TÍTOL DE LA PONENTA EN UNA O DUES LÍNIES

Nom i cognoms
Càrrec i Universitat
SUMARI

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Teaching Structural Bioinformatics at undergraduate level
BACKGROUND HISTORY

◆ Objectives of Structural Biology

1. Introduction to the basic molecular principles of biophysics
2. Structural principles of biopolymers: proteins and DNA
4. Relationship between structure, function and sequence of proteins.
5. Molecular simulation of proteins and DNA

◆ Competences of Structural Biology

1. Recognizing structural patterns of biomolecules and drugs
2. Relationship between 3D structure and function of biomolecules
3. Handling basic software and datasets of sequences and structures of biomolecules
4. Knowledge on experimental methods to analyze structures and biological systems.

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Teaching Structural Bioinformatics at the Undergraduate Level

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Understanding the basic principles of structural biology is becoming a major subject of study in most undergraduate level programs in biology. In the genomic and proteomic age, it is becoming indispensable for biology students to master concepts related to the sequence and structure of proteins in order to develop skills that may be useful in a wide range of applications. Within this context, this article shows a scheme for teaching structural biology based on hands-on computer approaches, including computational genomics, and structural bioinformatics tools. The students learn to use most of the leading computer programs available for the complete path that goes from sequence to structure and eventually function. During the course, they are taught to build models of proteins based on sequence and structure information. The students are also provided with a critical point of view on automatic procedures and learn to discern between likely and unlikely structures of their final models.

Keywords: Structural biology; homology modeling; computer simulations.
BACKGROUND HISTORY

◆ Evaluation

Theory: Multiple Choice + Assay (40%)
Practical (30%)
Presentation (30%)

◆ Competences acquired by presentation

Group management
Technical (IT)
Oral communication
Write and summarize
All members of a team have to present
BACKGROUND HISTORY

Already in 2002-2003 many presentations were in English

Undergraduate students projects (2003-2004)

- Transcription factors - Marta Arcabell, Dora Cano, Blanca Puchau and Verónica Rodilla [PPT file].
- Chaperones - Anaís Estrada, Edurne Gallastegui, Mercè Garf, Marta Guerra and Jordi Milà [PPT file].
- Rhodopsin - Laia Font, Mireia Gimeno, Maria Larroy, Paola Padletti and Laura Vicente [PDF file][PPT file].
- Cyclin-dependent kinases - Yolanda Acosta, Naiara Aquizu, Elisabeth Castellanos, Ana Corriónero and María Ruiz [PPT file].
- Nuclear magnetic resonance - Miriam Onrubia, Laura Plaza and Patricia Resa [PPT file].
- High resolution electronic microscopy - Esther Molo, Susagna Sastre, Íngrid Sebastià, Roser Soler and Lidia Tubert [PPT file].
- Circular dichroism and infra-red - Elena Echarte and Marta Mancebo [PPT file].
- X-ray crystallography - Marta Costa, Guillem Galofré and Meritxell Pellicer [PPT file].
- Ribosome - Jaume Bonet, Melquíades Calzado, Ana Campillo and Laura Ortel [PPT file].
- Spliceosome - Manuel Beltran, Javier Garcia, Gerard Ill and Xavi Jalsécas [PPT file].
- Nucleosome - Anna García-Elias, Marta Gimenez, Alba Llop and Mireya Plasa [PPT file].
- RNA polymerase - Ana Cuadrado, Montserrat Roura, Noemí de los Santos and Marta Valiente [PPT file].
- RNA fold - Nous Romo, Jesús Sánchez, Anna Sorra and Núria Torras [PDF file][PPT file].

Undergraduate students projects (2002-2003)

- DNA Structure - Laura Aguilera, Cristina Carreño, Irene Oliver and Blanca Reyes.
- Helix-turn-helix and transcription factors - Alexandra Ballester, Patricia Gordillo and M. del Carmen Molina.
- DNA polymerases - Mathieu Lichtenstein, Martin Nola, Nous Rafol and Vidalba Rocho.
- Aminooacil-t-RNA synthase - Montserrat Ferrer, Sara Fernandez, Cristina Fuentes, Eva Llambés and David Domínguez.
- Ribosome - Silvia Bea, Marta Beltran, Ana Igles,Montserrat Sole and Iris Urbesalgo.
- Enzymes with NAD motifs - Anna Boix, Aitzol Illarramendi, Ricard Perez, Ferran Pons and Roser Zaurin.
BACKGROUND HISTORY

2004-2005 starts the Master of Bioinformatics for Health Sciences
ALL COURSES WERE IN ENGLISH
## BACKGROUND HISTORY

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### Syllabus

The master provides different areas of specialization depending on the election of optional subjects:

- **Genome Bioinformatics**
  Automatic analysis, alignment, comparison and annotation of biological sequences; analysis of genome evolution and variation; molecular biology databases.

- **Structural Bioinformatics**
  An introduction to experimental methods used in determining the structure of biomolecules, protein structure prediction and biomolecular systems simulation.

- **Systems Biology**
  The description of biological networks and protein and metabolic gene network modelling. Emphasis in both topological aspects of networks and their dynamical behavior.

- **Pharmacoinformatics**
  Molecular library management and virtual screening, computer assisted drug design and quantitative modelling of structure-activity relationships (QSAR and 3D-QSAR).

- **Biomedical Computing**
  Clinical and healthcare information systems, biomedical imaging analysis, studying genotype-phenotype relationships and IT support systems for healthcare decision making.

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Teaching facilities

The building, which completed the complex of which Hospital del Mar is part, had been built in 1991, taking advantage of the celebration of the 1992 Olympic Games, to house the Municipal Institute of Medical Research (IMM), which was accredited by the International Olympic Committee (IOC) as an antidoping laboratory.

This narrow, 10-metre wide building measures 140 m in length and is arranged in the shape of a circumferential arch upon the axis of the pavilions that form the Hospital rooms. The renovation of the building for university purposes dates from 1998, the year in which it accommodated the new Biology studies. It was carried out by architects Josep Berenstein, Frederic Crespo and Ramon Valls. The renovated surface area totals 3,350 m2.

At present, studies belonging to the field of health sciences are taught here. This building together with the Barcelona Biomedical Research Park (PRBB), form the University's Mar campus.

Databases are free accessible in internet

Programs are Open Source

SBI = Structural Biology
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SBI = Structural Biology
ONLINE MATERIAL

http://sbi.upf.edu

www.vives.org
SELECTING A COURSE TO BE IN ENGLISH

- 01 Material, sources and experience from the master
- 02 International teachers: Jana Selent (Germany), Gianni de Fabritiis (Italy)
- 03 Mathematical language, programming languages and IT terms
- 04 High percentage of the course are practices and seminars with computers
- 05 Presentations of students are in English, in order to evaluate oral competences

IN SITU

- 01 Questions by the students are accepted in English, Catalan or Spanish
- 02 Individual help in practices can be in English, Catalan or Spanish
- 03 Questions of assay are in English and Catalan
- 04 Answers in assay are accepted in English, Catalan or Spanish

Degree of satisfaction of the students with the course of Structural Biology

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THE RESULTS: 2012

Selected comments from the students

2011-2012 (first year). **99% negative** comments for having the course in English

Crec que és una assignatura bastant complicada i el fet de fer-la en anglés augmenta el seu grau de dificultat considerablement.

I think this is a difficult course and having it in English considerably increases its difficulty

Per una banda, el fet de l'idioma ha sigut una mica limitant. La nova normativa de tot en anglés (a BE) ha suposat un repte; i mentre en activitats com el treball m'ha semblat una oportunitat, trobo que limitaven molt les classes teoriques ja que no s'entenien bé les explicacions.

On the one hand, the language has been a little impairment. The new rule of having all the lectures (of SB) in English was a challenge, while **for activities such as the presentation this was an opportunity**, I think it was a handicap to understand the explanations on the lectures of theory.
THE RESULTS: 2013

Selected comments from the students

2012-2013 (second year). Only **40% of negative** comments blamed the language

És una assignatura complicada, i el fet de que sigui en anglés ho fa encara més.

This is a complicated course, and being in English makes it worst

Estic d'acord que l'anglès en ciència i en general actualment és imprescindible, però trobo que fer TOTA l'assignatura en anglés no és necessari.

I agree that English in science, and in general nowadays, is essential, but I think that having the whole course in English was not necessary
THE RESULTS: 2014

Selected comments from the students

2013-2014 (third year). Many positive comments on having lectures in English, Complaints on the choice (structural biology) and the English level of the teachers

Sens dubte algun, l'anglés és l'idioma de les ciències i per aquest motiu no trobo malament fer algunes assignatures de la carrera en aquest idioma
I have no doubts that English is the language for sciences. Therefore, it's OK to have some subjects of Biology in English.

Entenc que és angoixant trobar-te amb una assignatura que de per si complicada, a més sigui en anglés.
It's stressing to have one of the most complex subjects in English.

No entenc com l'assignatura més difícil de la carrera estigi en anglés, el qual no és l'idioma que dominen els profes
I don’t get how the most difficult subject of Biology is in English, which is not the native language of the teachers

Crec que aquesta assigantura hauria de ser en català o castella, ja que els professors són d'aquí
I think this subject should be in Catalan or Spanish, because the teachers are local
THE RESULTS: 2015

Selected comments from the students

2015-2016 (last year). Still complaints on the choice (structural biology), potential discouragement to make questions?

El fet de ser en anglès disuadeix de fer preguntes a les classes teoriques per vergonya (m’incloc), i has de presionar força al professor, preguntant-li en català o castellà, per que et respongui enj algun d’aquests dos idiomes

English in the lectures of theory discourages the students to ask in class. We have to insist by questioning in Catalan or Spanish in order to get an answer in either of both.
EXAMPLES

Structure to death: CASPASES

DNA polymerases

THE NUCLEOSOME

Nicotinamide adenine dinucleotide binding proteins

Membrane proteins

Retinylidene proteins

Structural Biology of the Proteasome

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EXAMPLES

Tyr-Kinase SRC

Virus capsides (HRV2)

Ubiquitins