on the slow kinetics of silica polymerization adds to the structural diversity currently available from the natural biomineralizing microorganisms.

Another interesting aspect of the silica replica of the cell is that when amphiphilic lipid bilayers in the form of liposomes were added to the replicas, they localized only on the outer surfaces of the replicas, suggesting that the membrane lipids could potentially be reconstituted. Furthermore, when treated with high-temperature pyrolysis (900 °C in nitrogen) followed by dissolution of the silica with basic solutions, the replicas were converted to carbonized systems. These porous carbon replicas, which possessed greater conductivity than the silica ones, could potentially be used as absorbents or in sensing applications[3].

Both the silica and carbon replicas of mammalian cells add to the diversity of porous materials that have been created through the use of organic templates such as surfactants[4], short-chain molecules[5] and block copolymers[6]. For example, silica[7], alumina[8] and transition metal oxides[9] with well-defined porosities (in the range of ~1–50 nm) have been derived after the removal of the self-assembled organic templates. These materials are of great interest as catalysts and advanced functional materials.

In the future, the use of the silica replicas of the mammalian cells to create biomaterials for cell culture and tissue engineering applications could be possible. For example, the replica can act as a mould for the polymerization of different types of biomaterials. Following the removal of silica (for example, by etching in a basic solution), a porous biomaterial that is an inverted copy of the silica replica can be obtained. The unique microstructure of the inverted copy and the surface chemistry of the biomaterial may facilitate the expansion of stem cells and primary cells. They may also induce the selective differentiation of stem cells towards the desired cell type when the inverted biomaterial replica of the desired cells is employed as a cell-culture substrate.

Furthermore, it would be of interest to examine if the present approach with cells can be extended to obtain silica replicas of tissues, organoids and organs. Such replicas would present an interesting way of preserving complex specimens for biomedical research and bioengineering applications. In organ transplant research, there has been substantial interest in using decellurized organs as a host for seeding stem cells from patients[10]. The inverted biomaterial replicas of tissues, organoids and organs may potentially act as a structural support and offer an environment for controlled differentiation of stem cells. ❒

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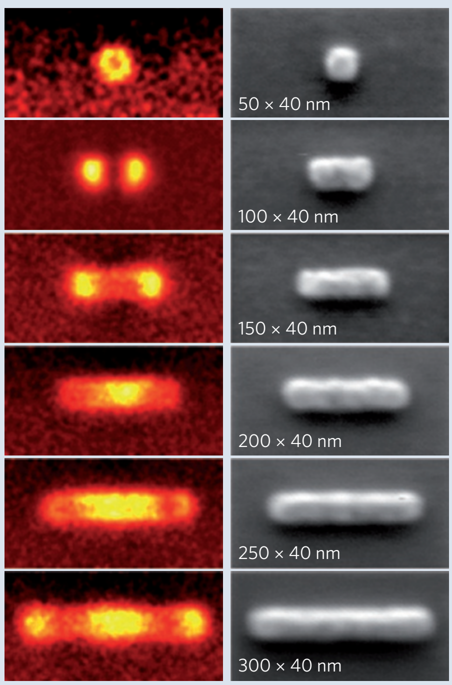
PLASMONICS

The aluminium rush

An electromagnetic field may promote a concerted oscillation of electrons on a metal surface, allowing light to be concentrated in spaces that are smaller than its wavelength. To visualize these waves (or plasmonic modes), researchers use cathodoluminescence, where a highly focused electron beam excites the surface electrons, which then emit light on recombination.

In *Nano Letters* (http://doi.org/jrw; 2012), Naomi Halas at Rice University (USA) and co-workers report the plasmonic modes of an aluminium nanorod with spatial resolution of about 20 nm. The nanorod functions as an optical antenna concentrating light in specific regions. Transitions from circular emission (top row in the figure), where the modes from the longitudinal and transverse directions are degenerate, to dipolar and even quadrupolar emission, which arise from the longitudinal confinement, are clearly visible as the rod length increases. The modes remain intense throughout the investigated regions and can be tuned from the ultraviolet to the visible range by changing the nanorod length.



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It is only recently that aluminium has been regarded as a serious contender for practical applications of plasmonics. Gold and silver have been the main players since the inception of the field because they allow long-distance propagation of plasmons with minimal loss of energy. However, for some applications propagation distance can be compromised, and the focus therefore shifted to the ability of nanorods to confine plasmons in tighter spaces. Here, aluminium outperforms both silver and gold. A particularly relevant application of this type involves the coupling between the semiconductor technology used in computers and the plasmonic modes of a nanorod. Aluminium is already compatible with fabrication technology for complementary metal-oxide semiconductors, and optimization of its optical properties at the nanoscale could lead to the integration of plasmonics and semiconductor electronics. Therefore, the spatially resolved characterization of the plasmonic properties of the aluminium nanoantenna reported by Halas and co-workers is an essential step in this direction. Add to the mix the fact that aluminium is the third most abundant element in the Earth's crust, and the potential for an aluminium rush in plasmonic science and technology is easily envisaged.

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