

## Practical Course

# BIOINFORMATICS and FUNCTIONAL GENOMICS: from genes to functions and networks

18,19,20 - June - 2008

Centro de Investigación del Cáncer (CIC-IBMCC, CSIC/USAL), Salamanca, Spain

<http://bioinfocourses.cicancer.org>

Practical course on bioinformatic tools and methods for functional genomics studies. Focus on robust analysis of microarrays data and critical strategies to identify significant genes, to reach appropriate functional assignment, to unravel the biological information and to explore the biomolecular networks derived.

### PROGRAM scheme

Day 1 – 18.June.2008 (Wednesday)

→ Genomics and transcriptomics: microarray data analysis (focus on Affymetrix)  
(Bioconductor-R, GEO, GeneAtlas, GATE, VisualGenomics, SNP arrays)

Day 2 – 19.June.2008 (Thursday)

→ Bioinformatic tools for functional-biological assignment of selected genes and text mining  
(Babelomics, iHOP, CARGO)

Day 3 – 20.June.2008 (Friday)

→ Exploring gene and protein networks and pathways using bioinformatic tools  
(INGENUITY, GeneCodis, APID, APID2NET, Cytoscape)

### Organized by:

Dr. Javier De Las Rivas (Centro de Investigación de Cáncer CIC, CSIC / USAL, Salamanca)

Dr. Alfonso Valencia (Instituto Nacional de Bioinformática INB, Centro Nacional Investig. Oncológicas CNIO, Madrid)

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Example links of some applications to be studied:

APID & APID2NET (CIC) – <http://bioinfow.dep.usal.es/apid/> Babelomics (INB) – <http://babelomics.bioinfo.cipf.es/> CARGO (INB) – <http://cargo.bioinfo.cnio.es/> GATE (CIC) – <http://bioinfow.dep.usal.es/gate/> iHop (INB) – <http://www.ihop-net.org/UniPub/iHOP/> Visual Genomics (INB) – <http://bioweb.cnb.uam.es/VisualGenomics/>

**Registration:** The price is 280 Euros (before 31.May). It includes registration, documentation, full practicals and meals.

If you are interested please sent as soon as possible an e-mail as pre-registration to: [jrivas@usal.es](mailto:jrivas@usal.es)  
Bioinformatics and Functional Genomics Research Group, Centro de Investigación del Cáncer (CIC) Salamanca.

**Note:** Bring your personal computer (laptop) for the practicals. Wi-Fi internet connection will be available.

### PROGRAM

Day 1 – 18.June.2008 → Genomics and transcriptomics: microarray data analysis (focus on Affymetrix)

09:00 – 09:30 .- Registration and documentation

09:30 – 09:45 .- Welcome address to the Course. Javier De Las Rivas (course director, CIC, CSIC / USAL).

09:45 – 10:00 .- Presentation of the Spanish National Bioinformatics Institute (INB).  
Federico Morán (Central Node INB, CNIO, Madrid) (nº 1 - Presentation, 30 min)

10:00 – 11:00 .- Bioinformatics key tool for Functional Genomics, current overview of needs and tools.

Installation of programs, tools and documentation in the computer laptops of the alumni: R, BioC, datasets, etc.  
Javier De Las Rivas & course team (Bioinformatics, CIC) (nº 2 - Lecture + Practical session, 60 min)

11:00 – 12:00 .- Use of R and BioConductor programs for gene expression data analysis.

Diego Alonso & Celia Fontanillo (Bioinformatics, CIC) (nº 3 - Practical session, 60 min)

12:00 – 12:30 .- Coffee break

**12:30 – 13:30 .-** 1° Critical analysis of microarray genome-wide expression data: experimental design, normalization, signal calculation, profiling. 2° Databases on gene expression: GEO, GeneAtlas, EMAGE, GDX. Javier De Las Rivas (Bioinformatics, CIC) (n° 4 - Lecture + Practical session, 60 min)

13:30 – 14:30 .- Lunch

**15:30 – 16:20 .-** Exploring the complexity of the genomes and the transcriptomes of human and mouse: GATE an ENSEMBL-based web tool to analyse a complex biomolecular landscape. Alberto Risueño (Bioinformatics, CIC) (n° 5 - Practical session, 50 min)

**16:30 – 17:20 .-** Visual genomics: finding gene activity *in situ* on tissues and cells (immunohistochemistry, RNA *in situ*, etc). Integration of EMAGE, GDX, GENSAT in a new bioinformatic tool. Natalia Jimenez (Visual Genomics and Proteomics, INB, CNB-CSIC, Madrid) (n° 6 - Lecture + Practical session, 50 min)

**17:30 – 18:20 .-** Use of R and BioConductor data analysis programs to find significant gene differential expression (SAM, EBA) and gene altered expression (AlteredExpression). Jose Manuel Sánchez-Santos & María Jesús Rivas López (Statistics, USAL) (n° 7 - Practical session, 50 min)

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## Day 2 – 19.June.2008 → Bioinformatic tools for functional assignment of selected genes and text mining

**09:30 – 10:15 .-** Human SNP microarrays from Affymetrix: genotyping (BRLMM) and copy number (CNAT). Celia Fontanillo & Diego Alonso (Bioinformatics, CIC) (n° 8 - Practical session, 45 min)

**10:15 – 11:00 .-** BABELOMICS: functional analysis of genome-scale experiments. David Montaner (Functional Genomics Bioinformatics, INB, CIPF, Valencia) (n° 9 - Lecture, 45 min)

**11:00 – 12:00 .-** Unravelling the biological meaning of selected lists of genes: tools for functional enrichment analysis and gene set enrichment analysis (GSEA). David Montaner & Francisco García (Funct. Genom. Bioinfo., INB, CIPF, Valencia) (n° 10 - Practical session, 60 min)

12:00 – 12:30 .- Coffee break

**12:30 – 13:20 .-** Text mining applied to the biomedical literature (introduction, parts of a text mining approach and applications). Osvaldo Graña (INB and Bioinformatics Unit CNIO, Madrid) (n° 11 - Lecture, 50 min)

13:30 – 14:30 .- Lunch

**15:30 – 16:20 .-** Web Service architecture: from bioinformatic applications to workflows (tools and service repositories). José Manuel Rodríguez (INB, CNIO, Madrid) (n° 12 - Lecture 50 min)

**16:30 – 17:30 .-** Text mining of biomedical literature, iHOP and other tools to find new information about groups of genes or proteins & CARGO (Cancer And Related Genes Online) a configurable biological web portal designed as a tool to facilitate, integrate and visualize results from biological on-line resources José Manuel Rodríguez & Osvaldo Graña (INB, CNIO, Madrid) (n° 13 - Practical session, 60 min)

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## Day 3 – 20.June.2008 → Exploring gene and protein networks and pathways using bioinformatic tools

**09:30 – 10:00 .-** Introduction to INGENUITY Pathway Analysis (IPA). Catalina Guerra (Field Application Scientist, Ingenuity Systems, France) (n° 14 - Lecture, 30 min)

**10:00 – 12:00 .-** Microarray analysis with IPA: analysis of prostate cancer disease subtype. Catalina Guerra (Field Application Scientist, Ingenuity Systems, France) (n° 15 - Practical session, 60 min)

**11:00 – 12:00 .-** Search and explore: exploring invasion and adhesion in IPA. Catalina Guerra (Field Application Scientist, Ingenuity Systems, France) (n° 16 - Practical session, 60 min)

12:00 – 12:30 .- Coffee break

**12:30 – 13:20 .-** APID and APID2NET: find, build and explore a protein-protein interaction network using a query subset of proteins. Carlos Prieto (Bioinformatics, CIC) (n° 17 - Practical session, 50 min)

**13:30 – 14:20 .-** Cytoscape: open source bioinformatics software platform for visualizing molecular interaction networks and integrating these with other state data. Javier De Las Rivas (Bioinformatics, CIC) (n° 18 - Lecture + Practical session, 50 min)

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### Sponsors and scientific support:

**CIC** - Centro de Investigación de Cáncer / **FIGUS** - Fundación de Investigación del Cáncer  
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