chalcogenide device is that both show incremental changes in their structure, cumulative over time, when they are operated below their threshold voltages. These changes give rise to controllable intermediate conductivities and are in effect precursors to the binary memory effects that make chalcogenides useful as storage materials. In PC-RAM, this cumulative behaviour is readily explained by crystal growth; in the electrolytic variant, it is explained by electrodeposition.

Both chalcogenide technologies present exciting opportunities that are not restricted to memory, but include cognitive computing[5,8] (E*PCOS 05: S. R. Ovshinsky, ECD Ovonics) and reconfigurable logic circuits[9]. It is too early to tell which technology will be selected for which niche, but scientific interest alone should motivate a closer look at chalcogenide materials to investigate correlations between phase-change and electrolytic behaviour. To take one example, the migration of dissolved ions is required in the electrolytic case, but could degrade the performance of a phase-change device. Fluxes of both electrons and ions participate in electromigration — widely studied as a degradation mechanism of the electrically conducting lines for integrated circuits. Thus, a unified approach to the study of chalcogenides, assessing the roles of atoms, ions and electrons, may prove crucial for both device performance and reliability. ■

A. Lindsay Greer and Neil Mathur are in the Department of Materials Science and Metallurgy, University of Cambridge, New Museums Site, Pembroke Street, Cambridge CB2 3QZ, UK.
e-mails: alg13@cam.ac.uk; ndm12@cus.cam.ac.uk

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CELL BIOLOGY

Helices sculpt membrane

Guillaume Drin and Bruno Antonny

Many proteins are carried within cells in bubble-like sacs. These are pinched off from membranes inside the cell, and it seems that the Sar1p protein is key in both starting and finishing this budding process.

The cell contains a network of membrane-bound compartments that exchange proteins with each other and with the cell surface thanks to several haulage systems, each providing a specific link between one station and another. At the departure point, specialized 'coat' proteins wrap up a small area of the lipid membrane, shaping it into a bulging 'bud' and gathering up proteins due to be transported inside it[1]. The bud detaches from the membrane — a stage called fission — to form a bubble-like 'vesicle' loaded with cargo. Lee *et al.*[2] report in *Cell* that a coat protein called Sar1p, whose structure contains several α-helices, initiates buds for one type of vesicle by thrusting one of its helices into the membrane, causing it to balloon outwards[2].

We knew that Sar1p begins the formation of so-called COPII vesicles, but quite how was unclear. These vesicles transfer proteins from a membrane-bound structure called the endoplasmic reticulum, where they are made, to another such structure, the Golgi apparatus, where they are processed into their final form. A common cellular fuel called guanosine triphosphate (GTP) activates Sar1p. When Sar1p binds to GTP, it exposes a short α-helix at its amino (or N) terminus that anchors the protein to the membrane of the endoplasmic reticulum. There, Sar1p recruits two large COPII protein complexes, Sec23/24p and Sec13/31p, which polymerize into a curved lattice. Studies using artificial lipid vesicles called liposomes show that adding all these components is sufficient to generate coated buds on the liposome and, less efficiently, free coated vesicles[3]. Now Lee *et al.*[2] report how Sar1p contributes to the initial moulding of the membrane and, less expectedly, to membrane fission.

Using electron microscopy, the authors first show that Sar1p alone can deform liposomes into long, narrow tubules, but only when it is bound to GTP, suggesting an involvement of the N-terminal helix. To demonstrate this, they swap this helix for a peptide that binds to an artificial lipid. As expected, the Sar1p mutant still binds to liposomes containing the artificial lipid but no longer deforms them.

Both normal Sar1p and the domain-swapped mutant can interact with the other COPII complexes, so the next step was to compare incubations conducted with the complete set of COPII proteins. Puzzlingly, though, buds do form in the presence of the

50 YEARS AGO

For some time past, the B.B.C. Research Department has been studying the technique of colour television, and recently a programme of experimental transmissions was started outside normal broadcasting hours. On October 20, Sir Harold Bishop, director of technical services, presented a special demonstration for the Press. This comprised the transmission over a closed circuit at the Alexandra Palace station, of still pictures, a short travel film and a number of 'live' camera shots, all of which were reproduced at the receiving end as attractive colour pictures.
From *Nature* 29 October 1955.

100 YEARS AGO

The Far East. By Archibald Little. — Of late years the Far East is only far in actual distance; it is very near to our thoughts, while the ignorance regarding these lands is being very rapidly dispelled... China stands now at the parting of the ways; for many years resolute in keeping out foreign inventions so distasteful to the old-fashioned mandarin, circumstances have proved too strong, and railways, the precursors of western life, are now being built or projected throughout the land... Consider the Yangtse Valley... This magnificent river will undoubtedly remain the great high road for commerce into Central China; but railways are and will be built to act as feeders to the main line, much to the profit of the shareholders and of the inhabitants, for Chinese are born traders, and already make use of the pioneer of Chinese railways — the line from Tientsin to Peking — in large numbers.

Finally, we have a vivid description of the southern basin, Canton, Hong Kong, and the provinces bordering on French territory. Yunnan, which adjoins our Burma, has a particular interest to Englishmen; but here, owing to our supineness in days gone by, we have allowed the French to get ahead of us with their railway, which will undoubtedly draw to itself all that is valuable of the trade of the province.
From *Nature* 26 October 1905.

50 & 100 YEARS AGO