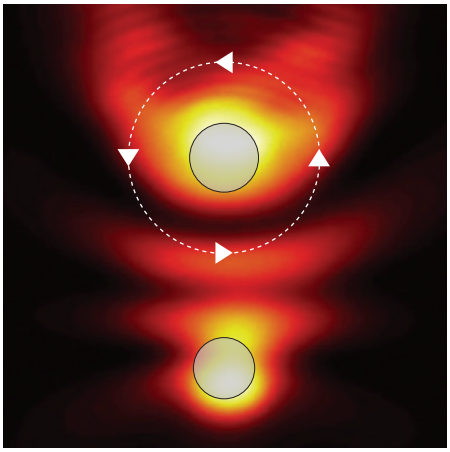
SPIN-TORQUE NANO-OSCILLATORS

Geometrical synchronization

Nature Nanotech. http://doi.org/bbmz (2015)



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A spin-polarized current injected in a ferromagnet is able to modify the magnetization direction due to spin transfer. This effect is used in spin-torque nano-oscillators to make the magnetization of a ferromagnet precess, enabling microwave generation. Taking advantage of their nonlinear behaviour and the propagating spin-waves generated by the spin precession, multiple nano-oscillators can be synchronized, allowing the total emitted microwave power to be increased. Now, Afshin Houshang and colleagues demonstrate that the Oersted field originating from the current passing through the nano-oscillator not only alters the emission pattern of the spin-waves but can be used to enhance the synchronization of several devices if simple array geometries are used. This represents an important step towards the development of practical applications. In particular, they demonstrate the synchronization of five nano-oscillators — a record-high number — and robust synchronization of two devices separated by distances longer than one micrometre. *DC*

PHOTOVOLTAICS

Robust against climate change

Nature Commun. **6,** 10014 (2015)

Future atmospheric conditions must be taken into account in evaluating the long-term effectiveness of energy supply from renewable sources. Now, Sonia Jerez and collaborators have explored the potential effects of climate change on the electricity produced by photovoltaic installations in Europe. They considered a set of scenarios describing the future evolution of greenhouse gas concentrations in the atmosphere, solar irradiance, surface air temperature and surface wind velocity. Variations of solar power production were calculated based on the impact that these atmospheric parameters have on the operating temperature of the photovoltaic panels. In the worst-case scenario of a continued increase of greenhouse gas emissions, the power generation may decrease by about 10% by 2100 in countries in northern Europe, whereas it should remain unchanged or slightly decrease by 2% in southern and central Europe, where the highest density of solar power plants is expected. Additional climate- and technology-related factors should be considered to refine this prediction, yet these results confirm that photovoltaics will be a source to rely on in the next century. *LM*

TISSUE REGENERATION

Guiding fibres

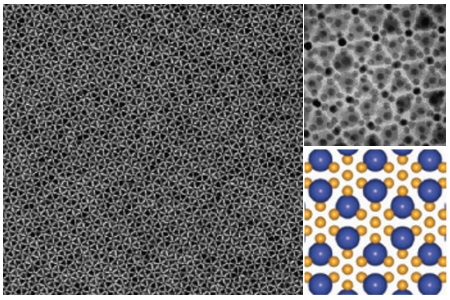
Cell Stem Cell http://doi.org/bbm3 (2015)

On muscle injury, resident stem cells and their descendant myogenic progenitor cells orchestrate a regenerative response. Yet how muscle stem and progenitor cell populations become organized *in vivo* to replace degenerated muscle fibres and thus repair muscle tissue is poorly understood. By using three-dimensional, time-lapse intravital imaging in live mice, Chen-Ming Fan and colleagues now find that post-injury degenerated fibres in the basal lamina govern the division and migration of myogenic progenitor cells, with migration occurring primarily along the long axis of the fibres. They also show that artificial rotation of the remnant degenerated fibres negatively affects the migration and division behaviour of the progenitor cells. The researchers conclude that post-injury degenerated fibres provide a necessary scaffold for the proper alignment of progenitor cells and for the fusion of their differentiated descendants, which are critical stages for the proportional regeneration of muscle tissue (that is, with pre-injury organization and dimensions). *PP*

LATTICE ASSEMBLY

Patterned by polymers

Nature Commun. **6,** 10052 (2015)



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The potential functional applications of multicomponent nanocrystal superlattices depend largely upon the level of control that can be achieved through the combination of their constituent building blocks. Although it is possible to control lattice structure by modifying the chemical/structural arrangements of the individual crystals, or through ligand attachment, it can still be difficult to achieve stable and larger-scale nanocrystal lattices. Ting Xu, A. Paul Alivisatos and their colleagues now present a method for the controllable formation of long-range-ordered two- and three-dimensional binary nanocrystal superlattices. Their structures were composed of spherical nanocrystals modified on their surface with polymeric ligands. They found that these surface polymers offered significant benefits for the stabilization of precise (and large) interparticle separations. By tailoring the sizes of the nanocrystals and the appended polymers, the researchers were able to generate a variety of well-ordered superlattices over different length scales. *JH*

THERMOELECTRICS

Ranged performance

Science http://doi.org/bbmx (2015)

Thermoelectric materials generate power when a temperature gradient is applied across them, and hence are of substantial interest for the recovery of waste heat. As such, high performance thermoelectrics — characterized by a large thermoelectric figure of merit, *ZT* — typically exhibit large electrical conductivity, but low thermal conductivity. Although a number of high-*ZT* materials have been reported, a pressing need exists to develop systems that exhibit this performance over a wide temperature range, not just at a single temperature. Writing in *Science*, Zhao *et al.* hole-doped layered SnSe single crystals, achieving a *ZT* of 0.7–2.0 in the temperature range of 300–773 K along the crystallographic *b* axis. Although the ultralow thermal conductivity of SnSe along the *b* axis had been reported previously, hole doping leads to a remarkable enhancement in both electrical conductivity and the Seebeck coefficient, rationalizing the impressive performance. High *ZT* over the reported temperature range results in an expected maximum conversion efficiency of almost 17%. *JP*

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