

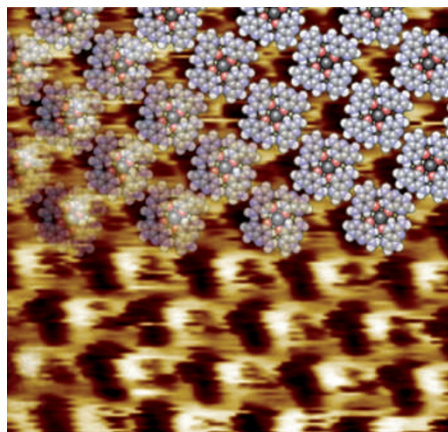
side-chains — and replaced the easily hydrolysable ester linkages of QS-21 with more stable amide bonds to overcome the problem of chemical instability. Interestingly, the QS-21 analogues not only showed comparable or better adjuvant activity to QS-21 itself, but also lower toxicity.

This highly convergent synthesis of the analogues takes 30 fewer steps compared with that for QS-21. It also allows the formation of other potent analogues and the possibility of including molecular probes that could enable more elaborate studies into their mechanism of action.

#### SCANNING TUNNELLING MICROSCOPY

### Surface conversion

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The Watson–Crick base pairing underlying DNA's helical structure is very well known, but nucleobases can form a variety of other hydrogen-bonded motifs. Guanines, in particular, can assemble into dimers, ribbons or macrocyclic 'G-quartets' that are relevant to fields as diverse as organic electronics or drug design. Now, a team from the universities of Strasbourg and Bologna, led by Paolo Samorì and Gian Piero Spada, has directly observed the reversible conversion between guanine-based ribbons and G-quartets at a liquid–solid interface by scanning tunnelling microscopy (STM).

Guanine-based assemblies on surfaces have been widely investigated by STM, but under ultra-high vacuum. To study liquid–solid interfaces, Samorì and colleagues used solutions of guanines bearing a long alkyl side chain that were so dilute they could all be adsorbed on the surface. The molecules first assembled into extended ribbons on the highly oriented pyrolytic graphite surface. The addition of potassium ions to the solution then triggered the formation of macrocyclic G-quartets centred around

the cations. When the potassium ions were subsequently captured by addition of a cryptand molecule, the ribbons re-assembled.

On acidification of the solution, the protonated cryptands released the potassium ions, inducing the re-formation of the G-quartets. Finally, the formation of ribbons could be triggered again by further addition of cryptands. The surface areas covered by either the ribbons or the quartets were found to be very similar, suggesting that the conversions occur on the surface without involving desorption and re-adsorption steps.

#### SOLVENT-MEDIATED REACTIONS

### Shape matters

*Science* **327**, 308–312 (2010)

Many questions are still to be answered about the solvent-mediated reactions of water. Although we know that many of its properties arise from its ability to form dynamic hydrogen-bonded networks, the intricacies of many reactive processes are still unclear. One such unresolved issue is how water clusters mediate ion chemistry. Now Mark Johnson of Yale University and colleagues from across the United States have studied how water clusters surround and react with  $\text{NO}^+$  to form HONO. This reaction involves the transfer of charge from  $\text{NO}^+$  to the surrounding water network and has significance for the understanding of chemistry in the Earth's ionosphere.

The rate of reaction is known to depend on the number of water molecules that surround  $\text{NO}^+$ . How the geometry of the water network affects the reaction, however, is less understood. To study this, Johnson and colleagues used infrared spectroscopy to measure the vibrational spectra of clusters of  $\text{NO}^+(\text{H}_2\text{O})_n$ , and performed calculations to understand them.

Small clusters with just one or two water molecules were unreactive as expected, but the spectrum of  $\text{NO}^+(\text{H}_2\text{O})_3$  revealed three different possible geometries. Only one of them was able to promote charge delocalization over the water network — and thus reactivity. This geometry differed from the others in that only one water molecule was directly interacting with  $\text{NO}^+$ , allowing the other two — in the second solvation shell — to accommodate the excess charge on the  $\text{NO}^+$ -interacting water molecule.

The definitive versions of these Research Highlights first appeared on the *Nature Chemistry* website, along with other articles that will not appear in print. If citing these articles, please refer to the web version.

## blogroll

### Smarten up

**Better chemistry through smartphones, and 20 science books we should all read.**

And so it begins. Not only are smartphones seen nearly everywhere in everyday life, they are now beginning to take over in labs too. First, Joel Kelly at Infinilux (<http://go.nature.com/8PfDcS>) used his boss's iPhone flashlight app to excite the fluorescence of a dispersion of colloidal silica nanocrystals. After Mitch at the Chemistry Blog (<http://go.nature.com/300iPM>) saw that, he knew he "had to one-up him for no other reason than I am a Google Android user." So he made his own app, which scrolls through the visible spectrum. Mitch then uses this to show how different colours of light are absorbed or transmitted differently in a glass of red wine — and there's a video on the post in case you don't believe him. With another smartphone, he reckons he could have made "a quick and dirty visible spectrometer." Joel replied saying that if he had more bucks (and more brains) he would "be starting a company around smartphone lab tools" and issued a call to "any chemistry-loving electrical engineers out there who want to take that idea and run with it".

Have you seen the message doing the rounds about a BBC list of 100 books, of which the average person is supposed to have only read six? Perhaps you've even happily put an 'x' next to *War and Peace* or *One Hundred Years of Solitude* and felt a little bit superior. Well, apart from the fact that this internet meme is of dubious or no provenance (see <http://go.nature.com/SkrKsa> among others), Wavefunction at The Curious Wavefunction (<http://go.nature.com/c6fHtb>) took the list to task for a lack of science, highlighting it as yet another example of 'the two cultures' at work. Fired by righteous indignation and the shade of C. P. Snow, Wavefunction recommends 20 science books "that surely deserve as much of a place in the 'educated' man's mind" as those doing the rounds. They feature Darwin and Dawkins, Oppenheimer and Heisenberg, Watson and Pauling, and Snow's *The Two Cultures* itself. Now, I wonder how many of them are available as e-books for my smartphone...