
<td>29</td>
<td>Deolinda Lima</td>
<td>2926</td>
<td>Seg Jan 29, 2007 3:45 pm</td>
</tr>
<tr>
<td>Replicação, reparação e recomposição do DNA</td>
<td>24</td>
<td>Deolinda Lima</td>
<td>2353</td>
<td>Sex Jan 27, 2007 5:14 pm</td>
</tr>
<tr>
<td>Síntese e processamento de RNA</td>
<td>28</td>
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<td>3059</td>
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</tr>
</tbody>
</table>

Síntese e processamento de RNA
{Ir para a página 1 / 2}

Ver mensagens anteriores: Ver mensagens

Sobre a página 1 / 2
Quizzes semanais

Adenoma e Carcinoma do colon

Pergunta 1. Aspecto macroscópico de extensa lesão do recto de um homem de 55 anos. Qual o diagnóstico mais provável?

A. Hiperplasia da mucosa rectal
B. Hipertrofia das pregas da mucosa rectal
C. Úlcera rectal
D. Rectite crónica
E. Adenoma Viloso
EDUCATIONAL MULTIMEDIA TASK FORCE

DG XIII Telematics and Applications Programme
DG XXII Leonardo da Vinci Programme

LAHYSTOTRAIN
Integration of Virtual Environments and Intelligent Training Systems for Laparoscopy/Hysteroscopy Surgery Training
E-learning platform - online evaluation

Preview 9º Miniteste - Base de Dados

Escolha a opção que completa a frase correctamente.

Um campo chave externa é ...

Choose one answer.

- a. Um campo numérico cujo valor nunca se repete
- b. Um campo cujo valor se pode repetir
- c. Um campo numérico cujo valor se pode repetir
- d. Um campo cujo valor nunca se repete

Dado o seguinte esquema e de acordo com os dados nele existentes quantos doentes com idade inferior a 20 anos foram internados desde o início de 2006 no serviço de Pneumologia?

<table>
<thead>
<tr>
<th>Nº Doente</th>
<th>Data Nascimento</th>
<th>Morada</th>
<th>Nome</th>
</tr>
</thead>
<tbody>
<tr>
<td>123456</td>
<td>20/06/1998</td>
<td>Rua</td>
<td>X</td>
</tr>
<tr>
<td>654321</td>
<td>20/06/2000</td>
<td>Avenida</td>
<td>Y</td>
</tr>
<tr>
<td>6789</td>
<td>20/06/1999</td>
<td>Rua</td>
<td>Z</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Nº internamento</th>
<th>Data Entrada</th>
<th>Nº Doente</th>
<th>Serviço</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>05/03/2006</td>
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<tr>
<td>33</td>
<td>05/02/2006</td>
<td>6789</td>
<td>6</td>
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</table>

Servico Nome
Evaluation of impact on the learning process

Quality of the material available:
*high quality learning contents*

Pages most frequently visited:
*lecture presentations, learning modules-seminars; students deliverables*

Correlation between student access to the web site and final grade:
*significant positive correlation although a causal relationship could not be inferred*
In the future

- On-line labs
- Clinical Simulation
  - Interview teaching tool
  - On-line physical exam teaching
Papers ISI-WoS 2002-2006

Portugal / Univ Porto

<table>
<thead>
<tr>
<th>Ano</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
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<td>5618</td>
<td>6628</td>
<td>7643</td>
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<tr>
<td>UP</td>
<td>828</td>
<td>1023</td>
<td>1169</td>
<td>1369</td>
<td>1553</td>
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</table>
Full Papers ISI-WoS 2006 by department

- Centro de Farmacologia e Biopatologia Clínica
- Centro de Morfologia Experimental
- CINTESIS – Centro de Investigação em Tecnologias e Sistemas de Informação em saúde
- Unidade de Investigação e Desenvolvimento Cardiovascular do Porto
- Unidade de Investigação e Desenvolvimento de Nefrologia
- Within IPATIMUP
- Within IBMC
Vanilloids in Pain Therapy

Vanilloid Receptors (TRPV1) in the urinary bladder

Francisco Cruz
António Avelino
Paulo Dinis
Ana Charrua
Célia Cruz
Carlos Silva
Gene Therapy for Pain Control

- Programme 1 - Advanced classification methods (Joaquim Marques de Sá)
- Programme 2 - Modelling and simulation (Willem van Meurs)
- Programme 3 - Clinical diagnosis ans signal processing (João Bernardes)
Research at the undergraduate level

- Participation in research projects while attending the various modules
- Being part of a research team in a longitudinal module of the medical course
- Applying to a research project granted by Univ. Porto / Private Foundation
- Apply to the European “Standard Research Exchange Project” of the IFMSA
- Regular scientific workshops (FMUP students organization)
- YES Meeting – Young European Scientists Meeting (FMUP students organization)
ICBAS
INSTITUTO DE CIÊNCIAS BIOMÉDICAS ABEL SALAZAR
UNIVERSIDADE DO PORTO

A school of applied biology / education and research

Established in August 1975

University degrees in different subjects
  - graduate programme
  - a post-graduate programme

Joint degrees with other faculties

Solid education and research in life sciences

Promoting health sciences
## ICBAS

### Degrees offered from 2007 / 2008

<table>
<thead>
<tr>
<th>1st cycle (3 years)</th>
<th>2nd cycle (2 years)</th>
<th>Integrated Master (5 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Sciences</td>
<td>Marine Sciences</td>
<td>Medicine (+ 1 year)</td>
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<tr>
<td>Biochemistry</td>
<td>Biochemistry</td>
<td>Veterinary Medicine</td>
</tr>
<tr>
<td>Environ. Toxicology</td>
<td>Environ. Toxicology</td>
<td>Bioengineering</td>
</tr>
<tr>
<td>Public Health *</td>
<td>Public Health *</td>
<td></td>
</tr>
<tr>
<td>Nursing</td>
<td>Nursing</td>
<td></td>
</tr>
<tr>
<td>Forensic Medicine</td>
<td>Forensic Medicine</td>
<td></td>
</tr>
</tbody>
</table>
Students distribution

Undergraduate students ±1600

Postgraduate students

  Master degree 419
  PhD students 245

Total Students 2264
I CBAS

Degree in Medicine
with the
Hospital de Santo António

And others such as

Oncology Institute (IPO)
Hospital Magalhães Lemos
Hospital de V.N.Gaia
The Hospital de Santo António

<table>
<thead>
<tr>
<th>Service</th>
<th>Numbers</th>
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<tbody>
<tr>
<td><strong>Budget</strong></td>
<td>215 millions Euros</td>
</tr>
<tr>
<td>Medical doctors</td>
<td>755 (including internships)</td>
</tr>
<tr>
<td>Beds</td>
<td>615</td>
</tr>
<tr>
<td>Inpatient admissions</td>
<td>24 500</td>
</tr>
<tr>
<td>Inpatient surgery</td>
<td>12 500</td>
</tr>
<tr>
<td>Outpatient surgery</td>
<td>10 000</td>
</tr>
<tr>
<td>Outpatients</td>
<td>375 000</td>
</tr>
<tr>
<td>Emergency patients</td>
<td>130 000</td>
</tr>
</tbody>
</table>
Subject distribution along the medical course
Staff

- involved in education and research (experimental):
  - working at the Institute facilities
  - working in partners research institutes such as:
    - Institute for Molecular and Cellular Biology (IBMC)
    - Institute for Pathology and Molecular Immunology (IPATIMUP)
    - Marine Research Center (CIMAR)
- involved in clinical education and research at the Hospital Santo António
RESEARCH ACTIVITIES AND TRAINING OF PhD STUDENTS

In 2006

- members of ICBAS are authors of more than 200 research articles in peer review journals

- 245 students are registered as PhD students
Ongoing and new PhD programmes

- GABBA – graduate programme in basic and applied biology
- Genetics and molecular pathology
- Oncology and molecular medicine
- Neurosciences
- Bioengineering *

The PhD programmes are co-organised with the Faculty of Medicine, IPATIMUP and IBMC and INEB

* With the Faculty of Engineering
ICBAS

Improving the facilities >>>> NEW BUILDING
ICBAS
ICBAS
ICBAS
• Undergraduate students  ±1600
• Postgraduate students
  – Master degree  419
  – PhD students  283
• Total Students  ±2300

(from 18 countries)
PhD Graduations

- 1997: 20
- 1998: 15
- 1999: 22
- 2000: 25
- 2001: 20
- 2002: 30
- 2003: 32
- 2004: 28
- 2005: 30
- 2006: 30

Number of PhD Graduations from 1997 to 2006.
• Funding of the activities of the faculty (1)
  
  - Contribution of the government for an annual fixed number of students
  - Fees paid by students who have not qualified for state commissioned positions
  - Competitive research funding from the Portuguese Research Foundation or European grants
  - Work on contract basis
• Funding of the activities of the faculty (2)
  – The total funds allocated to de Abel Salazar Institute for the Biomedical Sciences
  – about 13 millions Euros (including donations)
<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget</td>
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</tr>
<tr>
<td>Emergency patients</td>
<td>130 000</td>
</tr>
</tbody>
</table>
Why are interactions between university and health care difficult?

- Different cultures
- Lack of communication
- Health care R&D is an academic affair
- Achievement in R&D is not rewarded by hospitals.
• At government level does not exist a strong link between their departments of health and department of education.

• Professionaly we see medical education as a continuum, begining with the undergraduate education and continuing through professional development until the end of our professional lives.
• Unfortunately the many players involved in medical education are not well coordinated
ICBAS – HGSA
drivers for change
• Service – Pressures to reduce costs of clinical care, provide care more locally. Pressures to demonstrate quality of care
Research – pressures to improve competitiveness, linked to institutional income. And pressures from the health system for a different kind of research.
• Education – pressures to reform medical education, increase patient contact, broaden experience of illness and its context
• The way the medical school, university and health system govern their shared interests has to be rethought according to the changing context. The traditional model of liaison is increasingly ineffective as a form of governance.
ICBAS – HGSA
Cooperation agreement
Joint management, in this cooperation agreement, is more fluid than a merger implies and is not necessarily about integrating structures, which might be better thought of as joined management of teaching, research and service.
Research, service and teaching should all be complementary but instead compete. The reason they compete is that usually the medical school has responsibility for research while the teaching hospital is held accountable for the quality of clinical care.
ICBAS – HGSA
Cooperation agreement

- Medical school Management Board
  - Dean
  - Head for scientific affairs
  - Head of teaching affairs
  - Administrative director

- Hospital Management board
  - Administrative director (CEO)
  - Medical director
  - Teaching director
• The Hospital Teaching Director mediates between the Hospital CEO and the Dean. This has not removed the tensions but has to an extent mitigated them. This model was adopted from the one that exits in the Johns Hopkins University, Baltimore and the Academic Medical Centre at the University of Amsterdam. In these institutions, as in ICBAS-HGSA, service, research and teaching all retain their individual balance through integrating their functions.
• We assume the death of the triple threat leader

- The medical leader, usually a professor and a head of an academic department who was outstanding at clinical practice, teaching and research no longer exists, if indeed he ever existed
Clinical academic staff recruitment
- Clinical leaders
- Leaders of the profession
- Recruitment
- Retention
- Role models?
- International links
- Agents for change?
Clinical academic staff recruitment

- The head of the clinic in the Hospital is not necessarily the head of teaching in the subjects related to that area
- Every medical doctor has an obligation to take part in teaching either on pre-graduate level or on post-graduate level
Strategies for university and health care interactions

- Create forum for informal communication
- Development of common R&D strategy
- Focus on larger program areas and integration of quality assessment
• **Strategies for university and health care interactions**

  – Stimulate academic career opportunities in health care

  – Improve scientific status of clinical R&D

  – Stimulate interactions between pre-clinical and clinical research
A partnership since 2001

A multidisciplinary research institution
The Institute for Molecular and Cell Biology (IBMC)
The Institute for Biomedical Engineering (INEB)
Universidade do Porto

Research institutions on Life Sciences, Health Sciences and Bioengineering

Non-profit associations
Public interest
The non-profit associations includes:

Universidade do Porto
Faculdade de Ciências
Faculdade de Engenharia
Faculdade de Farmácia
Faculdade de Medicina
Instituto de Ciências Biomédicas Abel Salazar
Hospital Geral de Santo António
Hospital de S. João
Instituto de Genética Médica Jacinto de Magalhães
Instituto Nacional de Saúde Dr. Ricardo Jorge
Comissão de Coordenação e Desenvolvimento Regional do Norte
Câmara Municipal do Porto
FLAD (Fundação Luso-Americana para o Desenvolvimento)
BIAL

Member: UNESCO - Molecular and Cell Biology Network

A. Salgado – Ortopedia, Lda.
Centro Hospitalar de Vila Nova de Gaia *
Centro de Performance Humana
Centro de Reabilitação Profissional de Gaia (CRPG)
Comissão de Coordenação e Desenvolvimento Regional Norte *
Faculdade de Engenharia da Universidade do Porto (FEUP)
Hospital Geral de Santo António *
Hospital de São João *
Instituto Português de Oncologia (IPO)
Instituto Português do Sangue (IPS)
Serviço de Utilização Comum dos Hospitais (SUCH) *
Universidade do Porto *

* Founding Members
Scientific activity

• The Institutions are developing research in 7 different areas

• 31 Research Groups

• 17 support facilities
The 5 MAJOR RESEARCH AREAS at IBMC

With large component of fundamental and applied work

1. **BASIC & CLINICAL NEUROBIOLOGY**  
   *Head:* Maria João Saraiva

2. **BIOLOGY OF INFECTION & IMMUNOLOGY**  
   *Head:* Alexandra Moreira

3. **CELL ADAPTIVE MECHANISMS**  
   *Head:* Pedro Moradas-Ferreira

4. **HUMAN GENETICS & GENETIC DISORDERS**  
   *Head:* Maria de Sousa

5. **STRUCTURAL & MOLECULAR BIOLOGY**  
   *Head:* Jorge Vieira
The 2 RESEARCH AREAS at INEB

1. BIOMATERIALS
   The Biomaterials Laboratory is located at a building shared with the IBMC

2. BIOMEDICAL SIGNAL & IMAGE
   The Signal and Image Laboratory is located at the Faculdade de Engenharia da UP
EXTERNAL SCIENTIFIC COUNCIL

Christopher Leaver (chair) - University of Oxford, Oxford
Angelo Azzi - University of Bern, Bern
JJ Neefjes - The Netherlands Cancer Institute, Amsterdam
Mina Bissell - University of California, Berkeley
Sydney Brenner - The Molecular Sciences Institute, California
Fotis Kafatos - EMBL, Heidelberg
Henk Groenewegen - Vrije Universiteit, Amsterdam

André Dittmar - INSA, Lyon
Bernard Buxton – University College London, London
Charles Baquey - Université de Bordeaux II, Bordeaux
Paolo Tranquilli Leali - Università di Sassari, Sassari
William Bonfield (chair) – University of Cambridge, Cambridge
Nuno Grande – University of Porto, Porto
Eduardo Caetano - Lisbon
INTEGRATIVE INITIATIVE
Establishing a joint program in understanding learning and memory

Laboratory Animal Science - A Olsson & L Antunes
Study housing conditions and evaluation of anesthetics

Neuropharmacology - A Albino-Teixeira
Neuropsychopharmacology of the peripheral nervous system

Morphophysiology of the Somatosensory System – D Lima
Molecular and physiological aspects of pain processing

Neurophysiology & Psychophysiology – A Martins-da-Silva
Neuropsychophysiology, neurorehabilitation, neuroepidemiology

Neurobehaviour - L de Sousa
Neurotoxicology and neuroprotection

Molecular Neurobiology - MJ Saraiva
Amyloid diseases; peripheral nerve; protein-ligand interactions

1. BASIC & CLINICAL NEUROBIOLOGY
2. BIOLOGY OF INFECTION & IMMUNOLOGY
3. CELL ADAPTIVE MECHANISMS
4. HUMAN GENETICS & GENETIC DISORDERS
5. STRUCTURAL & MOLECULAR BIOLOGY
1. BASIC & CLINICAL NEUROBIOLOGY
2. BIOLOGY OF INFECTION & IMMUNOLOGY
3. CELL ADAPTIVE MECHANISMS
4. HUMAN GENETICS & GENETIC DISORDERS
5. STRUCTURAL & MOLECULAR BIOLOGY

Cell Activation & Gene Expression – A Carmo & A Moreira
Analysis of gene transcription and protein expression in the immune and nervous system

Fish Immunology & Vaccinology
Immunobiology – N Santos
Develop new vaccination strategies

Immunobiology – M Vilanova & P Ferreira da Silva
Develop new vaccination strategies

Microbiology & Immunology of Infection – R Appelberg
Dissect mechanisms of protective immunity

Molecular Microbiology – D Cabanes
New virulence factors of *Listeria monocytogenes*

Parasite Disease – A Cordeiro-da-Silva & A Ouassi
*Leshmania* infection

INTEGRATIVE INITIATIVE
Tuberculosis
1. BASIC & CLINICAL NEUROBIOLOGY
2. BIOLOGY OF INFECTION & IMMUNOLOGY
3. CELL ADAPTIVE MECHANISMS
4. HUMAN GENETICS & GENETIC DISORDERS
5. STRUCTURAL & MOLECULAR BIOLOGY

Biology of Inflammation & Reproduction – N Teixeira
Study of cell and molecular mechanisms associated to cell response in human conditions

Cellular & Applied Microbiology – P Moradas-Ferreira
Cell response and ageing in microorganisms

Stress in Animals – H de Almeida
Steroid cell function, transduction and cell response

INTEGRATIVE INITIATIVE
Ageing and Biological Regeneration
Iron genes & the Immune System – M de Sousa
Human immunogenetics and experimental models of iron overload

Molecular Epidemiology – J Armas
Musculoskeletal research

Lymphocyte Biology – F Arosa
Cell interaction and immune system

Lysosome & Peroxisome
Biology – C Sá Miranda
Storage disorders and clinical trials in enzyme replacement

Organelle Biogenesis
and Function – J Azevedo
Structural and functional relationships and pathways of peroxisome proteins

UniGENe – J Sequeiros
Genetics and neurodegenerative diseases
1. BASIC & CLINICAL NEUROBIOLOGY
2. BIOLOGY OF INFECTION & IMMUNOLOGY
3. CELL ADAPTIVE MECHANISMS
4. HUMAN GENETICS & GENETIC DISORDERS
5. STRUCTURAL & MOLECULAR BIOLOGY

Developmental Biology – F Casares
Gene expression and regulation during Drosophila development

Mitochondria – A Videira
Characterization of mitochondria involvement in biological processes

Molecular Biology of Nitrogen Assimilation - H Carvalho
Protein regulation, gene expression and structural analysis

Molecular Evolution – J Vieira
Cromossomal polymorphisms, adaptation and genes co-evolution

Molecular Genetics – C Sunkel
Cell Division, aneuploidy and cell dynamics

Molecular Structure – AM Damas
Protein crystallography and structural analysis

INTEGRATIVE INITIATIVE
Protein Production and Purification Facility
• INEB is organized in four research groups:

**Biointerfaces** - M Barbosa  
**Bioceramics and Glasses** - J Domingos Santos  
**Signal Processing** - J Marques de Sá  
**Biomedical Imaging and Vision Computing** - A Campilho
The research is supported by 17 core facilities and administrative departments

- Financial and Administrative Department
- Secretariat
- Library
- Occupational health and safety
- Maintenance
- Projects office
- Information and technology department
- Public understanding of science office
- Technology transfer office (TTO)
- Animal Facility (P3)
- Advanced Light Microscopy Facility (ALMF)
- Advanced Tissue Analysis Facility (ATAF)
- Cell Culture and Genotyping
- Protein Production and Purification UP3
- Radioactivity
- Unit for Interfaces and Macromolecules
- Cytometry

Human and Animal Ethic Committees
Research & Development

- VAL (Projects)
- TT
- Other
- R&D Consortium

Graph showing financial data from 2002 to 2008.

Logos of various companies including PME Capital, IMUNEstar, GENETEST, NOVARTIS, Ablynx, Genzyme, Emerillon, METI, BIOMARIN, Bioteca, Speculum, and bioCodex.
### Associate Laboratory Staff

<table>
<thead>
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<tbody>
<tr>
<td>Associate Laboratory Staff</td>
<td>185</td>
</tr>
<tr>
<td>Researchers (PhDs)</td>
<td>190</td>
</tr>
<tr>
<td>Research Students</td>
<td>80</td>
</tr>
<tr>
<td>Support Personnel</td>
<td>455</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>455</td>
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</table>

### Number of researchers with PhDs

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<th>Year</th>
<th>PhD with PhD</th>
<th>PhD without PhD</th>
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</thead>
<tbody>
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<td>2005</td>
<td>35-40</td>
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<tr>
<td>2006</td>
<td>40-45</td>
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<td>2009</td>
<td>55-60</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>60</td>
<td>0</td>
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2/3 < 40 years; > 2/3 Women

### PhDs Researchers

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<tbody>
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<td>PhDs Researchers</td>
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<tr>
<td>Univ. Teachers &amp; Others</td>
<td>25</td>
</tr>
<tr>
<td>Contracted by IBMC</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>185</td>
</tr>
</tbody>
</table>
Outreach Activities
1st Workshop on Advanced Light Microscopy and Flow Cytometry

Ethics in Science Symposium

Mechanisms of T cell recognition and activation

Workshops and Symposiums
Long Term Goals:

• Develop into an *Integrative Systems Biology Institute*

• Study the aetiology of disease and dysfunction

• Elucidate the genetic and environmental mechanisms involved

• Devise strategies for treatment, repair and regeneration

• Using new tools and developing innovative applications
Enhance the cooperation between IBMC·INEB and IPATIMUP.

• Joint application submitted to CCDRN for the constitution of Instituto de Investigação e Inovação em Saúde (I³S).
Center for Neuroscience and Cell Biology

Harvard Medical School - Portugal

April, 16 2007

Lisboa
Center for Neuroscience and Cell Biology

Staff

Technicians ........... 25
Administrative ....... 7
Ph.D. members ...... 89
Ph.D. students ...... 112

Total: 233

Scientific activity (2001-2006)

Ph.D. thesis ......................... 60
M.Sc. thesis ......................... 49
Financed national projects .... 241
Financed international projects ...... 24
Scientific papers .................... 774
Advanced Courses ............... 76
Seminar .......................... 159
Center for Neuroscience and Cell Biology

Scientific Areas

✓ Neuroscience and Disease
✓ Molecular Biotechnology and Health
✓ Cell and Molecular Toxicology
✓ Biophysics and Biomedical NMR
✓ Cell and Development Biology
✓ Microbiology
Outreach Programme

- Hospitals
- Industry

- Human resources
- Basic research
- Applied research

Transfer of Technology

Functional studies (PET/NMR)

Clinical trials
Center for Neuroscience and Cell Biology

University of Coimbra

Graduate Studies Programme

✓ Taught by leading portuguese and foreign scientists
✓ Providing advanced research-oriented training in emerging areas of Biology and Biomedicine

Doctoral Programme in Experimental Biology and Biomedicine
Master Programme in Cell Biology
Advanced Courses
Seminar
Center for Neuroscience and Cell Biology

MIT – Portugal Collaboration Programme

European Neuroscience Institutes Network (ENI-NET)

International Schools of Neurosciences


Internationalization
Visiting scientists: 127 [2002-2007]
A Glance on Research at the Center for Neuroscience

Rodrigo Cunha
School of Medical Sciences

New University of Lisbon

J.M. Caldas de Almeida
16 April 2007
Medical education

• Clinical education delivered in clinical learning environments distributed throughout the health care delivery system:
  – 8 affiliated hospitals in Lisbon
  – family medicine in physicians’ practices throughout Lisbon and the south of Portugal

• Innovation on medical educations issues
PBL experience

- Applied in the first years, but with impact on the clinical teaching

- Development of computer programs allowing for students interaction with clinical cases

- Development of concept maps in order to improve medical reasoning from basic science to clinical symptoms
Post graduate education - major areas

• Respiratory diseases

• Microbiology (MSc jointly developed by FMC, ITQB and IHTD)

• Mental health
  – Participation in international master and PhD courses on mental health services funded by the EU
  – International MSc on mental health services development to start in 2008 (joint initiative of SMC and World Health Organization)

• Public health
Research

• A growing program in basic medical sciences

• Important alliances with the Institute of Tropical Medicine and the National School of Public Health both of which are sited in the New University of Lisbon

• Special focus on health services research
Centers for Biomedical Research

- Center for Research in Human Molecular Genetics
- Respiratory Diseases Research Centre
- Associated Laboratories: “Center for Malaria and other Tropical Diseases (IHTD/NUL)”

Key projects:
- Center of molecular biology
- New labs for molecular biology, genetics and microbiology included in the plan of expansion of the SMC
- New labs included in the project of the new teaching hospital
Health services research (1)

National and international projects on mental health policy and services:

• Collaboration with Harvard Medical School (participation in the World Mental Health Survey, Ronald Kessler, Department of Health Care Policy)

• Participation in several projects with WHO and EU on mental disorders in primary care, mental health and poverty, suicide prevention
Health services research (2)

- Collaboration with WHO in the development and evaluation of mental health policies and services in Eastern Europe, Africa and Latin America

- Coordination of the national Mental Health Plan development in Portugal

- Coordination of the national Plan against Depression (EAAD)
Major areas for collaboration

• Improvement of medical education
  – Curriculum development
  – Development and adaptation of materials
  – Students exchange

• Health systems research
  • Capacity building
  • Education of doctors, other professionals and the general public on disease management
  • International cooperation initiatives
GULBENKIAN FOUNDATION

Four statutory goals: science, art, education, charities

Assets ~4 B US$; Annual spending ~150 M US$

Instituto Gulbenkian de Ciência, from 1961:

introduced graduate education;
professionalized research in biomedicine;
reformed in 1985 and 1998;
MISSION STATEMENTS (from 1998):

• “to identify, educate, “incubate” and export new research leaders”

• “to serve as an entrance hall to the country”

• “to conduct biomedical research on the genetic bases of development and evolution of complex systems”
“serve as an entrance hall into the country”

- 46/48 PIs established at the IGC came from abroad
- Of 19 groups exported, 12 remained in Portugal (also Spain, France, Germany and Sweden)
- “External”, associated groups in other institutions
- A network of alumni in Portugal and over the world (Annual PhD retreats; GAMeets)
- “Collaboratorium in Computational Biology”
- Visitors and sabbatical programs
“to identify, educate, “incubate” and export new research leaders”

• Strong PhD programs with an international Faculty (started 1993; 4 Programs running; 100 speakers/y/progr)

• 311 PhD students started at the IGC in those programs; another 67 were educated here;

• Small groups (5-6); very young group leaders (age 30-35); (currently: 25% foreigners; ~40% females)

• Full scientific and financial autonomy to the groups

• High turnover of groups (5-6 years/group; 7 groups/2006)
“biomedical research on the genetic bases of development and evolution of complex systems”

* :2002-2007

2001-2007
Host Institution:

- **Scientific Advisory Board**
- Intellectual atmosphere  
  (last 7 years: 99 courses/workshops;  
  ~ 3,000 lecturers & seminar speakers)
- Lab set-ups and common technicians
- **State of the art, centrally run technological platforms**  
  and user-directed **services** with “user committees”  
  (8 technology-support units, open to external users,  
  and 5 centralized services)
IGC Scientific Advisory Board

- Sydney Brenner (Chairman)
- Jonathan Howard
- Philippe Kourilsky/David Sabatini
- Nicole Le Douarin
- Martin Raff
- Kai Simons
- Susumu Tonegawa
- Lewis Wolpert/Gines Morata
- In appointment: 3 more neuroscientists
Strategic principles:

• Small and cohesive; “esprit de corps”: no divisions; all spaces and equipments in common

• Diversity, openness: all know what everyone is doing

• Autonomy, cooperativity, and flexibility: explore “edges”

• Encourage risk-taking research

• Scientific “glues/organizers”: evolutionary biology; theoretical/mathematical biology
“biomedical research on the genetic bases of development and evolution of complex systems”

• Hypothesis-driven, thoughtful science
• Risk-taking research on integrative, quantitative biology
• Organism-centered approaches:
  bacteria, yeast, plants, worms, flies, fish, mice, man
• Transversal themes (e.g., morphogenesis, inflammation, population dynamics; phenotype/genotype mapping)

[LA ITQB/IBET: protein chemistry, structural biology, microbiology, biotechnology]
Currently:

- Total population of ~285
  (~100 PhDs; 106 PhD students)
- 29 research groups
- Total budget: ~9,500,000€ (year average last 3 years)
  (operation 8,500,000€; infrastructure 1,000,000€)
- F Calouste Gulbenkian: ~5,000,000€
- FCT (LA, 2 Units, contracts, fellowships);
- IEFP; EU; EMBO; NIH (USA); CNRS (Fr); etc.
- corporations; private organizations; etc.
2001-2007

* : 2002-2007
ITQB – Chemistry and Biology Frontiers - Chemistry, Microbiology, Cell Biology, Genetics, Biochemistry and Structure and Function of Proteins

IGC – Molecular Medicine, Developmental Biology, Immunology, Computacional Biology, Neurosciences

IBET – Platform for technology transfer, collaboration with industry, GLP services, Pilot Plant (fermentation and down stream processes) – Main Projects with Pharmaceutical International Companies; 11 Start up Companies

Large set of multiple Biophysical Methods, Computational Biology, Analytical Methods, Imagiology, Transcriptomics, Animal house, Transgenics units, etc
Associate Laboratory ITQB /IGC /IBET

600 Researchers
262 PhD Holders
80 Independent Laboratories

Open Institutions (Other Faculties, Research Institutes, Associate Laboratories, ...)
2001-2006 > Over 1300 ISI Papers (2006 – 2 Nature, 1 Science );Over 200 PhDs Degrees

Doctoral Programs,
Incubation of New Research Groups

From Basic and Transdisciplinary Research to Societal Issues (Medicine, Industry, Public Awareness of Science)

April 2007
Laboratory of Microbial Development
Genetics of spore formation in *Bacillus subtilis* and related spore-forming bacteria; emphasis on asymmetric cell division and chromosome segregation, the establishment and maintenance of compartmentalized gene expression, and the molecular mechanisms underlying morphogenesis of the bacterial spore.

Laboratory of Molecular Genetics
Main focus: genetics, biochemical and evolutionary mechanisms and epidemiology of drug resistant gram-positive pathogens, specifically, *Staphylococcus* spp. and *Streptococcus pneumoniae*.

Tracking the spread of drug resistant *S. aureus* clones in hospitals and in the community. Long-range studies on the colonization of children by *S. pneumoniae* in Day Care Centers in the Lisbon area and molecular characterization of the new *S. pneumoniae* genotypes that emerge in response to the selective pressure of the 7-valent conjugate vaccine PrevenarL.

April 2007
Bacterial Cell Biology Laboratory
Model organism: *Staphylococcus aureus*, a Gram positive pathogen and the most common cause of antibiotic-resistant hospital-acquired infections both in the US and in Europe.
Aim: to understand, at a molecular level, the organization and the temporal and spatial regulation of two fundamental steps of cell division - the segregation of the bacterial chromosome and the synthesis of the division septum, as well as to integrate this information for a better understanding of antibiotic resistance mechanisms in *S. aureus*.

Laboratory of Bacterial Cell Surfaces and Pathogenesis
The relationship of Gram-positive pathogens and their hosts, namely the role of cell wall synthesis and turnover in the process of host colonization and infection.
Use of *Staphylococcus aureus* and *Streptococcus pneumoniae* as bacterial model organisms, to understand the metabolism of the peptidoglycan macromolecule, which is conserved in almost all bacteria and has been shown to cause an inflammatory response in different invertebrate and vertebrate hosts. Interaction of peptidoglycan with peptidoglycan-recognizing proteins, using NMR spectroscopy

April 2007
Medical Microbiology

Molecular Genetics of Metalloproteins Laboratory
Elucidation of the bacterial systems that confer to bacterial pathogens resistance to reactive oxygen and nitrogen species, namely nitric oxide and peroxides in *Escherichia coli*, *Staphylococcus aureus* and *Helicobacter pylori*, and in protozoa.

Neurodegenerative diseases

Glycobiology Laboratory
Intracellular trafficking and glycosylation of proteins associated with ovarian carcinoma and the neurodegenerative disease amyotrophic lateral sclerosis.

Protein folding Laboratory
Protein folding and disease: disorders that result from protein misfolding, for example due to a mutational change. In some circumstances, that is the case of the neurodegenerative disease Friedreich ataxia (FRDA) which involves the protein frataxin.

April 2007
Cell Physiology and NMR
Novel osmolytes from hyperthermophiles and their role in protein stabilization, as chemical chaperones in therapeutic approaches to protein-misfolding diseases: mode of action and solute engineering. In particular, the chaperone effect demonstrated by several solutes holds a tremendous potential for the treatment or prevention of many conformational diseases that afflict modern society.

Pharmacological oriented projects
Macromolecular Crystallography Laboratory
Proteins with Biomedical applications
Animal Cell Technology Lab
Development of cell and gene therapies
Phase II clinical trials Unit for biopharmaceuticals

Chemistry
Development of Novel pharmaceuticals, synthesis of biologically important molecules

April 2007
Harvard / Portugal

Strengthen Research Activities

Forster Translational of Knowledge to Medical Schools

Forster Intertwinship with Medical Schools
Egas Moniz
Cerebral Arteriography (1927)
Pre-frontal Leucotomy (1933)
Nobel Prize (1949)

Reynaldo dos Santos
Translumbar Aortography (1929)

J. Cid dos Santos
Phlebography (1937)
Endarterectomy (1946)
Strengthen Basic Science

Institute for Molecular Medicine
New facilities (Egas Moniz building)

Network of Affiliated Institutions for Clinical Teaching

Health Centres and Hospitals (Partnership)
Clinical Professorship (invitation)

New Programs Leading to Academic Degree

Microbiology
Dietetics / Nutrition
Institute of Preventive and Social Medicine

Institute for Advanced Education (IFA)

Provision of Public / Community Services

Student Support Office
  Health / Integration
  Tutorial Program (new students)
  Exchange programs (Socrates / Erasmus)

Curricular Revision (pre-graduation)
Program on Education through Science
(Pre-graduation Students)

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<tr>
<th>Year</th>
<th>No. Projects</th>
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<tr>
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<tr>
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### Faculty of Medicine - University of Lisbon

#### Number of Students - Total

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<th>2005</th>
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<th>Variation</th>
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<td>42</td>
<td>51</td>
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<td><strong>Total</strong></td>
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<td>1.431</td>
<td>1.608</td>
<td>1.719</td>
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<td>15</td>
<td>25</td>
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</table>

(60-IMM)
DEPARTMENTS AND LABORATORIES (Basic Science)

- Anatomy
- Molecular and Cell Biology
- Physiology
- Histology and Developmental Biology
- Pharmacology and Basic Neurosciences
- Biochemistry and Biopathology
- Immunology
- Microbiology
- Genetics
- Pathology
- Biomathematics
- Nuclear Medicine
- Nutrition

DEPARTMENT OF PREVENTIVE AND SOCIAL MEDICINE

DEPARTMENT OF CLINICAL SEMIOTICS

Simulation / Skills Laboratory for Introduction to Clinical Medicine
HOSPITAL SANTA MARIA

1,100 BEDS
444,000 outpatients
37,000 inpatients / year

- Departments (Medicine, Surgery, Thorax and Clinical Neurosciences, Pediatrics)
- Specialized University Clinics

AFFILIATED HOSPITALS AND HEALTH CENTRES

10 Hospitals
230 Health Centres
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<tr>
<th></th>
<th>Basic Science</th>
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<td>• Full Professors</td>
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<td>• Associated / Assistant</td>
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<tr>
<td>Professors</td>
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<tr>
<td>• Assistants / Lectures</td>
<td>126</td>
<td>129</td>
<td>355</td>
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<tr>
<td>• Instructors</td>
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<tr>
<td>• Researchers</td>
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<tr>
<td>• Clinical Tutors</td>
<td>862</td>
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</tbody>
</table>

*Docente-Livre*
BASIC SERVICES

Information technology / Informatics Unit

Library / Documentation Centre

- Preservation of historical documentation
- Free Access to academic / hospital personnel
- Virtual Library (VPNs, Wifi)

Administrative Division

Academic Division
• PRE-GRADUATION CURRICULUM:

  • Discipline based, teacher-centred, unstructured repetitions

  • 2 periods: preclinical 3yrs + 2yrs clinical electives

  • 6th year (professional year with clinical rotations (internal medicine, surgery, obst-gyn, pediatrics and general and familial medicine)

M.D. DEGREE
NEW INTEGRATED CURRICULUM (I)

• Student-Centred, Learning vs Teaching focus

• Translational Medicine: cooperation between basic science/clinical medicine

• Integrated areas vs discipline based

• Early exposure to Clinical Medicine

• Emphasis on Community and General Medicine

• Bioethics and Social Aspects of Medicine
NEW INTEGRATED CURRICULUM (II)

- Integration (*Foundation*) course / 1st week
- Modular Organization: integration and continuity
- Common Trunks: cooperation between basic science / clinical medicine
- Research initiatives for students
NEW INTEGRATED CURRICULUM (III)

Semester (6 yrs-12 semesters): 360 ECTS → Master Degree
  2 final semesters: professional year with clinical rotations

20% reduction in contact hours

Exposure to Community Medicine (1\textsuperscript{st} / 2\textsuperscript{nd} / 6\textsuperscript{th} yrs) and hospital medicine (3\textsuperscript{rd} yr: 9 weeks)

Electives (Medicine, Surgery, Pediatrics, Mental Health, Obst-Gyn, Community Medicine) during 4\textsuperscript{th} and 5\textsuperscript{th} yrs.

Optional Curriculum: disciplines, practical courses, community medicine and research projects
ADVANCED EDUCATION (I)

POST-GRADUATE COURSES (< 6 m)

MASTER DEGREE COURSES (2 yrs)
  - Theoretical program
  - Research project (Thesis)

PhD / DOCTORATE PROGRAMS
  - Biomedicine
  - Clinical Medicine
  - Health Sciences
ADVANCED EDUCATION (II)

Master Degrees Courses

Bioethics
Pain
Sleep Disorders
Palliative Care
Neurosciences
   (→ PhD)
Medical Education
Mental Disorders
School Health
Clinical Nutrition
Human Sexuality
Emerging Infections Diseases
Forensic and Legal Medicine
Child and Adolescent Abuse
Dependency and Behavioural Disorders
### ADVANCED EDUCATION (III)

<table>
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<td>Courses</td>
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<td>11</td>
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<tr>
<td>Students</td>
<td>807</td>
<td>496</td>
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<tr>
<td>Master Courses</td>
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<td>8</td>
</tr>
<tr>
<td>Students</td>
<td>350 (13%)</td>
<td>284 (34%)</td>
</tr>
<tr>
<td>PhD / Doctoral</td>
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<tr>
<td>Biomedical Sciences</td>
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<tr>
<td>Clinical Medicine</td>
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FacMed Lisbon or FacMed Lisboa or Hosp Santa Maria or Inst Mol Med

420 records

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<td>Immunology</td>
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<td>7.6</td>
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<td>Biochemistry and Molecular Biology</td>
<td>31</td>
<td>7.3</td>
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MISSION AND FUTURE

• Science and Academic Medicine (MD/PhD programs)

• Academic Medical Centre

  Strengthening the clinical network (*e-programs*)
  Improvement on Quality on Education and Provision of Health Services
  Engagement on active EMC / CPD programs
  Public Education on Health Issues

• New Facilities for Research and Education

  *Câmara Pestana* Building
  Institute of Advanced Education
NEW FACILITIES

Areas for Research Laboratories

Microbiology (Advanced)
Immunology

Virtual Reality Institute

Training and Education (Surgery, Trauma)
Robotic Surgery
MUCH TO DO

• Implementation (monitoring) of the new Curriculum

• Partnership for Clinical Teaching (resources, payment, quality improvement)

• Scientific development and international participation (*networking*)

• New areas (research / teaching) for understanding disease and to alleviate human suffering (new diseases, tropical medicine)

• New information technologies to disseminate knowledge
FACULTY OF MEDICINE - UNIVERSITY OF LISBON
Public financial contribution per student

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<th>Year</th>
<th>Euro</th>
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<td>2005</td>
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<td>2006</td>
<td>6675</td>
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<tr>
<td>2007</td>
<td>6266</td>
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Total Budget Evolution: Public and Institutional

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<tr>
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<td>2006</td>
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<td>2007</td>
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<td>• Others</td>
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<td>65/35%</td>
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FacMed Lisbon or FacMed Lisboa or Hosp
Santa Maria or Inst Mol Med

420 records

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<td>LETTER</td>
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<tr>
<td>MEETING ABSTRACT</td>
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<td>35.9524%</td>
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% Variation on number of students and public budget

- 2002: -30%
- 2003: 20%
- 2004: 70%
- 2005: 120%
- 2006: 200%
- 2007: 250%

Anos

- 2002: 2.79%
- 2003: 5.12%
- 2004: 13.71%
- 2005: 18.25%
- 2006: 25.29%
- 2007: 77.47%

Public budget
Pre-graduation students
E-LEARNING

- Availability of pedagogic contents
- Discussion Forum
- Introduction to Clinical Medicine
  6th Year (professional)
- Continuous Medical Education
  Palliative Care
  Sleep Sciences (European course)
Collaborations in Research and Education within an Academic Medical Center

David E. Golan, M.D., Ph.D.
HMS/Portugal Collaboration
April 16, 2007
Collaborations in Research and Education within an Academic Medical Center

- Role of research and in-depth projects in education
  - Proposal for areas of concentration in the Harvard Medical School curriculum
  - Student-faculty collaboration on a textbook of pharmacology

- Collaborations among sciences and disciplines within the institution
  - Core facility for single-molecule research
  - Research collaborations among multiple laboratories
Role of Research and In-Depth Projects in Education:

Proposal for Areas of Concentration in the Harvard Medical School Curriculum
Concentration with In-Depth Project Rationale

- Provide graduate-level experiences in specific Concentrations to foster scholarship, discovery, leadership and service
- Foster self-directed and life-long learning
- Foster academic rigor and critical analysis
- Develop common and Concentration-specific skill sets for in-depth exploration and career preparation
- Provide opportunities for close faculty mentoring around a collaborative project
- Provide opportunities for production of a thesis or scholarly work
- Build on and strengthen existing in-depth experiences at HMS
Concentration with In-Depth Project Proposal

- Integral component of curriculum, not “enrichment”
  - Requirement for graduation with MD degree
- Three broad Concentrations
  - Biology in Medicine
  - Medicine in Society
  - Patient Oriented Research
Concentration with In-Depth Project
Goals: Biology in Medicine

- Learn to identify important problems in biology and medicine that merit further investigation
- Make an individual contribution to medical knowledge by actively engaging in biomedical investigation
- Understand the connections among basic biomedical research, patient oriented research, and studies in medicine and society
Concentration with In-Depth Project
Goals: Medicine in Society

- Learn to identify critical social and ethical problems in medicine
- Develop skills to identify needs and engage diverse communities in research and intervention
- Make an individual contribution to medical knowledge by actively engaging in an in-depth project in social science or humanities
- Understand the connections among basic biomedical research, patient oriented research, and studies in medicine and society
Concentration with In-Depth Project

Goals: Patient Oriented Research

- Undertake didactic and mentored practical training in translational research, human pharmacology, biostatistics, clinical epidemiology and clinical trials
- Make an individual contribution to medical knowledge by actively engaging in patient oriented investigation
- Understand the connections among basic biomedical research, patient oriented research, and studies in medicine and society
Concentration with In-Depth Project Curriculum

- Concentration elements span entire MD curriculum
  - Year 1 (January block): Core courses for all three Concentrations
    - Research design and methods (4 weeks)
    - Two critical reading courses (2 weeks each)
  - Years 1-2: Elective courses, develop project proposal
  - Years 1-4+: Conduct in-depth project (minimum of 4-6 months full-time equivalent)
  - Final year: Write and submit thesis or scholarly work
Concentration with In-Depth Project Advising, Mentoring, Infrastructure

- Longitudinal advising for each Concentration throughout the medical school years
- Mentoring of in-depth project
- Resources and infrastructure support for:
  - Directors of Concentrations
  - Board of Scholarly Advisors
  - In-depth project mentors
  - Students
# Design Group on In-Depth Educational Experiences

## Members and Subgroups

David Golan, co-chair  
Eleftheria Maratos-Flier, co-chair

<table>
<thead>
<tr>
<th>Biology in Medicine Subgroup</th>
<th>Medicine in Society Subgroup</th>
<th>Patient Oriented Research Subgroup</th>
<th>Research Design and Methods Course Subgroup</th>
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</thead>
<tbody>
<tr>
<td>Thomas Michel (chair)</td>
<td>Elizabeth Miller (chair)</td>
<td>Eleftheria Maratos-Flier (chair)</td>
<td>David Golan (chair)</td>
</tr>
<tr>
<td>Ehrin Armstrong</td>
<td>Elizabeth Armstrong Karimi Gituma</td>
<td>Emery Brown Julie Buring</td>
<td>Elizabeth Armstrong Emery Brown</td>
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<tr>
<td>Stephen Blacklow</td>
<td>Mary Jo Good</td>
<td>Gary Curhan Maurizio Fava</td>
<td>Julie Buring</td>
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<td>Joseph Bonventre</td>
<td>Vanessa Harris</td>
<td>Douglas Hanto</td>
<td>Elizabeth Miller</td>
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<tr>
<td>Constance Cepko</td>
<td>Howard Hiatt</td>
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<td>Anne Nicholson-Weller</td>
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<td>Thomas Fox</td>
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<td>David Golan</td>
<td>Kenneth McIntosh</td>
<td>J. Woodrow Weiss</td>
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<tr>
<td>Anne Nicholson-Weller</td>
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<td></td>
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</table>


Student-Faculty Collaboration on a Textbook of Pharmacology
Student-Faculty Collaboration on a Textbook of Pharmacology

Background

- Principles of Pharmacology course in the New Pathway curriculum at Harvard Medical School
  - Mechanism-based
  - Pharmacology in the context of biochemistry, physiology, and pathophysiology
- Students recognized the need for a new textbook of pharmacology structured in the same way as the course
- Students approached course director in April 2000 with proposal to write a textbook together
Student-Faculty Collaboration on a Textbook of Pharmacology Implementation

- Students and course director met for 6 months to plan critical features of textbook
  - Mechanism-based
  - Pharmacology grounded in biochemistry, physiology, and pathophysiology
  - Clinical cases used to introduce each system
  - High-quality art program to illustrate pathophysiology and mechanisms of drug action
- Draft textbook chapters critically reviewed by students in pharmacology course
- Students and faculty collaborated in all phases of writing and editing the book’s 52 chapters
Principles of Pharmacology: The Pathophysiologic Basis of Drug Therapy

- Published in April 2004
- Now a leading textbook in the field
- Translated into four languages
Second Edition!

- To be published on April 27, 2007
- Portuguese translator needed…
Collaborations Among Sciences and Disciplines within the Institution:

Core Facility for Single-Molecule Research
Core Facility for Single-Molecule Research
Scientific Capabilities

- Single-molecule fluorescence imaging
  - Total internal reflections fluorescence
  - Fluorescence resonance energy transfer

- Single-molecule manipulation
  - Flow-stretching
  - Magnetic tweezing
  - Optical trapping

- $600,000 proposal to NSF
- $100,000 institutional support
Core Facility for Single-Molecule Research

Major User Groups

- **Membrane proteins**
  - David Golan, HMS Biol. Chem. & Mol. Pharm. (co-PI)
  - Timothy Springer, HMS/CBR Pathology
  - Donald Ingber, HMS/CHB Pathology
  - David Clapham, HMS/CHB Neurobiology

- **Cytoskeletal dynamics**
  - Michael Eck, HMS/DFCI Biol. Chem. & Mol. Pharm.
  - David Pellman, HMS/DFCI Biol. Chem. & Mol. Pharm.
Core Facility for Single-Molecule Research

Major User Groups

- **Nucleic acids and nucleic acid-binding proteins**
  - Antoine van Oijen, HMS Biol. Chem. & Mol. Pharm. (co-PI)
  - Donald Coen, HMS Biol. Chem. & Mol. Pharm.
  - Mara Prentiss, Harvard University Physics
  - Pamela Silver, HMS Systems Biology
  - Jack Szostak, HMS/MGH Genetics

- **Bioengineering applications**
  - David Weitz, Harvard University Physics/Engineering
  - George Whitesides, Harvard University Chemistry
Research Collaborations Among Multiple Laboratories
Current Research Collaborations Involving the Golan Laboratory (All at Harvard Medical School)

- Prof. Thomas Michel, Brigham and Women’s Hospital (Endothelial cell signaling pathways): 7 postdoctoral fellows, 1 PhD student, 1 MD-PhD student; 7 publications since 1998
- Prof. Gerald Pier, Channing Laboratory (Pseudomonas aeruginosa invasion of pulmonary epithelial cells): 3 postdoctoral fellows, 1 MD-PhD student; 3 publications since 2000
- Prof. Christopher Walsh, Biological Chemistry and Molecular Pharmacology (Site-specific labeling of membrane receptors): 2 postdoctoral fellows, 1 graduate student; 4 publications since 2005
Dynamic Regulation of Adhesion Receptor Lateral Mobility
Dynamic Regulation of Integrin Lateral Mobility
The Power of Collaboration

Understanding and Treating Neurodegenerative Diseases

Portugal
April 2007
The Aging Population and Neurodegenerative Diseases

- Elderly population expanding
- Age increases risk
- 10% of > 65 years have Alz Dis
- 5.1M patients today.
- By 2035, 10 million cases
The Power of Collaboration

- **Individual investigator lab:**
  - Disease specific
  - Limited techniques
  - Homogeneous peers
  - One institution
  - Single discipline

- **The Network:**
  - Multiple diseases
  - Technically diverse
  - Many investigators/labs
  - Multi-institutional
  - Multidisciplinary
# The Power of Collaboration

<table>
<thead>
<tr>
<th>Collaboration Requirements</th>
<th>Collaboration Risks</th>
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<tbody>
<tr>
<td>- Flexible and responsive</td>
<td>- Insecurity of individuals</td>
</tr>
<tr>
<td>- As big as needed</td>
<td>- Loss of independence</td>
</tr>
<tr>
<td>- Shared, well defined vision</td>
<td>- Need to change behaviours</td>
</tr>
<tr>
<td>- Agreed strategy</td>
<td>- Another layer of bureaucracy</td>
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<tr>
<td>- Team behaviour</td>
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Required People/skills

- Molecular biologists
- Pathologists
- Epidemiologists
- Project managers
- Physicians
- Informaticians
- Geneticists
- Engineers
- Statisticians
- Lawyers

Basic research → Disease mechan. → Animal models → Therapy develop. → Tech transfer → Clinical trials
Tools and Techniques

Molecular biologists
- Genotyping/sequencing
- Confocal microscopy

Basic research
- Disease mechan.
- Animal models
- Therapy develop.
- Tech transfer
- Clinical trials

Disease mechan.
- Genotyping/sequencing
- Pathologists
- High throughput screening
- PET

Animal models
- Epidemiologists
- Project managers
- Assay development

Therapy develop.
- Informaticians
- Proteomics
- MRI

Tech transfer
- Project managers
- Engineers
- Statisticians

Clinical trials
- Physicians
- Pathologists
- Geneticists
- Expression arrays
- Computing
Administration / Support

- Project management
- Legal services (inter-institutional agreements/ IP etc)
- Fundraising/grant writing
- Business development
- Meetings/symposia
- Web development/communications
- Financial services
Authority & Leadership

- Requires support from institutions
- Requires $ € £
- Requires enthusiasm from senior investigators
- Requires support from industry/community
FDA-approved drugs 1995-2004
Drug Discovery

Basic research
  ↓
Disease mechanism
  ↓
Target identification
  ↓
Assay development
  ↓
Screening (lead discovery)
  ↓
Lead optimization
  ↓
Preclinical development
  ↓
Clinical trials (phases I, II & III)
  ↓
Submission/approval

Academia

Industry
Lab Drug Discovery Neurodegeneration

Biotech-style group
14 full-time staff
>70 years of industry experience
3,900 sq.ft. of lab space
Highly automated

Assay development
140,000 compound library
Screening
Medicinal chemistry
Animal Efficacy
Lab Drug Discovery Neurodegeneration

Permanent Staff

- Leads Discovery
  - assay development -
  - high throughput screening -
  - mechanism -

Medicinal Chemistry
- lead optimization -
- inhibitor design -

Collaborators
Post-Doctoral Fellows

Attract new ideas from outside Harvard.
Provide full access to our established drug disc lab.
Working on 14 projects, in parallel.

- 4 on Alzheimer’s disease
- 1 on ALS
- 1 on Huntington’s disease
- 2 on multiple sclerosis
- 3 on Parkinson’s disease
- 3 others

Collaborating closely with 6 hospitals in Boston plus 7 other universities.

3 studies advanced to animal testing stage.