Biofísica Magazine

Sep - Dec 2015
issue #3

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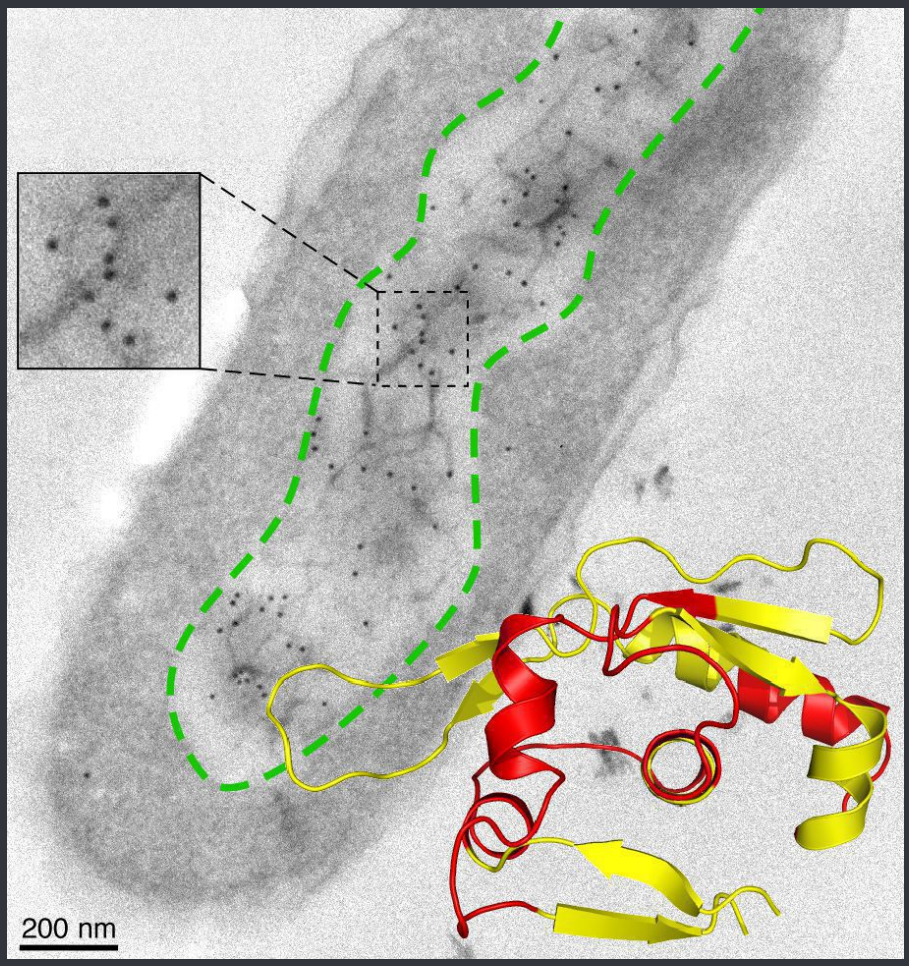

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EDITORS:
Jesús Salgado
Jorge Alegre-Cebollada
Xavier Daura
Teresa Giráldez

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CONTACT

SBE - Sociedad de Biofísica de España
Secretaria SBE, IQFR-CSIC,
C/Serrano 119, 28006 Madrid
Email: sbe_secretaria@sbe.es
WEB: http://www.sbe.es

Biofísica Magazine

In this issue

Biofísica Magazine

EDITORIAL

Biophysics in Iberia

Manuel Prieto, *IST, Universidade de Lisboa, Lisbon (Portugal)*

Iberia and *Biophysics*, two beautiful words: one from classical geography of Greek origin, and the other describing our scientific activity, which attained visibility in the second half of last century... In contrast with the imagination of Saramago (in the book "The Stone Raft"), well-known in all the *Peninsula*, the activity around Biophysics, is in an excellent moment, but certainly strongly connected to the continent, not drifting into the ocean.

Scientific Societies are essential to nucleate and promote scientific activity, and in this moment that funding and support to science have been severely decreased in *Iberia*, we should strongly join arms defending and promoting our activity. The congresses organized by the national Societies, are instrumental in fostering contacts between scientists.

Biophysics is a multidisciplinary subject at the frontier of Science, spanning Biology, Physics and Chemistry, and encompassing many other subjects. We should be proud of being scientists in this area, and we should also attract to Biophysics more researchers who are within this broad definition. It is also our duty to flag up Biophysics as a critical area of Science, and to press for recognition of its relevance, so that Biophysics becomes well supported at the European level.

The origin of the Portuguese Biophysics Society – SPBf, is directly linked to the activities of the Sociedad de Biofísica de España – SBE. In fact, a small number of Portuguese biophysicists (at the time they would not even classify themselves as such!), looking for a scientific family, started to attend the meetings of SBE. The first ones were the "I Congreso Iberoamericano de Biofísica" in Seville (**1989**), and the "III Congreso de la Sociedad de Biofísica de España" in Madrid (**1991**). At the Cáceres meeting in **1994**, the Spanish colleagues gave them a final impetus to speed up the formation of SPBf. The landmark of the joint cooperation was the "1st Portuguese- Spanish Biophysics Congress", at Lisbon (**1995**), and some more meetings followed this first one.

However, this is history, and we should look into the future. Together, both Societies, can potentiate achievements, and focus on several aspects which deserve joint approaches.

Recently, the two Societies signed an agreement on the joint realization of congresses, every two years. On this regard, the contribution of Antonio Ferrer-Montiel, the President of SBE was instrumental. To SPBf, the joint meetings were and will be excellent, enabling a critical mass of scientists for events of high scientific quality. In this way, the relevance of SBE extends much further than the origin and the foundation of the Portuguese Society, reaching to its present activity.

We are one of the few strong regional organizations of Biophysics in Europe. This should be emphasized within European institutions, in a moment where funding for regional/sectorial activities is eventually available. If we have this specific geographical confinement, with no drama about it, since the *Iberia* is fantastic for living, we should profit from it.

The two societies are strongly linked to Latin-American Biophysics, with connections both at the national level, and directly to the Latin-American Federation of Biophysical Societies – LaFeBs. Science in Latin-America has improved very significantly, namely in countries such as Argentina, which has a longtime scientific tradition, and in Brazil that strongly invested in Science in recent years. Our Latin-American colleagues do not only look towards the USA. They attend European scientific meetings, and have joint research projects with both Spain and Portugal. This is an additional reason for the joint activities of both SBE and SPBf, namely in the participation/organization of Ibero-American meetings.

Within Europe, the North-South and East-West asymmetries are well known, and one of the immediate parameters to evaluate them is the geographical distribution of Marie Skłodowska-Curie Actions. Although *Iberia* is in a distinct situation as compared to Eastern Europe, the flux of students from the more advanced European countries to *Iberia* is still very small. This is not specific to our research area, but joint lobby efforts to increase our visibility may be envisaged. And certainly, as Jesus Salgado wrote recently in this Magazine, difficult times are happening in *Iberia* regarding funding. The situation of excellent researchers in the 30-45 years age range, who are moving away is really problematic. Both Societies are strongly connected to EBSA – the European Biophysics Societies' Association, and within this organization, coordination with ISE – Initiative for Science in Europe, a strong organization regarding European science policy, is effective.

Also, productive collaboration already exists, connecting groups in both countries, and in some areas such as membrane and channel Biophysics and structural Biology, international recognition and an effective critical has already been achieved. Certainly, this also happens in other areas.

So, here we are, facing new challenges in Biophysics, some of them critical, and living in a beautiful part of the world, *Iberia*. And we should tell Strabo, who coined this word, to know that the joint efforts of the two societies will be fruitful.

And we will meet altogether at the 5th International Iberian Biophysics at Oporto, on the 15-17 June 2016!

Manuel Prieto

Centro de Química-Física Molecular and Institute for Nanoscience and Nanotechnology

Complexo Interdisciplinar, IST, Universidade de Lisboa,

Av. Rovisco Pais, 1049-001 Lisbon, Portugal.

E-mail: manuel.prieto@tecnico.ulisboa.pt

Biofísica Magazine

BEYOND BIOPHYSICS

Light and Biophysics

Conversation with Lluís Torner

Xavier Daura, *ICREA, IBB-UAB (Barcelona)*

On 20 December 2013, the United Nations' General Assembly proclaimed 2015 as the International Year of Light and Light-based Technologies (IYL 2015), "*stressing that enhanced global awareness of and increased education in the science and technologies of light are vital for addressing challenges such as sustainable development, energy and community health, as well as for improving the quality of life in both developed and developing countries*".

Biophysics is one of the many scientific disciplines strongly influenced by the progressive advance of light science and technology. Indeed, the central act of observing a biological system is invariably enabled by some form of light. To talk about *light and biophysics* I visit Lluís Torner at The Institute of Photonic Sciences (ICFO) in Castelldefels (Barcelona). Dr. Torner is Full Professor at the Universitat Politècnica de Catalunya (UPC), Founder and Director General of ICFO since its creation in 2002 and member of the Photonics21 Board of Stakeholders, a European technology platform representing the European photonics community of industry and research organisations.

Photonics deals with the study of light –here comprising the region between far IR and soft X-rays– and its applications. The name is, however, not to everyone's satisfaction. As Torner explains, the US community tends to prefer the older denomination of *optics*. Detractors of photonics find the term too technological. Detractors of optics are disturbed by the bias introduced by the colloquial acceptation of the word. One more proof that scientific disciplines cannot (and should not) be bound by the words we use to identify them.

Professor Lluís Torner.

Spain has a significant weight in the European photonics community. Torner comments that the wide-scope approach of ICFO quickly made it a reference in Europe, where photonics centres tend to be highly specialised. Nevertheless, he makes me note that ICFO only covers a small fraction, however wide, of the photonics field, and this responds not only to the size of the centre but also to the costs associated to some research areas. Some topics require large, sustained investments that one cannot realistically expect in our country. "The Institute has therefore selected areas in which it is possible to compete at the highest international level using the resources that we have available". And he adds: "happily, biophotonics is an area that combines relatively low funding requirements with the possibility to be extremely creative".

The application of new light technologies to the observation of biomolecules and biological systems and to the study of dynamic processes in them is, Torner confirms, a hot topic in photonics:

> *Light is a perfect tool resource for biophysics as it provides means to observe and manipulate things at scales that are very difficult to access with other "instruments", especially if you are looking for a non-invasive technique that will not alter the sample.*

Thus, "although light gives less resolution than other *instruments* (e.g. synchrotron radiation), it allows you to manipulate –stretch, etc.– a biological sample without destroying it. Moreover, if you want to observe a process taking place inside a living cell, light may allow you to do the observation in the relevant time frame without killing the cell or altering the process." Torner points out that the high impact that photonics is having in Biology and Medicine is illustrated by the joint award of the Nobel Prize in Chemistry 2014 to Eric Betzig, Stefan W. Hell and William E. Moerner "for the development of super-resolved fluorescence microscopy", that is, for circumventing Abbe's diffraction limit for an optical microscope.

The driving force for new advances will continue to be the need to observe processes in vivo.

In most cases, we learn about new technologies applicable to our research only when they are close to available –nothing wrong with that. Lluís Torner is in this sense in a privileged position. He has participated in the elaboration of the Photonics Multiannual Strategic Roadmap 2014-2020 "Towards 2020 – Photonics Driving Economic Growth in Europe", developed by Photonics21 in partnership with the EU Commission and outlining the research and innovation priorities for the period. It comes as no surprise, therefore, that I end up asking him how will photonics push the current limits of biophysical research in the coming years. He quickly answers that the driving force for new advances will continue to be the need to observe processes in vivo –or under functional conditions. Within this context, he distinguishes two research directions in continuous development. The first one focuses on the observation of ever-smaller things –down to molecules– at ever-higher resolution. He notes, however, that higher resolution means also smaller observation area and therefore a loss of context. The second one focuses on the observation of ever-larger things –up to small organisms such as embryos– at a given sufficient resolution. The priority in this case is to see the full context in which the biological process is taking place. In either direction, there is plenty of room to go.

Quantum phenomena are for obvious reasons central to photonics research. Out of curiosity, I ask Lluís Torner if any of the quantum research performed at ICFO belongs to the biophysics domain. Photons, quantum effects and biology; the answer is of course photosynthesis and, the approach, ultrafast single-molecule techniques. "The ultrafast and directional transport of excitation energy in the initial steps of photosynthesis is not yet understood in full detail. Imagine the implications of understanding such a highly efficient and robust system for the transfer of energy." The words of the United Nations proclamation of IYL 2015 come back to my head: "...for addressing challenges such as sustainable development, energy and community health...", and I realise for the n^{th} time that I should be talking more often to people out of my field of research.

Lluís Torner

Director General of ICFO – The Institute of Photonic Sciences

Mediterranean Technology Park

Av. Carl Friedrich Gauss, 3

08860 Castelldefels (Barcelona), Spain.

E-mail: director@icfo.eu

Xavier Daura

Institute of Biotechnology and Biomedicine – IBB

Universitat Autònoma de Barcelona, Campus UAB

08193 Cerdanyola del Vallès (Barcelona), Spain.

E-mail: Xavier.Daura@uab.cat

Biofísica Magazine

COOL BIOPHYSICS

Cryo-EM: an Emergent Structural Biology Technique for the Visualization of Macromolecular Complexity

Eva Nogales, *UC Berkeley, (USA)*

Structural visualization is invaluable for a mechanistic understanding of macromolecular function. X-ray crystallography is a very effective method to produce atomic models of proteins and nucleic acids, but suffers from the requirement of large amounts of sample and the bottleneck of crystallization. On the other hand, NMR needs also large sample amounts and requires isotopic enrichment. Such constrains have imposed limitations in the application of X-ray crystallography and NMR to large macromolecular complexes, integral membrane proteins, polymers or macromolecular samples with coexistence of multiple conformational or compositional states. Single particle cryo-electron microscopy (**cryo-EM**) is a structural biology technique applicable to the study of challenging biological systems, for which crystallization is not required and only small amounts of sample are needed. Furthermore, via computational classification this technique has the potential to deal with compositional and conformational mixtures. Single particle cryo-EM has just taken a quantum leap in applicability and achievable resolution, gaining worldwide attention (see Nogales and Scheres 2015 for a recent review).

Three-Dimensional Electron Microscopy of Biological Samples

Biological samples can be directly visualized at the molecular level using transmission electron microscopy (TEM). TEM images are 2D projections of the structure in the direction of the electron path that can be combined via 3D reconstruction. The first applications of 3D-EM used helical principles to combine the multiple views of the molecule naturally present in assemblies, such as phage tails or helical viruses. 2D crystals later became favorite samples to pursue high-resolution structures using a combination of images and electron diffraction. This type of sample required tilting in order to obtain different views of the molecule (technical issues made this a lengthy process), but did produce a number of atomic models, including those of bacteriorhodopsin , tubulin and aquaporin . In the most general implementation of 3D-EM, the sample is made of

individual macromolecular complexes ("single particles") that adopt random (or at least multiple) orientations on the EM grid. This single particle methodology uses computational tools to define the relative orientations of the projection images and produce a 3D reconstruction . While helical Fourier methods and 2D crystallography pioneered the 3D-EM field, the general applicability of single particle analysis makes it often the technique of choice today.

Biological samples can be stained (typically with uranium salts) and dried, or studied in a frozen hydrated state after vitrification (cryo-EM), in order to withstand the high vacuum in the electron microscope and minimize radiation damage. Negative staining is limited in resolution to about 15 Å due to the grain size of the stain, but it is useful in the study of small macromolecules (< 250 kDa), and for ab initio reconstructions that use geometrical principles (see below). On the other hand, cryo-EM of frozen hydrated samples has the potential to produce atomic resolution structures. This potential has been realized for single particle studies with the use of new detectors that have drastically improved image contrast and resolution, and with the implementation of powerful new image processing algorithms.

Challenges in Single Particle Studies

The two major challenges in single particle 3D reconstruction concern the noisy character of the images and the need to computationally identify their relative orientations. The first arises from the need to minimize radiation damage, using very low electron doses (~20-40 electrons/$Å^2$). In order to gain signal, tens to hundreds of thousands of images need to be averaged. A generally used method to deal with the second is to compare each experimental particle image with computationally generated views of a 3D reference that resembles the true structure ("projection-matching") . Initial reference structures may need to be determined de novo from EM images, using geometry-based approaches (in which two or more images of the same area of the specimen at different tilt angles are imaged) that are generally considered robust and provide information on the handedness of the structure. They include the Random Conical Tilt method (RCT) , the orthogonal tilt reconstruction (OTR) and tomography. Alternatively, the relative orientation between particle images can be analytically determined using the fact that each pair of 2D projections shares a "common line" in the 3D Fourier transform. The angular reconstitution method is a real space implementation of common lines principles.

Often, cryo-EM samples present the additional challenge of conformational or compositional heterogeneity. The analysis of such samples requires classification of the particle images into structurally homogeneous subsets. This task can be done using the geometry-based principles initially, then through the use of more than one reference structure for projection-matching. Alternatively, maximum-likelihood approaches for unsupervised classification methods have been implemented to simultaneously determine coexisting structural states. While computationally demanding, the final outcome of identifying and characterizing multiple molecular states is to provide invaluable insight into the dynamics of the sample.

New Detector Technology for Cryo-EM: The Resolution Revolution

The 3D-EM field has evolved very dramatically since its first application to the T4 phage tail with the development of both, instrumentation and image processing methods. But advances have never been as transformative as during the last two years, with the commercialization and use of direct electron detection cameras. The new detector technology results in images with notably higher contrast, which together with their fast read out allow for a "movie mode" of data collection that significantly overcomes the limitation of beam-induced motion. An effective correction of this phenomenon is obtained by splitting the total dose into short frames (e.g. 20, with typically 1 e/Å^2 dose each), followed by computational frame alignment that minimizes the blurring caused by beam-induced movement . The particle images, having higher signal-to-noise ratios, can be aligned more accurately and contribute to higher resolutions. In turn, higher resolution references lead to even more accurate alignments, resulting in a strong synergistic effect. The improvement in detector technology has not only lead to higher resolution with smaller data sets, but has also moved the lower size limit of the samples that can be studied in a frozen hydrated state (towards smaller complexes/molecules), and allowed better classification of heterogeneous samples, leading to the identification and description of even rare states.

Sample Case: Microtubule Structures at Atomic Resolution

The lack of a crystallization requirement and the use of conditions where macromolecules are fully active allow 3D-EM studies the description of multiple functional states in a mechanistic cycle. We have used 3D cryo-EM to describe the structure of microtubules in different states to gain information on their dynamic behavior.

Microtubules (MTs), formed by the self-assembly of αβ-tubulin, undergo dynamic instability, consisting on the stochastic switching between growth and shrinkage driven by GTP hydrolysis. While only GTP-bound tubulin incorporates efficiently at growing MT ends, polymerization is coupled to GTP hydrolysis. A MT switches from a growing phase, when its end is capped by GTP-bound tubulin, to a shrinking phase, when its "GTP cap" is lost . MTs can be stabilized against depolymerization by non-hydrolizable GTP analogs and by a variety of anti-tubulin drugs, some of which are used as anticancer agents . In the cell, MTs interact with a number of factors that regulate their dynamics. In order to understand dynamic instability, it is necessary to define the consequence of nucleotide state on microtubule structure and the effect of regulatory factors.

Our lab previously reported cryo-EM reconstructions of dynamic MTs and MTs made of tubulin bound to GMPCPP (a slowly-hydrolizable GTP analog), reaching resolution better than 5 Å. These structures were used in conjunction with Rosetta molecular modeling to generate pseudo-atomic structures that illustrated the changes in tubulin upon GTP hydrolysis within the MT.

In our most recent studies of MT structure, we have used a direct electron detector and improved

data processing strategies to obtain cryo-EM reconstructions of MTs at 3.5 Å or better resolution (**Figure 1**).

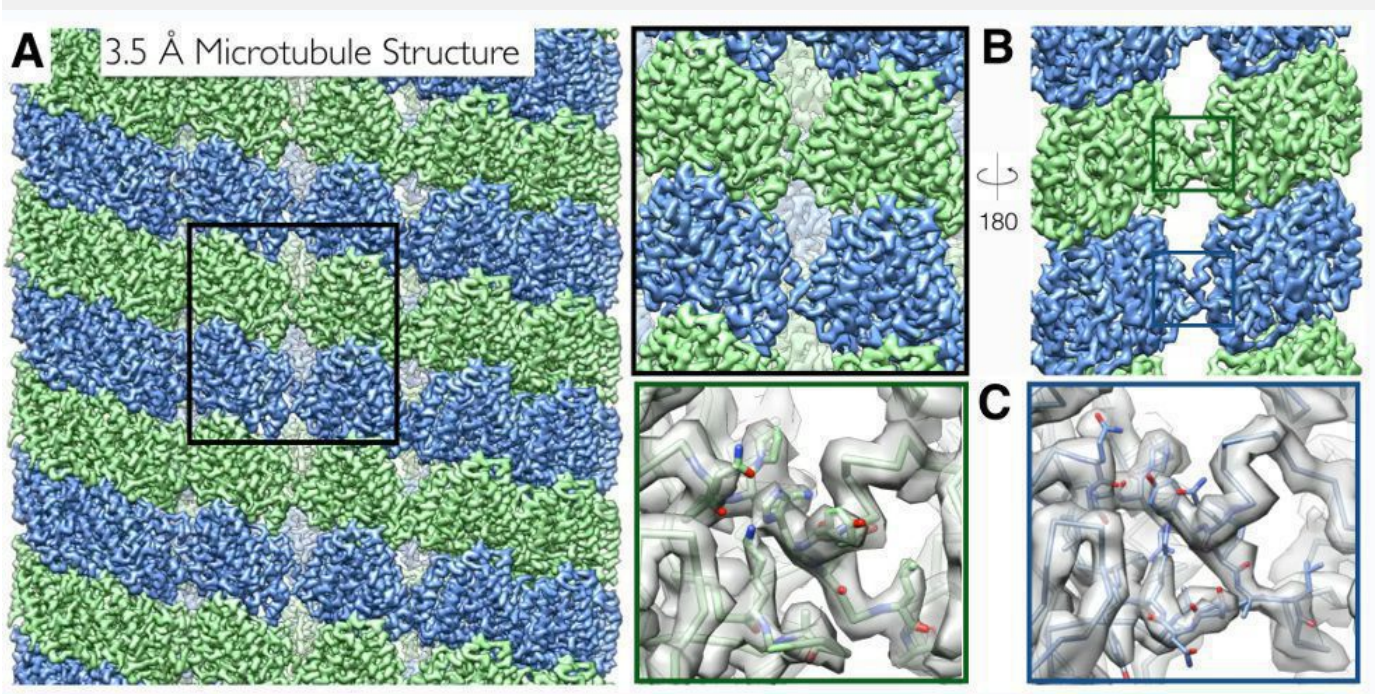

Figure 1. High-resolution Cryo-EM Structure of the Microtubule. (A) *Cryo-EM map (3.5 Å resolution).* ***α****-tubulin, green,* ***β****-tubulin, blue.* ***(B)*** *Boxed region from (A) showing the lateral interaction of two dimers, viewed from the outside (left) and inside (right) of the microtubule.* ***(C)*** *Atomic details of the lateral contact between* ***α****-tubulin subunits, left, and* ***β****-tubulin subunits, right (R. Zhang, et al. 2015).*

At this resolution, side-chain densities can be seen for most residues, with the noticeable exception of those from acidic residues (Glu and Asp), presumably due to radiation damage during electron exposure. Our studies have now allowed us to visualize the consequences of nucleotide hydrolysis , the effect of the anticancer drug Taxol , and the interaction of MTs with the regulatory protein EB3.

The high resolution of our MT structures allows, for the first time, the atomic description of the lateral contacts between protofilaments (the rows of tubulin heterodimers that run along the length of the microtubule; **Figure 1C**). Our analysis has now showed that these lateral contacts do not change significantly with nucleotide state. The lateral interface is limited to a single point of contact, with exquisite shape complementarity, that resembles a lock-and-key configuration. The M-loop of both α- and β-tubulin positions a strategic aromatic residue, H283 in α-tubulin and Y283 in β-tubulin, to function as the "key" that inserts into a complementary "lock" formed by the H2-S3 and H1'-S2 loops on the subunit across the interface.

Studies like the one just described demonstrate that microtubules are structurally tractable by cryo-EM at resolutions now approaching those obtained by X-ray crystallography, thus enabling the detailed study of nucleotide and drug effects, or the interaction of microtubule binding proteins, in the context of the native tubulin polymer.

Challenges for the Future

Single particle cryo-EM has emerged as a powerful alternative to X-ray crystallography and NMR that is broadly applicable. Recent technical breakthroughs, both in instrumentation and image processing software, have dramatically increased the achievable resolution, the throughput and the capacity of cryo-EM to describe conformational and compositional mixtures. As a consequence, a flood of biological insight is being gained on systems traditionally refractant to structural characterization, and many new researchers have entered the cryo-EM field. Still, significant technical issues remain: complexes smaller than 200 kDa are challenging, fragile samples may fall apart during cryo-EM grid preparation and existing image classification algorithms cannot yet deal with continuous forms of structural variability. Further developments in sample preparation, hardware and software should lead to more improvements in the future.

Eva Nogales
Molecular and Cell Biology Department, UC Berkeley, Berkeley, CA 94720-3220.
Howard Hughes Medical Institute, USA.
Life Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA.
E-mail: enogales@lbl.gov

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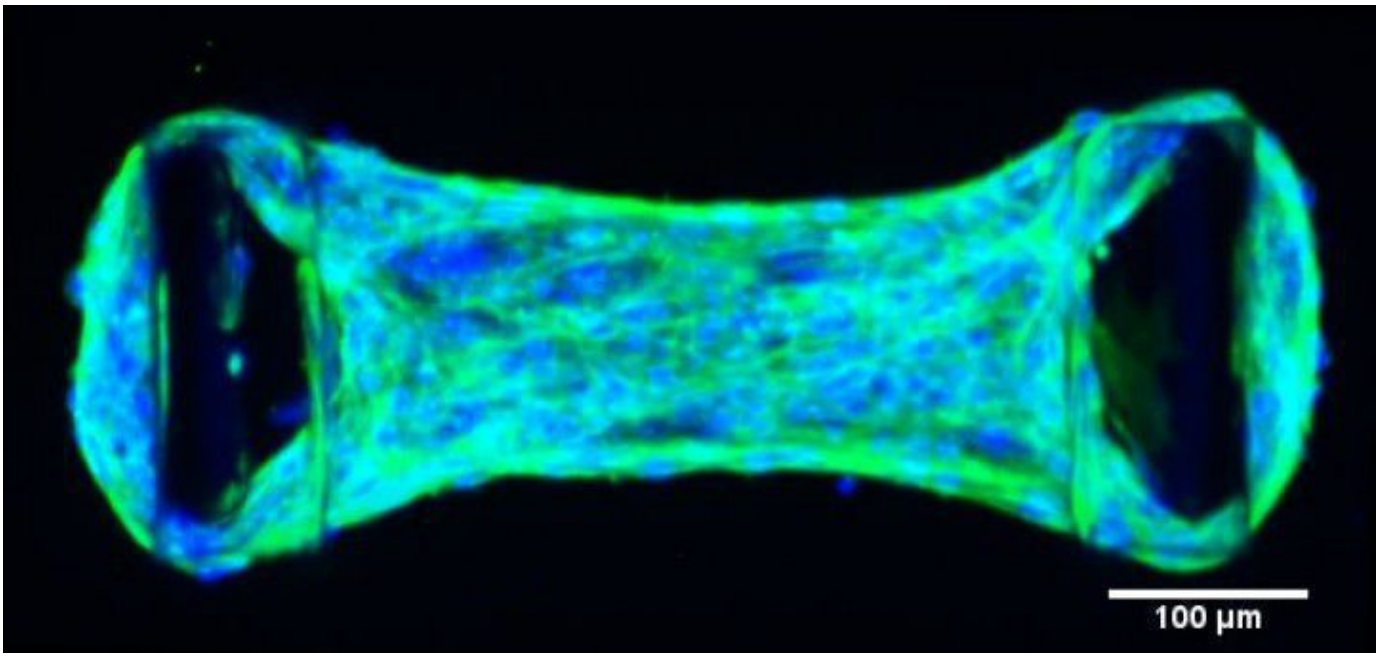
Biofísica Magazine

COMMENTARIES / NEWS

Engineered heart-tissue via cellular reprograming: A new tool for research and diagnosis

15/10/2015



Engineered cardiac tissue. Image kindly provided by John T. Hinson (Brigham and Women's Hospital, Boston, USA)

Jorge Alegre-Cebollada, *CNIC (Madrid, Spain)*.

Commentary to *Titin mutations in iPS cells define sarcomere insufficiency as a cause of dilated cardiomyopathy* (Hinson, et al. *Science*, **2015**, 349: 982-986).

The heart is a mechanical machine in charge of pumping blood against gravity and friction. Severe diseases develop when the mechanical properties of the heart muscle fail. Among them, there are several forms of familial cardiomyopathies that are caused by mutations in sarcomeric proteins with a mechanical role, such as titin. However, geneticists and cardiologists still have a hard time figuring out whether a particular mutation found in a patient causes disease or not, which prevents genetic diagnosis of relatives. Basic research in cardiomyopathies is also hampered because of the lack of appropriate disease models for every and each one of the individual mutations found in patients.

A recent report describes cellular reprograming techniques to obtain patient-derived induced pluripotent

stem cells (iPS) that can be differentiated into engineered heart-tissue-like structures, whose mechanical properties can be studied in the lab [1]. These engineered tissues recapitulate several important features of the myocardium such as sarcomerogenesis and contractility. These novel patient-derived cardiac microtissues are an exciting new tool that can be used to learn more about how cardiomyopathies develop. For example, from the Biophysics point of view, these tissues can be used to understand how a point mutation in a sarcomeric protein can lead to deficits in contractility and remodeling of the heart. There are also reasons for being optimistic regarding potential translational applications.

The paper by Hinson et al. reports that dilated cardiomyopathy (DCM)-derived engineered tissue where titin is truncated in heterozygosis shows deficits in contractility. The authors suggest that mutations of uncertain clinical significance could be evaluated using the same mechanical approach to define pathogenicity. No doubt this is an enticing proposal. However, although results are encouraging, there are a number of observations that merit future experimental work to fully validate the system:

- The authors do not find any mechanical defect at the single-cell level.
- Engineered tissues express fetal forms of titin with longer I-band segments and less exon skipping. Since the existence of exon skipping diminishes or even abolishes pathogenicity of truncations at the I-band [2], the observation that exon skipping happens less often in engineered tissues questions their predictive power, particularly for mutations of titin occurring in the I-band.
- The expression of some key cardiac genes is different in engineered tissues with respect to myocardium.

All of these concerns come down to the fact that engineered microtissues do not fully recapitulate native cardiac tissue. Future research has to determine to what extent such differences may prevent diagnostic applications. In the meantime, we can expect to learn many new things about the pathophysiology of familial DCM using the iPS system. Maybe more importantly, this new platform could be used to evaluate tailored therapeutic approaches.

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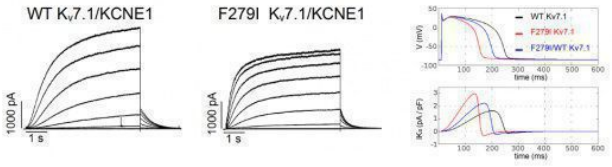
Biofísica Magazine

PAPERS OF THE MONTH BY SBE MEMBERS: SEPTEMBER - DECEMBER 2015

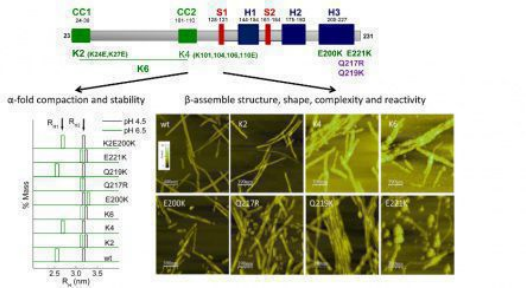


HIGHLIGHTED / SEP. 2015

A new KCNQ1 mutation at the S5 segment that impairs its association with KCNE1 is responsible for short QT syndrome

Moreno C, Oliveras A, de la Cruz A, Bartolucci C, Muñoz C, Salar E, Gimeno JR, Severi S, Comes N, Felipe A, González T, Lambiase P, Valenzuela C.

Cardiovasc Res. 2015 Sep; 107: 613.

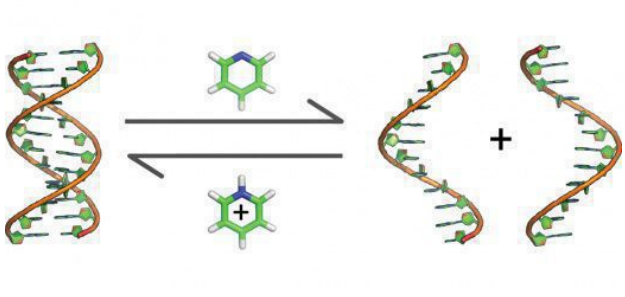


HIGHLIGHTED / SEP. 2015

PrP charge structure encodes interdomain interactions

Martínez J, Sánchez R, Castellanos M, Makarava N, Aguzzi A, Baskakov IV, Gasset M.

Sci Rep. 2015 Sep; 5:13623.

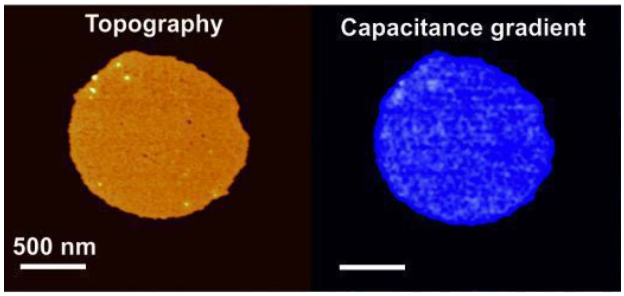


HIGHLIGHTED / SEP. 2015

Can A Denaturant Stabilize DNA? Pyridine Reverses DNA Denaturation in Acidic pH

Portella G, Terrazas M, Villegas N, González C, Orozco M.

Angew Chem Int Ed Engl. 2015 Sep; 54: 10488.

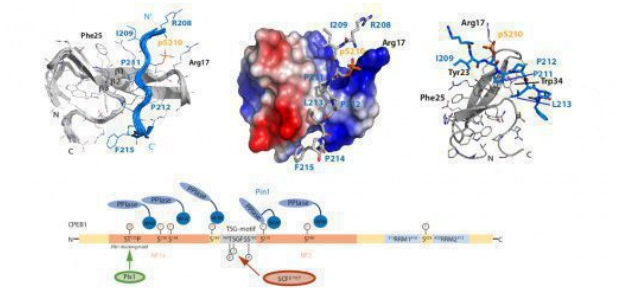


HIGHLIGHTED / OCT. 2015

Nanoscale electric polarizability of ultrathin biolayers on insulating substrates by electrostatic force microscopy

Dols-Perez A, Gramse G, Calò A, Gomila G, Fumagalli L.

Nanoscale. 2015 Oct; 7: 18327.

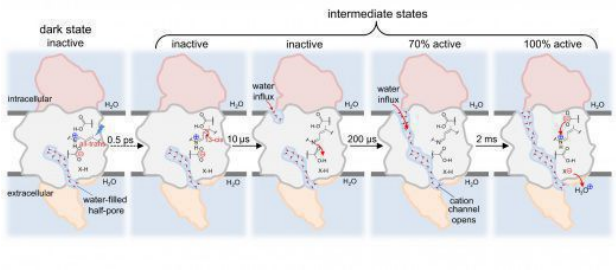


HIGHLIGHTED / OCT. 2015

Structural Analysis of the Pin1-CPEB1 interaction and its potential role in CPEB1 degradation

Schelhorn C, Martín-Malpartida P, Suñol D, Macias MJ.

Sci Rep. 2015 Oct; 5:14990.

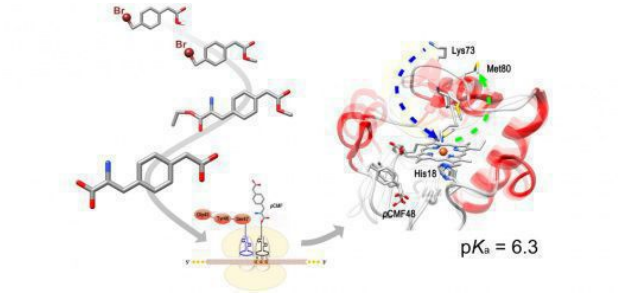


HIGHLIGHTED / OCT. 2015

Temporal evolution of helix hydration in a light-gated ion channel correlates with ion conductance

Lórenz-Fonfría VA, Bamann C, Resler T, Schlesinger R, Bamberg E, Heberle J.

Proc Natl Acad Sci USA. 2015 Oct; 112: E5796.

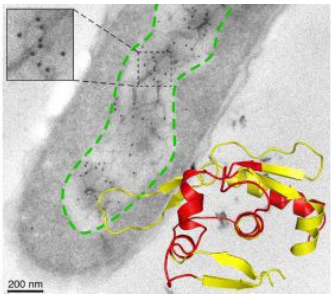


HIGHLIGHTED / OCT. 2015

Mimicking Tyrosine Phosphorylation in Human Cytochrome c by the Evolved tRNA Synthetase Technique

Guerra-Castellano A, Díaz-Quintana A, Moreno-Beltrán B, López-Prados J, Nieto PM, Meister W, Staffa J, Teixeira M, Hildebrandt P, De la Rosa MA, Díaz-Moreno I.

Chemistry. 2015 Oct; 21: 15004.

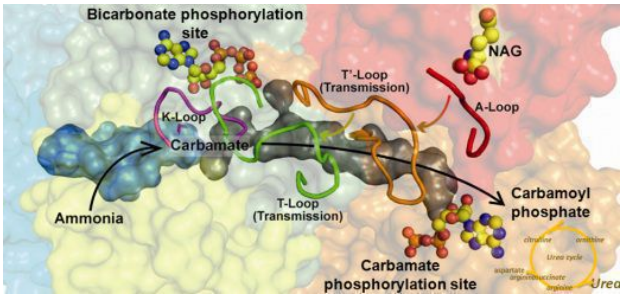


HIGHLIGHTED / OCT. 2015

Pre-amyloid oligomers of the proteotoxic RepA-WH1 prionoid assemble at the bacterial nucleoid

Moreno-Del Álamo M, de la Espina SM, Fernández-Tresguerres ME, Giraldo R.

Sci Rep. 2015 Oct; 5: 14669.

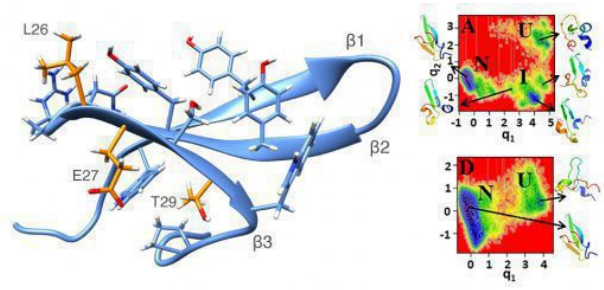


HIGHLIGHTED / NOV. 2015

Structure of human carbamoyl phosphate synthetase: deciphering the on/off switch of human ureagenesis

de Cima S, Polo LM, Díez-Fernández C, Martínez AI, Cervera J, Fita I, Rubio V.

Sci Rep. 2015 Nov; 5:16950.

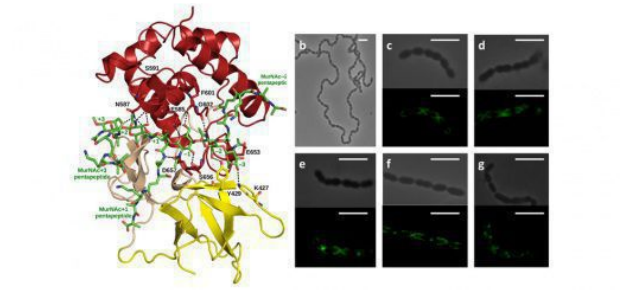


HIGHLIGHTED / NOV. 2015

Preventing fibril formation of a protein by selective mutation

Maisuradze GG, Medina J, Kachlishvili K, Krupa P, Mozolewska MA, Martin-Malpartida P, Maisuradze L, Macias MJ, Scheraga HA.

Proc Natl Acad Sci USA. 2015 Nov; 112:13549.

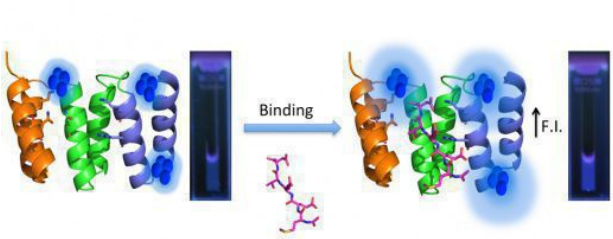


HIGHLIGHTED / NOV. 2015

Substrate recognition and catalysis by LytB, a pneumococcal peptidoglycan hydrolase involved in virulence

Rico-Lastres P, Díez-Martínez R, Iglesias-Bexiga M, Bustamante N, Aldridge C, Hesek D, Lee M, Mobashery S, Gray J, Vollmer W, García P, Menéndez M.

Sci Rep. 2015 Nov; 5:16198.

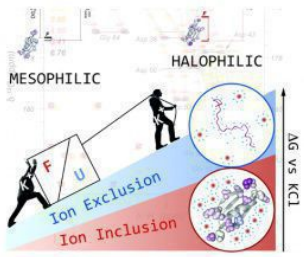


HIGHLIGHTED / DEC. 2015

Designed Modular Proteins as Scaffolds To Stabilize Fluorescent Nanoclusters

Couleaud P, Adan-Bermudez S, Aires A, Mejías SH, Sot B, Somoza A, Cortajarena AL.

Biomacromolecules. 2015 Dec; 16: 3836.

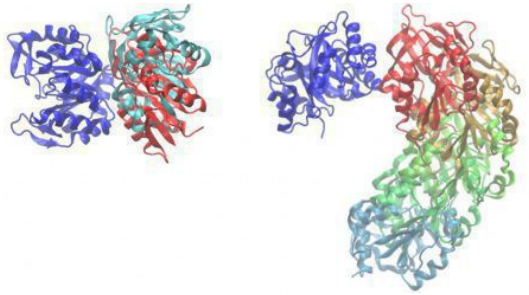


HIGHLIGHTED / DEC. 2015

Halophilic Protein Adaptation Results from Synergistic Residue-Ion Interactions in the Folded and Unfolded States

Ortega G, Diercks T, Millet O.

Chem Biol. 2015 Dec; 22:1597.

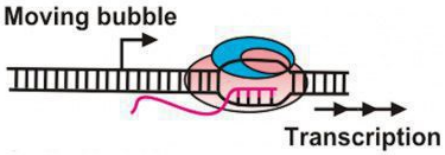


HIGHLIGHTED / DEC. 2015

PACSAB: Coarse-Grained Force Field for the Study of Protein-Protein Interactions and Conformational Sampling in Multiprotein Systems

Emperador A, Sfriso P, Villarreal MA, Gelpí JL, Orozco M.

J Chem Theory Comput. 2015 Dec; 11:5929.

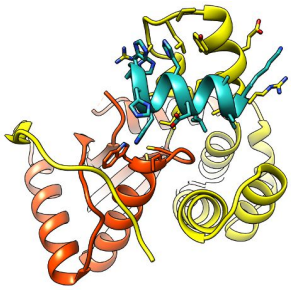


HIGHLIGHTED / DEC. 2015

Activation-induced deoxycytidine deaminase (AID) co-transcriptional scanning at single-molecule resolution

Senavirathne G, Bertram JG, Jaszczur M, Chaurasiya KR, Pham P, Mak CH, Goodman MF, Rueda D.

Nat Commun. 2015 Dec; 6:10209.



HIGHLIGHTED / DEC. 2015

The Redox State Regulates the Conformation of Rv2466c to Activate the Antitubercular Prodrug TP053

Albesa-Jové D, Comino N, Tersa M, Mohorko E, Urresti S, Dainese E, Chiarelli LR, Pasca MR, Manganelli R, Makarov V, Riccardi G, Svergun DI, Glockshuber R, Guerin ME.

J Biol Chem. 2015 Dec; 290: 31077.

Biofísica Magazine

AWARDS / NOMINATIONS / SBE PRIZES / NEWS

SBE Prizes 2016 – Call for Nominations

The 2016 call for nominations to SBE Prizes is now open

The SBE offers yearly special awards to the recognize excellence in the field of Biophysics. These prizes are given in following three categories:

'MANUEL RICO' – BRUKER PRIZE

DEADLINE JANUARY 30TH 2016.

> *Recognizes an outstanding Biophysics career, performed in Spain mainly during the last 10 years.*

Sponsored by Bruker Española S.A.

Addressed to

Biophysicist who develope their main activity in Spain. **Preference** is given to members of the SBE working on Structure/Function of molecules.

Award

3000 € and a talk delivered by the awardee during a special session of the 5th International Iberian Biophysics Congress (Porto June 15 – 17, 2016).

How to apply

Send a letter to the President of the SBE (Dr. Antonio Ferrer Montiel), attaching a *Curriculum vitae* and a summary of your most relevant scientific achievements.

More information

See *here* the Complete Bases and instructions to apply.

'E. PÉREZ PAYA' – SBE 40 PRIZE

DEADLINE JANUARY 30TH 2016.

> *Recognizes the trajectory of a Biophysicist with age under 40 with a special contribution to the progress of Biophysics in Spain.*

Sponsored by

BCN Peptid and Prima – Derm.

Addressed to

Biophysicists under 40 who develope their main activity in Spain. **Preference** is given to members of the SBE and to achievements from the last 10 years.

Award

1500 € and a talk delivered by the awardee during a special session of the 5th International Iberian Biophysics Congress (Porto June 15 – 17, 2016).

How to apply

Send a letter to the President of the SBE (Dr. Antonio Ferrer Montiel), attaching a *Curriculum vitae* and a summary of your most relevant scientific achievements.

More information

See *here* the Complete Bases and instructions to apply.

ANTALGENICS – SBE 33 PRIZE

DEADLINE JANUARY 30TH 2016.

> *Recognizes a young Biophysicist with age under 33, who have contributed significantly to the developmen of Biophysics, in Spain and/or abroad.*

Sponsored by

AntalGenics.

Addressed to

Outstanding young Biophysicists under 33, independently of the country where their work has been done. **Preference** is given to members of the SBE.

Award

1000 € and a talk delivered by the awardee during a special session of the 5th International Iberian Biophysics Congress (Porto June 15 – 17, 2016).

How to apply

Send a letter to the President of the SBE (Dr. Antonio Ferrer Montiel), attaching a *Curriculum vitae* and a summary of your most relevant scientific achievements.

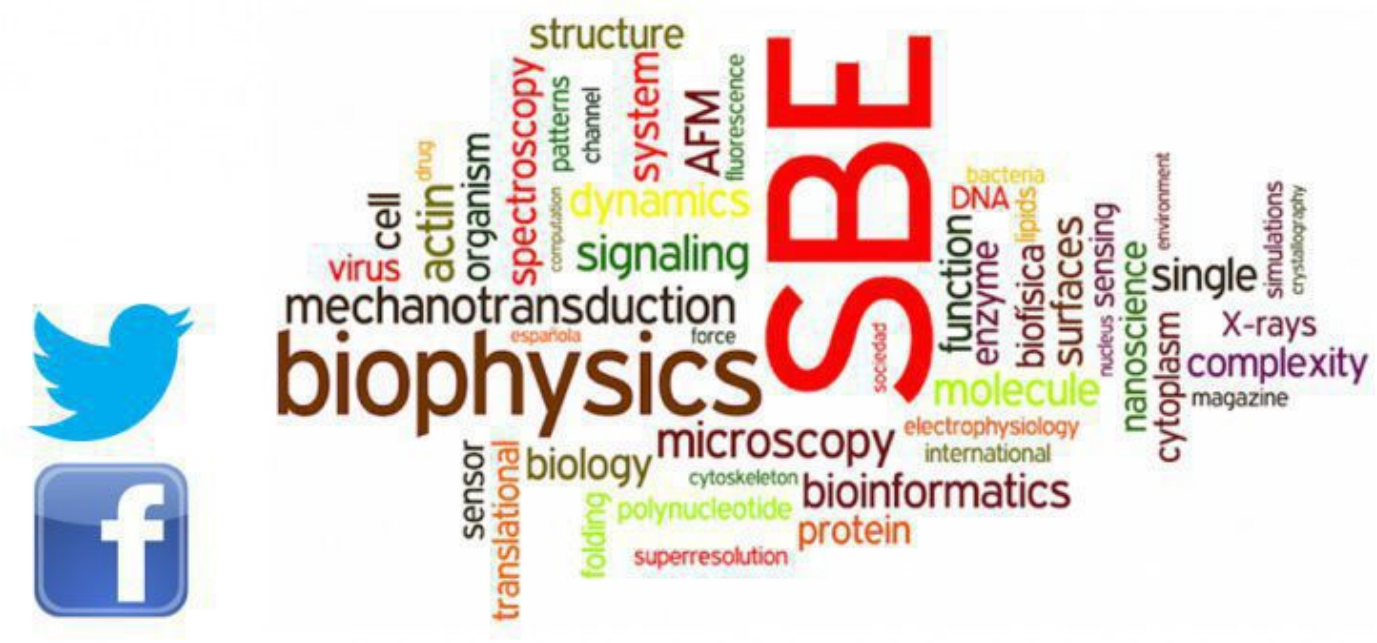
More information

See *here* the Complete Bases and instructions to apply.

Biofísica Magazine

NEWS

#SBEgoessocial



This week, the SBE debuts in social media with the launching of official accounts on Twitter and Facebook.

Follow us on Twitter @SBEsp and ***like*** us on www.facebook.com/spanishbiophysicalsociety, for latest updates on publications, news and events in Biophysics.

OUR SOCIAL MEDIA WILL PUT SBE CONTENT RIGHT AT YOUR FINGERTIPS!!

This launching expands SBE's online presence, which already includes the official website and Biofisica-magazine.

Biofísica Magazine

JOBS / FELLOWSHIPS / CALLS / GRANTS / POSTDOC

Grants for contracts 'Juan de la Cierva' – 2015

"Juan de la Cierva" (JdC) training / admission grants

Find *below* a list of Biophysics Positions for this call announced in this site.
Deadlines: Closing date for postdoc applicants: February 3rd, 2016; for centres: February 10th, 2016.

> *Financed by the ministry of economy and competitiveness (Government of Spain), the objective of this call is to promote employment of young researchers in Spanish research institutions. The grants will be awarded for a period of two years.*

Conditions and application

- Nationality: There are no restrictions of nationality.
- Types of grant: There are two modalities, with specific conditions. See in the call package full restrictions for eligibility:
  - JdC – training grants are for young scientist who got their degree after January 1st, 2014. The host institution for this postdoc must be different from the one where they obtained

their PhD.
    - JdC – admission grants are for scientist who got their PhD degree between January 1st, 2011 and December 31st, 2013.
- For the two modalities, the applications are presented through the host centres.
- For more information and instructions to apply, please visit the following web-sites :
    - Call package.
    - JdC – training.
    - JdC – admission.

List of positions announced in this site with links to specific information:

- Project: Protein Folding and Conformational Diseases.
  Host group: Conformational Diseases Lab at the Institute of Biotechnology and Biomedicine, Universitat Autònoma de Barcelona.
- Project: Host cell recognition of bacteriophage fibre and tailspike proteins.
  Host group: Structural biology of viral fibres, CNB-CSIC, Madrid.
- Project: Image processing in Electron and Soft-X-ray microscopies.
  Host group: Biocomputing Unit of the Spanish National Center for Biotechnology, CNB-CSIC, Madrid.

Tags: Funding Young Scientists Training

Biofísica Magazine

JOBS / FELLOWSHIPS / CALLS / GRANTS / PREDOC

'La Caixa' predoctoral training – 2016 call

"La Caixa" grants for doctoral studies in Spanish universities and research centres

Find *below* a list of Biophysics Positions for this call announced in this site.
Deadlines: Closing date of the call: February 29th, 2016.

> *'L'Obra Social "la Caixa" ', convinced of the importance of research and scientific progress, mobility and professional qualification, for the development of Society, opens a grants programme for young scientists who want to obtain a doctor degree in any University or Research Centre in Spain.*

Conditions and application

- Nationality: The applicants must be Spanish.
- Academic: The applicants must fulfil the conditions to study a doctorate degree, with a University Degree obtained at any date between January 2011 and June 2016. Furthermore, they must demonstrate knowledge of English, with a University of Cambridge First Certificate,

or equivalent.

- Duration: The grants are given for a maximum of three years. The starting date will be September-October 2016, or in exceptional cases, not later than January 2017.
- Mobility: The applicants must perform doctorate studies in a University different from the one where they graduated. They also have to change Autonomous Region, from he one where they had their normal residence or activity.
- Salary: The grants include gross annual amounts of € 36000, plus an extra price of € 7500 for those who defend their thesis within 6 months after the third year.
- Application: Applications have to be performed through the web site of l'Obra Social "la Caixa".

Application Process

There will be a pre-selection step. Preselected candidates will be call for an interview in Barcelona in May 31st 2016.

In order to apply, the candidates will have to mention an existing Spanish research group to which they would like to integrate. No admission letter in the group, or name of a thesis director, is needed during the selection step. The final agreement with the group and thesis director will be made after the selection process, and it will be possible to change the group of choice, provided it belongs to the same area of research.

List of positions announced in this site with links to specific information:

- Project: Protein-protein interactions involved in chromatin remodelling.
  Host group: Biointeractomics, cicCartuja, Sevilla.
- Project: Image processing in Electron and Soft-X-ray microscopies.
  Host group: Biocomputing Unit of the Spanish National Center for Biotechnology, CNB-CSIC, Madrid.

More Information

- Information package and application links in Spanish or in Catalan.
- Other doctoral grant programmes of "la Caixa".
- International PhD Programme 'la Caixa' – Severo Ochoa.

Biofísica Magazine

JOBS / FELLOWSHIPS / CALLS / GRANTS / PREDOC

International PhD "la Caixa" – Severo Ochoa 2016

International PhD program "Severo Ochoa" sponsored by "Obra Social la Caixa"

> *The 'Obra Social "la Caixa"', provides funds for PhD grants to perform research in Spanish Centres which have been awarded a "Severo Ochoa" certification. Such a distinction is given by an independent international scientific committee, and recognizes excellence of centres which perform frontier basic research and are among the best worldwide.*

- **Four years** grants
- **2 – 3** grants for candidates of any nationality assigned **to each of 20 research centres** from Spain awarded a Severo Ochoa distiction (see list and links below)
- Deadlines: Please, contact the *Severo Ochoa* Research Institution of your interest from the list below

List and links to websites of *Severo Ochoa* Research Centers

1. **Institut de Recerca Biomèdica (IRB)**
2. **Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC-CNS)**
3. **Barcelona Graduate School of Economics (BGSE)**

4. **Instituto de Ciencias Fotónicas (ICFO)**
5. **Centro Nacional de Investigaciones Cardiovasculares (CNIC)**
6. **Instituto de Ciencias Matemáticas (ICMAT)**
7. **Centro Nacional de Investigaciones Oncológicas Carlos III (CNIO)**
8. **Instituto de Astrofísica de Canarias (IAC)**
9. **Instituto de Física Teórica (IFT)**
10. **Instituto de Tecnología Química (ITQ)**
11. **Estación Biológica de Doñana (EBD-CSIC)**
12. **Centre de Regulació Genòmica (CRG)**
13. **Instituto de Física de Altas Energías (IFAE)**
14. **Basque Center for Applied Mathematics (BCAM)**
15. **Instituto de Neurociencias de Alicante (IN)**
16. **Centro Nacional de Biotecnología (CNB)**
17. **Institut Català d'Investigació Química (ICIQ)**
18. **Institut Català de Nanociència i Nanotecnologia (ICN2)**
19. **Instituto de Física Corpuscular (IFIC)**
20. **Institut de Bioenginyeria de Catalunya (IBEC)**

Biofísica Magazine

CATEGORY: JOBS

Positions in Biophysics

JOBS / CALLS 8 JAN, 2016

Computational chemist position – Drug discovery

Full time, indefinite position based in Barcelona (Parc Científic) IDP Pharma is a drug discovery company that develops first-in-class medicines directed to a novel type...

JOBS / CALLS 8 JAN, 2016

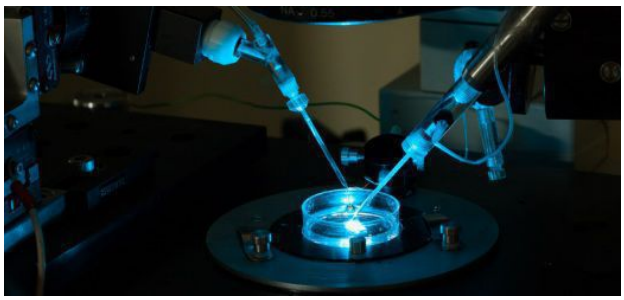
Senior permanent research positions in Structural Biology, Biocomputation, and Cell Biology

The ARAID Foundation launches an international call for applications to fill up to 8 research positions Deadline: Applications must be submitted electronically before 14.00h (CET)...

JOBS / POSTDOC 16 JAN, 2016

Postdoc in Biomolecular NMR at CBS Montpellier

2 years Postdoctoral position at the "Highly Flexible Proteins" group (Centre de Biochimie Structurale – CBS), lead by Pau Bernadó, Montpellier (France). The project, funded...



FELLOWSHIPS / CALLS / PREDOC 4 DEC, 2015

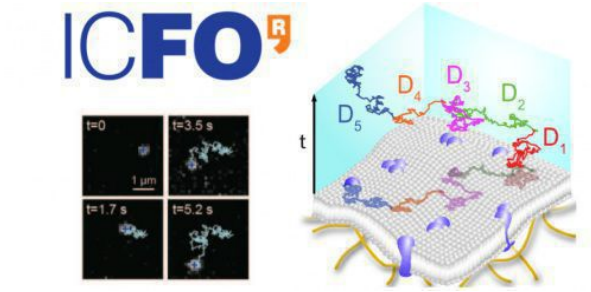
PhD grant opportunity in Membrane Nanomechanics

Thinking about applying for an FPU 2015? Consider the group of Membrane Nanomechanics (Biophysics Unit, University of the Basque country) at Bilbao (Spain), lead by...

JOBS / POSTDOC 5 OCT, 2015

Postdoctoral position available at the interface of Academia and Industry

Develope safe, robust, rapid, and reproducible protein formulation protocols In the frame of an ongoing funding scheme of the Walloon Region (DGO6; BEWARE FELLOWHIPS Academia),...



JOBS / PREDOC 30 SEP, 2015

PhD position in single molecule biophysics of the cell membrane

Dynamic interactions of membrane receptors in living cells The Single Molecule Biophotonics research group led by Prof. Maria Garcia-Parajo at ICFO (Castelldefels, Barcelona) is looking...

JOBS / PREDOC 24 SEP, 2015

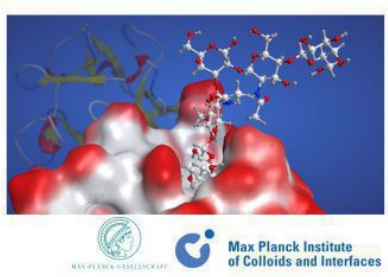
PHD-Student IN BIOPHYSICS

Artificial Mitochondria for Health The group of Dr. Iván López-Montero at the Department of Physical Chemistry I at the Complutense University in Madrid is looking...

JOBS / POSTDOC 24 SEP, 2015

3 Postdoc Positions – Protein Mechanics – Columbia University (New York)

Single molecule techniques to understand the dynamics of proteins under force The Single Protein Mechanics and Engineering laboratory of Columbia University in the City of...



JOBS / PREDOC / POSTDOC 18 SEP, 2015

PostDoc or PhD position in Structural Glycobiology

Targeting mammalian lectin receptors The “Structural Glycobiology” group at the Max-Planck-Institute of Colloids and Interfaces in Potsdam is looking for a motivated and ambitious candidate...

JOBS / CALLS 17 SEP, 2015

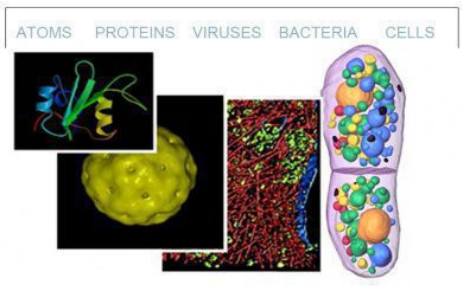
Platform coordinator position, long-term contract

The Institut Curie seeks an experienced coordinator The Institut Curie is a private non-profit organization which combines a leading European cancer research center with currently...

JOBS / POSTDOC 17 SEP, 2015

Postdoc Positions at López-Barneo's Lab

Announcement of recruitment of research personnel Three jobs are available at the laboratory of José López-Barneo at the Institute of Biomedicine of Seville, Seville, Spain....



JOBS 13 SEP, 2015

Software Developer at INSTRUCT

Position open at the INSTRUCT Image Processing Center in Microscopy, CNB-CSIC, Madrid (Spain). We are looking for a technically oriented candidate (engineer, physicist, mathematician, computer...

Biofísica Magazine

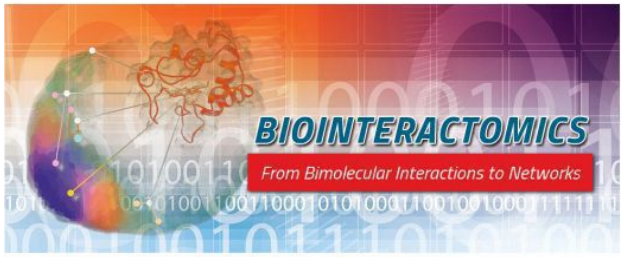
CATEGORY: EVENTS

Upcoming Meetings, Courses and Workshops

MEETINGS / EVENTS / NEWS 16 OCT, 2015

5th International Iberian Biophysics Congress

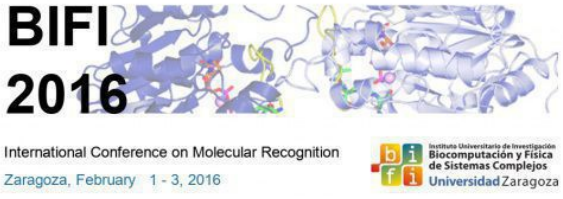
June 15th – 17th, 2016, Porto (Portugal). Congress Web Site: http://www.iberianbiophysicscongress.pt. The Spanish (SBE) and Portuguese (SPBf) Biophysical Societies have agreed to reestablish Biannual meetings...



EVENTS / WORKSHOPS 16 JAN, 2016

Biointeractomics: From biomolecular interactions to networks

FEBS / IUBMB | Workshop: Biointeractomics: From biomolecular interactions to networks. May 17 – 20 2016, Seville (Spain). Workshop Web Site: Follow this Link Understanding...



MEETINGS / EVENTS

VII BIFI International Conference on Molecular Recognition

MEETINGS / EVENTS

15th Iberian Peptide Meeting

XV EPI—15° Encontro Peptídico Ibérico/15th Iberian Peptide Meeting February 10th – 12th, 2016, Porto

VII International Conference of the Institute for Biocomputation and Physics of Complex Systems (BIFI) February 1 – 3, 2016, Zaragoza (Spain). Link: Conference Web Site...

(Portugal). The deadline for abstract sumission is 15th of November, 2015....

MEETINGS / EVENTS

XII Girona Seminar – Predictive Catalysis

Transition-Metal Reactivity by Design April 17 – 20, 2016, Girona (Spain). Links: Seminar Web Site, or follow in twitter The study of reactions in the...

MEETINGS / EVENTS

60th Biophysical Society Annual Meeting

60th Biophysical Society Annual Meeting. February 27 – March 2, 2016, Los Angeles Convention Center (USA). As science becomes increasingly interdisciplinary, the Biophysical Society Annual...

MEETINGS / EVENTS

The 3rd International Conference on Physiological Computing Systems – PhyCS 2016

July 27th – 28th, 2016, Lisbon (Portugal). Congress Web Site: Follow this link. Physiological data in its different dimensions, either bioelectrical, biomechanical, biochemical or biophysical,...

CONTACT

SBE - Sociedad de Biofísica de España

Secretaria SBE, IQFR-CSIC,

C/Serrano 119, 28006 Madrid

Email: sbe_secretaria@sbe.es

WEB: http://www.sbe.es

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