nature physics

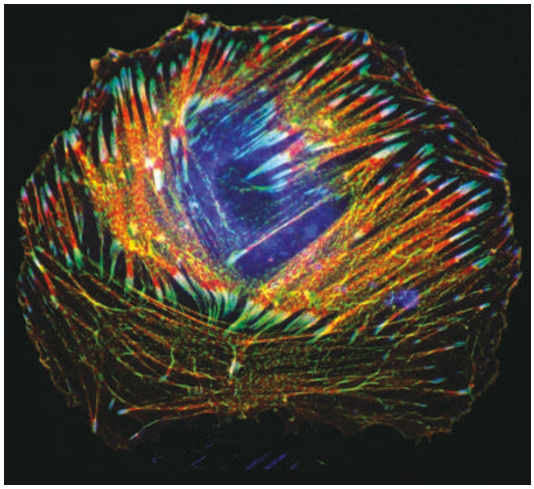
Vol.2 No.4 April 2006

www.nature.com/naturephysics

An eye on biophysics

Last month, the city of Baltimore, Maryland, found itself host to the March Meeting of the American Physical Society. Around 7,500 physicists thronged the city's convention centre, mostly eschewing the spring sunshine for a packed programme of talks, poster sessions, exhibitions, division meetings, reunions — and, best of all, corridor conversations.

The March Meeting is traditionally focused on condensed-matter physics (other divisions of the society such as particle physics and plasma physics being represented elsewhere during the year). Although the meeting might have been light on genuine 'news', the popularity of some sessions created such an overflow of audience that security guards were called to bar any more delegates from entering the room. That certainly lent an air of excitement. Crowd-pullers included the provocatively titled session 'Pathways to practical quantum computing', whereas interest in the 'Quantum Hall effect in graphene' was sufficient to fill a ballroom.



FLUORESCENCE MICROSCOPE IMAGE OF A RAT SMOOTH MUSCLE CELL, WITH THE ACTIN CYTOSKELETON SHOWN IN RED. THE MECHANICS OF THE CYTOSKELETON IS THE SUBJECT OF THE PROGRESS ARTICLE ON PAGE 231 OF THIS ISSUE. THIS IMAGE COMES FROM 'CELL OF THE MONTH' IN *NATURE CELL BIOLOGY*, JULY 2003, AND WAS CREATED BY MARIO GIMONA. SCALE BAR 20 μM.

More of a surprise hit with physicists was 'Methods in nanobiotechnology' (although 'nanobiotechnology' could well be a magic word among funding bodies at the moment): nanomechanical devices, when not probing quantum phenomena, put to use in single-molecule biosensing (Michael Roukes, Caltech); and luminescent quantum dots tracking protein transport (Paul Wiseman, McGill Univ.). The 'nanobiotech' theme continued in other sessions, in the description of a synthetic muscle (Amar Flood, UCLA), and in the use of nanostructures in the exploration of evolutionary microbiology (Juan Keymer, Princeton).

In fact, biological physics has become a significant part of the programme at the March Meeting, indicative of a growing relationship between the two sciences. There is, of course, a history of physics in biology, principally the use of imaging techniques for biomolecules. But in the modern era of molecular biology, understanding not just individual structures but dynamics and collective phenomena in out-of-equilibrium systems are at issue. Physicists are recognizing the challenge, and rising to it.

This issue of *Nature Physics* reflects something of that growing synergy across the sciences. In the Commentary, on page 212, epidemiologist Bryan Grenfell and colleagues discuss how, by standing back to look at the big picture, scaling relations and power laws can be used to make sense of the complexities in the spread of disease. Andreas Bausch and Klaus Kroy extol the opposite approach in their Progress article on page 231 — how about starting from the bottom, from fundamental physics principles and the simplest components, and building them up into something that resembles the complex workings of a biological cell? Their model is the polymeric protein actin, which forms the support structure of the biologial cell. Finally, on page 282, Jasna Brujić and co-workers explore the glassy dynamics of the energy landscapes of protein folding — the language of physics in a biological context.

Biophysics is firmly part of the remit of *Nature Physics*. But, as a journal for physicists, our interests are necessarily in those areas where physics is genuinely explored; less so in, say, the application of physics techniques. The increasing sophistication of imaging methods was clear at the March Meeting. Infrared spectroscopy, NMR, and picosecond X-ray crystallography using a pump–probe setup at synchrotron sources — all are contributing to our understanding of biology. But in other areas of biophysics, there is a need for physical insight. Indeed, in one of the final sessions of the meeting, 'Synchrony and complexity in brain activity and function', neurobiologist Steven Schiff (George Mason Univ.) made a straight appeal to his physics audience for help in making sense of the data.

It wasn't all work and no play in Baltimore. Offered for one evening's entertainment was a 'physics sing-a-long', at which delegates were invited to join in singing ditties, set to popular tunes, with lyrics inspired by the laws of physics — the 'geek chorus', said one journalist. Pejorative labels aside, physicists do stand out from the crowd. Wandering round Baltimore's Inner Harbour on the day before the conference began, they were easy to spot. If it were a biology conference in town, would those delegates be as instantly recognizable as the physicists? Maybe it just takes one to know one.