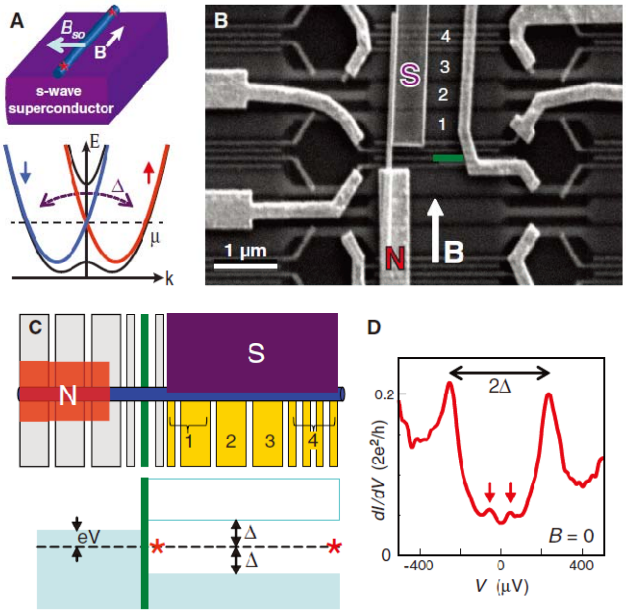
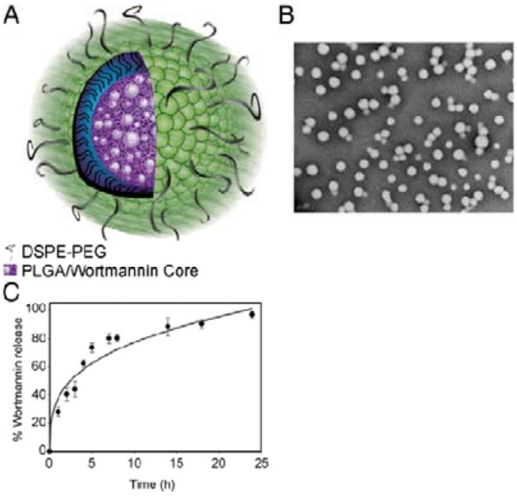
- Signatures of Majorana Fermions in Hybrid Superconductor-Semiconductor Nanowire Devices
  Mourik, V.; Zuo, K.; Frolov, S. M.; Plissard, S. R.; Bakkers, E. P. A. M.; Kouwenhoven, L. P. *Science* **2012**, *336*, 1003-1007.
  <u>Abstract:</u>



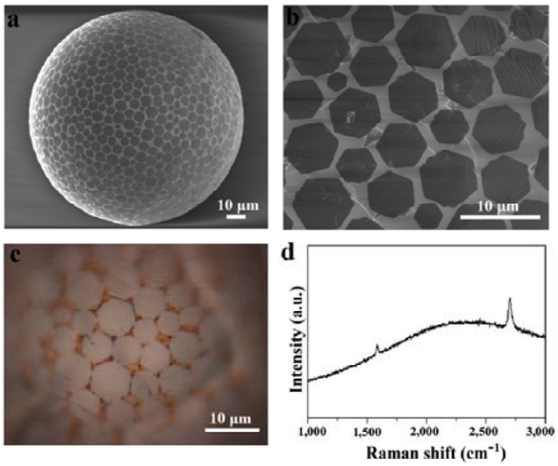
Majorana fermions are particles identical to their own antiparticles. They have been theoretically predicted to exist in topological superconductors. Here, we report electrical measurements on indium antimonide nanowires contacted with one normal (gold) and one superconducting (niobium titanium nitride) electrode. Gate voltages vary electron density and define a tunnel barrier between normal and superconducting contacts. In the presence of magnetic fields on the order of 100 millitesla, we observe bound, midgap states at zero bias voltage. These bound states remain fixed to zero bias, even when magnetic fields and gate voltages are changed over considerable ranges. Our observations support the hypothesis of Majorana fermions in nanowires coupled to superconductors.

- Revival of the abandoned therapeutic wortmannin by nanoparticle drug delivery
  Karve, S.; Werner, M. E.; Sukumar, R.; Cummings, N. D.; Copp, J. A.; Wang, E. C.; Li, C.; Sethi, M.; Chen, R. C.; Pacold, M. E.; Wang, A. Z. *Proc. Nat. Acad. Sci. USA* **2012**, *109*, 8230-8235.
  <u>Abstract:</u>



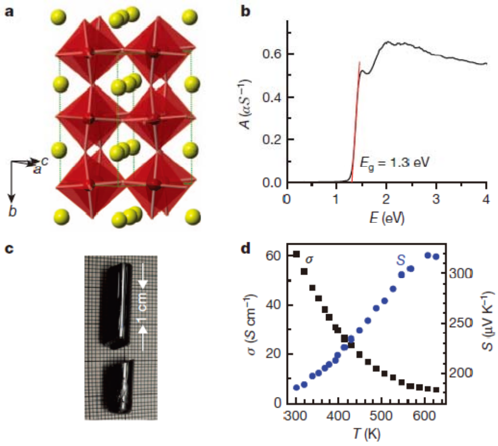
One of the promises of nanoparticle (NP) carriers is the reformulation of promising therapeutics that have failed clinical development due to pharmacologic challenges. However, current nanomedicine research has been focused on the delivery of established and novel therapeutics. Here we demonstrate proof of the principle of using NPs to revive the clinical potential of abandoned compounds using wortmannin (Wtmn) as a model drug. Wtmn is a potent inhibitor of phosphatidylinositol 3′ kinase-related kinases but failed clinical translation due to drug-delivery challenges. We engineered a NP formulation of Wtmn and demonstrated that NP Wtmn has higher solubility and lower toxicity compared with Wtmn. To establish the clinical translation potential of NP Wtmn, we evaluated the therapeutic as a radiosensitizer in vitro and in vivo. NP Wtmn was found to be a potent radiosensitizer and was significantly more effective than the commonly used radiosensitizer cisplatin in vitro in three cancer cell lines. The mechanism of action of NP Wtmn radiosensitization was found to be through the inhibition of DNA-dependent protein kinase phosphorylation. Finally, NP Wtmn was shown to be an effective radiosensitizer in vivo using two murine xenograft models of cancer. Our results demonstrate that NP drug-delivery systems can promote the readoption of abandoned drugs such as Wtmn by overcoming drug-delivery challenges.

- Uniform hexagonal graphene flakes and films grown on liquid copper surface
  Geng, D.; Wu, B.; Guo, Y.; Huang, L.; Xue, Y.; Chen, J.; Yu, G.; Jiang, L.; Hu, W.; Liu, Y. *Proc. Nat. Acad. Sci. USA* **2012**, *109*, 7992-7996.
  <u>Abstract:</u>



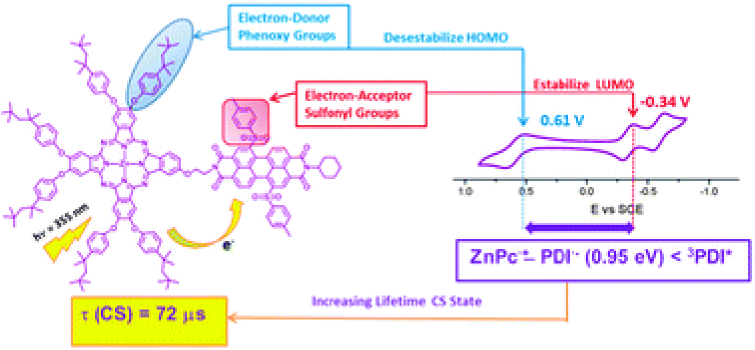
Unresolved problems associated with the production of grapheme materials include the need for greater control over layer number, crystallinity, size, edge structure and spatial orientation, and a better understanding of the underlying mechanisms. Here we report a chemical vapor deposition approach that allows the direct synthesis of uniform single-layered, large-size (up to 10,000 µm^2), spatially self-aligned, and single-crystalline hexagonal grapheme flakes (HGFs) and their continuous films on liquid Cu surfaces. Employing a liquid Cu surface completely eliminates the grain boundaries in solid polycrystalline Cu, resulting in a uniform nucleation distribution and low graphene nucleation density, but also enables self-assembly of HGFs into compact and ordered structures. These HGFs show an average two-dimensional resistivity of 609 ±200 Ω and saturation current density of 0.96±0.15 mA/µm, demonstrating their good conductivity and capability for carrying high current density.

- All-solid-state dye-sensitized solar cells with high efficiency
  Chung, I.; Lee, B.; He, J.; Chang, R. P. H.; Kanatzidis, M. G. *Nature* **2012**, *485*, 486-490.
  Abstract:



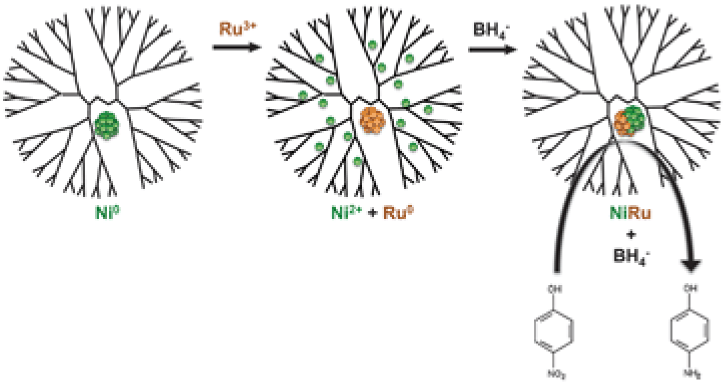
Dye-sensitized solar cells based on titanium dioxide (TiO_2) are promising low-cost alternatives to conventional solid-state photovoltaic devices based on materials such as Si, CdTe and $CuIn_{1-x}Ga_xSe_2$. Despite offering relatively high conversion efficiencies for solar energy, typical dye-sensitized solar cells suffer from durability problems that result from their use of organic liquid electrolytes containing the iodide/tri-iodide redox couple, which causes serious problems such as electrode corrosion and electrolyte leakage. Replacements for iodine-based liquid electrolytes have been extensively studied, but the efficiencies of the resulting devices remain low. Here we show that the solutionprocessable p-type direct bandgap semiconductor $CsSnI_3$ can be used for hole conduction in lieu of a liquid electrolyte. The resulting solid-state dye-sensitized solar cells consist of $CsSnI_{2.95}F_{0.05}$ doped with SnF_2, nanoporous TiO_2 and the dye N719, and show conversion efficiencies of up to 10.2 per cent (8.51 per cent with a mask). With a bandgap of 1.3 electronvolts, $CsSnI_3$ enhances visible light absorption on the red side of the spectrum to outperform the typical dye-sensitized solar cells in this spectral region.

- Rational design of a phthalocyanine–perylenediimide dyad with a long-lived charge-separated state
  Blas-Ferrando, V. M.; Ortiz, J.; Bouissane, L.; Ohkubo, K.; Fukuzumi, S.; Fernández-Lázaro, F.; Sastre-Santos, A. *Chem. Commun.* **2012**, *48*, 6241-6243.
  Abstract:



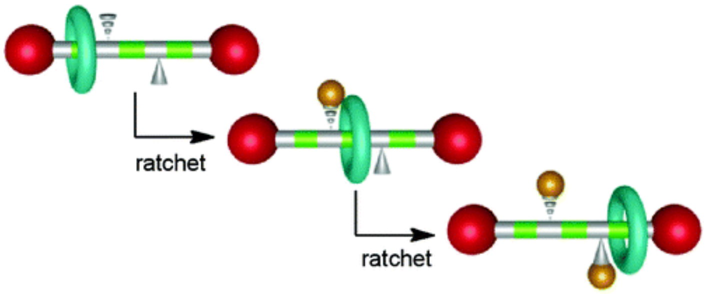
The longest charge-separated state so far, 72 µs, without the addition of external components, for phthalocyanine–perylenediimide arrays has been described.

- Preparation and catalytic evaluation of ruthenium–nickel dendrimer encapsulated nanoparticles via intradendrimer redox displacement of nickel nanoparticles
  Marvin, K. A.; Thadani, N. N.; Atkinson, C. A.; Keller, E. L.; Stevenson, K. J. *Chem. Commun.* **2012**, *48*, 6289-6291.
  <u>Abstract:</u>



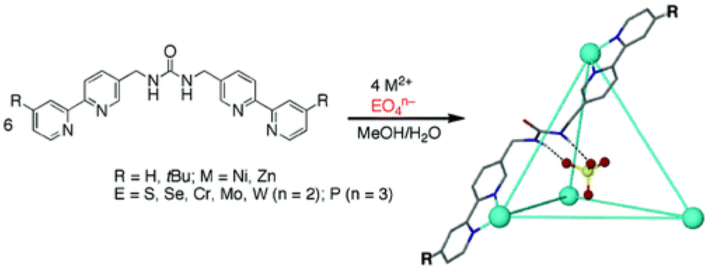
The synthesis of ruthenium–nickel (NiRu) nanoparticles by a novel redox-displacement chemistry is shown. These bimetallic nanoparticles are excellent catalysts for the reduction of p-nitrophenol.

- A Three-Compartment Chemically-Driven Molecular Information Ratchet
  Carlone, A.; Goldup, S. M.; Lebrasseur, N.; Leigh, D. A.; Wilson, A. *J. Am. Chem. Soc.* **2012**, *134*, 8321–8323.
  <u>Abstract:</u>



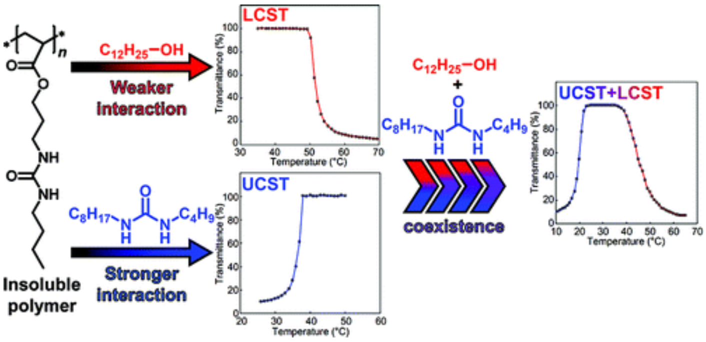
We describe a three-compartment rotaxane information ratchet in which the macrocycle can be directionally transported in either direction along an achiral (disregarding isotopic labeling) track. Chiral DMAP-based catalysts promote a benzoylation reaction that ratchets the displacement of the macrocycle, transporting it predominantly to a particular end compartment determined by the handedness of the catalyst.

- Urea-Functionalized M4L6 Cage Receptors: Anion-Templated Self-Assembly and Selective Guest Exchange in Aqueous Solutions
  Custelcean, R.; Bonnesen, P. V.; Duncan, N. C.; Zhang, X.; Watson, L. A.; Van Berkel, G.; Parson, W. B.; Hay, B. P. *J. Am. Chem. Soc.* **2012**, *134*, 8525–8534.
  Abstract:



We present an extensive study of a novel class of de novo designed tetrahedral M_4L_6 (M = Ni, Zn) cage receptors, wherein internal decoration of the cage cavities with urea anion-binding groups, via functionalization of the organic components L, led to selective encapsulation of tetrahedral oxoanions EO_4^{n-} (E = S, Se, Cr, Mo, W, *n* = 2; E = P, *n* = 3) from aqueous solutions, based on shape, size, and charge recognition. External functionalization with *t*Bu groups led to enhanced solubility of the cages in aqueous methanol solutions, thereby allowing for their thorough characterization by multinuclear (^{1}H, ^{13}C, ^{77}Se) and diffusion NMR spectroscopies. Additional experimental characterization by electrospray ionization mass spectrometry, UV–vis spectroscopy, and single-crystal X-ray diffraction, as well as theoretical calculations, led to a detailed understanding of the cage structures, self-assembly, and anion encapsulation. We found that the cage self-assembly is templated by EO_4^{n-} oxoanions ($n \geq 2$), and upon removal of the templating anion the tetrahedral M_4L_6 cages rearrange into different coordination assemblies. The exchange selectivity among EO_4^{n-} oxoanions has been investigated with ^{77}Se NMR spectroscopy using $^{77}SeO_4^{2-}$ as an anionic probe, which found the following selectivity trend: $PO_4^{3-} \gg CrO_4^{2-} > SO_4^{2-} > SeO_4^{2-} > MoO_4^{2-} > WO_4^{2-}$. In addition to the complementarity and flexibility of the cage receptor, a combination of factors have been found to contribute to the observed anion selectivity, including the anions' charge, size, hydration, basicity, and hydrogen-bond acceptor abilities.

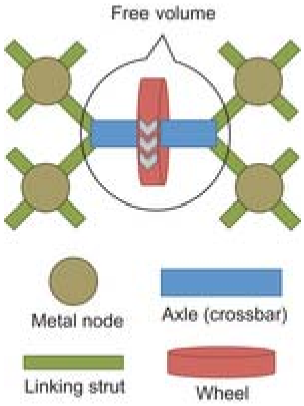
- Fundamental Molecular Design for Precise Control of Thermoresponsiveness of Organic Polymers by Using Ternary Systems
  Amemori, S.; Kokado, K.; Sada, K. *J. Am. Chem. Soc.* **2012**, *134*, 8344–8347.
  Abstract:



The de novo design of thermosensitive polymers in solution has been achieved by using the addition of small organic molecules (or “effectors”). Hydrogen bonding as an attractive polymer–polymer or

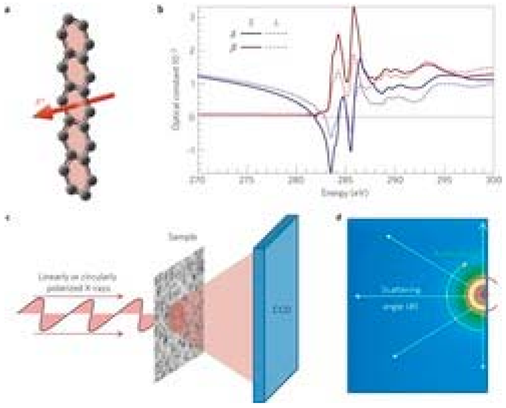
polymer–effector interaction substantially dominates the responsivity, causing facile switching between LCST-type and UCST-type phase transitions, control of the transition temperature, and further coincidence of the two transitions. Small molecules having a high affinity for the polymer induce UCST-type phase behavior, whereas those having a low affinity for the polymer showed LCST-type phase behavior.

- Metal–organic frameworks with dynamic interlocked components
  Vukotic, V. N.; Harris, K. J.; Zhu, K.; Schurko, R. W.; Loeb, S. J. *Nature Chem.* **2012***, 4*, 456–460.
  Abstract:



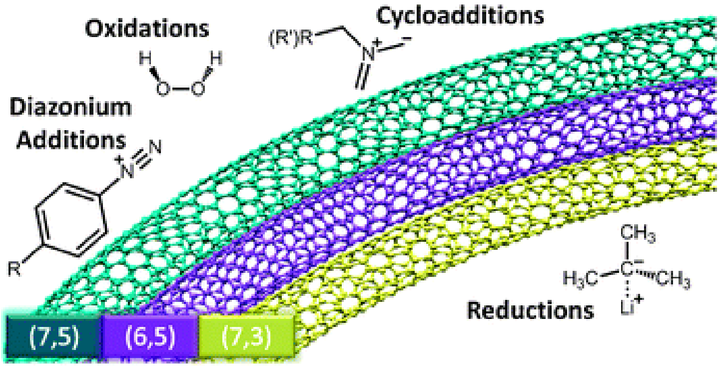
The dynamics of mechanically interlocked molecules such as rotaxanes and catenanes have been studied in solution as examples of rudimentary molecular switches and machines, but in this medium, the molecules are randomly dispersed and their motion incoherent. As a strategy for achieving a higher level of molecular organization, we have constructed a metal–organic framework material using a [2]rotaxane as the organic linker and binuclear Cu(II) units as the nodes. Activation of the as-synthesized material creates a void space inside the rigid framework that allows the soft macrocyclic ring of the [2]rotaxane to rotate rapidly, unimpeded by neighbouring molecular components. Variable-temperature 13C and 2H solid-state NMR experiments are used to characterize the nature and rate of the dynamic processes occurring inside this unique material. These results provide a blueprint for the future creation of solid-state molecular switches and molecular machines based on mechanically interlocked molecules.

- Polarized X-ray scattering reveals non-crystalline orientational ordering in organic films
  Collins, B. A.; Cochran, J. E.; Yan, H.; Gann, E.; Hub, C.; Fink, R.; Wang, C.; Schuettfort, T.; McNeill, C. R.; Chabiny, M. L.; Ade, H. *Nature Mater.* **2012**, *11*, 536–543.
  Abstract:



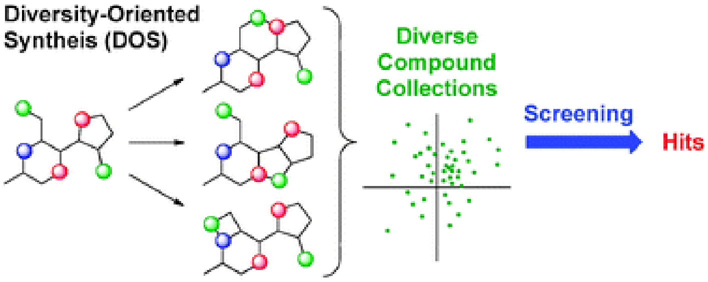
Molecular orientation critically influences the mechanical, chemical, optical and electronic properties of organic materials. So far, molecular-scale ordering in soft matter could be characterized with X-ray or electron microscopy techniques only if the sample exhibited sufficient crystallinity. Here, we show that the resonant scattering of polarized soft X-rays (P-SoXS) by molecular orbitals is not limited by crystallinity and that it can be used to probe molecular orientation down to size scales of 10□nm. We first apply the technique on highly crystalline small-molecule thin films and subsequently use its high sensitivity to probe the impact of liquid-crystalline ordering on charge mobility in polymeric transistors. P-SoXS also reveals scattering anisotropy in amorphous domains of all-polymer organic solar cells where interfacial interactions pattern orientational alignment in the matrix phase, which probably plays an important role in the photophysics. The energy and q-dependence of the scattering anisotropy allows the identification of the composition and the degree of orientational order in the domains.

- Unweaving the rainbow: a review of the relationship between single-walled carbon nanotube molecular structures and their chemical reactivity
  Hodge, S. A.; Bayazit, M. K.; Coleman, K. S.; Shaffer, M. S. P. *Chem. Soc. Rev.* **2012**, *41*, 4409-4429.
  <u>Abstract:</u>



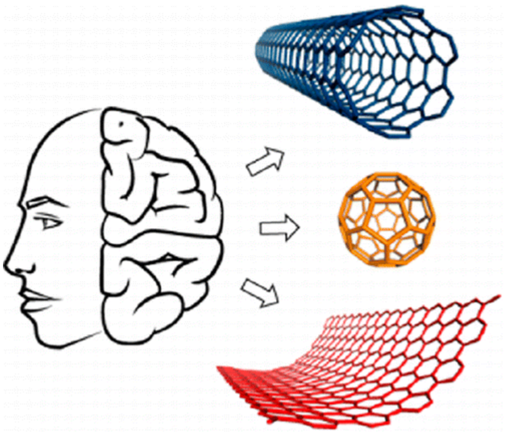
Single-walled carbon nanotubes (SWNTs) are a fundamental family of distinct molecules, each bearing the possibility of different reactivities due to their intrinsically distinct chemical properties. SWNT syntheses generate a heterogeneous mixture of species with varying electronic character, lengths, diameters and helicities, (*n*,*m*), as well as other amorphous, graphitic and metal catalyst impurities. In recent years, selective syntheses and post-synthetic separation strategies have advanced, driven by the requirement for pure SWNTs displaying particular features. Covalent surface modifications are widely-used to adapt SWNTs for specific applications with modified solubility, compatibility and specific functionalities. In many cases, such reactions have been found to be selective, illuminating the fundamentally distinct chemistry of each (*n*,*m*) species. This differential reactivity has found immediate utility in facilitating the sorting of nanotubes according to specific diameter, electronic properties and, most importantly, helicity. In this tutorial review, we discuss a wide range of selective reactions, the mechanisms that are thought to govern selectivity, and the challenges of separating, characterising and regenerating the modified SWNTs.

- Diversity-oriented synthesis: producing chemical tools for dissecting biology
  O' Connor, C. J.; Beckmann, H. S. G.; Spring, D. R. *Chem. Soc. Rev.* **2012**, *41*, 4444-4456.
  <u>Abstract:</u>



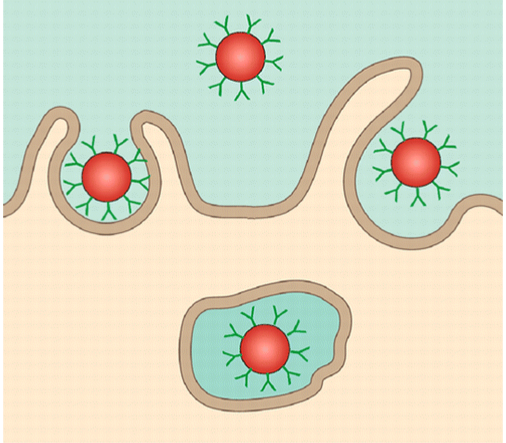
Small molecule modulators of biological function can be discovered by the screening of compound libraries. However, it became apparent that some human disease related targets could not be addressed by the libraries commonly used which typically are comprised of large numbers of structurally similar compounds. The last decade has seen a paradigm shift in library construction, with particular emphasis now being placed on increasing a library's structural, and thus functional diversity, rather than only its size. Diversity-oriented synthesis (DOS) aims to generate such structural diversity efficiently. This *tutorial review* has been written to introduce the subject to a broad audience and recent achievements in both the preparation and the screening of structurally diverse compound collections against so-called 'undruggable' targets are highlighted.

- Genesis of Creativity
  Tour, J. M. *ACS Nano* **2012**, *6*, 3649-3654.
  Abstract:



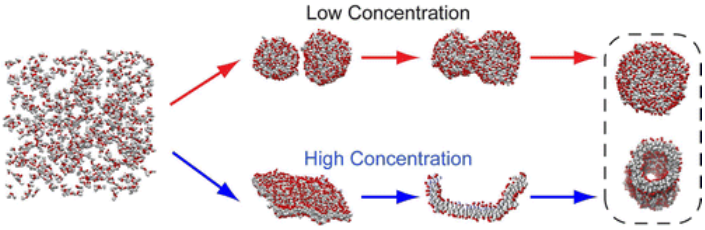
As advances in nanoscience and nanotechnology are sought, what will be the source of the inspiration to open the doors for new developments? In my opinion, it most often resides in the ingenuity of students, and among those ingenious students, was there a formative spark or a progressive set of stimuli in their childhoods that gave rise to the most precious asset in scientific advance, namely, creativity? Here, I outline the work of three of my students who have propelled the field of nanotechnology, and then I glimpse into their childhood years to see if there lays the key.

- Engineering Particles for Therapeutic Delivery: Prospects and Challenges
  Yan, Y.; Such, G. K.; Johnston, A. P. R.; Best, J. P.; Caruso, F. *ACS Nano* **2012**, *6*, 3663-3669.
  Abstract:



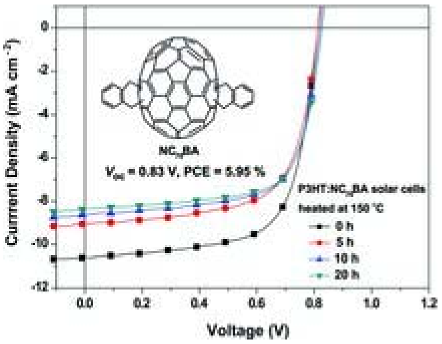
Nanoengineered particles that can facilitate drug formulation and passively target tumors have reached the clinic in recent years. These early successes have driven a new wave of significant innovation in the generation of advanced particles. Recent developments in enabling technologies and chemistries have led to control over key particle properties, including surface functionality, size, shape, and rigidity. Combining these advances with the rapid developments in the discovery of many disease-related characteristics now offers new opportunities for improving particle specificity for targeted therapy. In this Perspective, we summarize recent progress in particle-based therapeutic delivery and discuss important concepts in particle design and biological barriers for developing the next generation of particles.

- Probing the Self-Assembly Mechanism of Diphenylalanine-Based Peptide Nanovesicles and Nanotubes
  Guo, C.; Luo, Y.; Zhou, R.; Wei, G. *ACS Nano* **2012**, *6*, 3907-3918.
  Abstract:



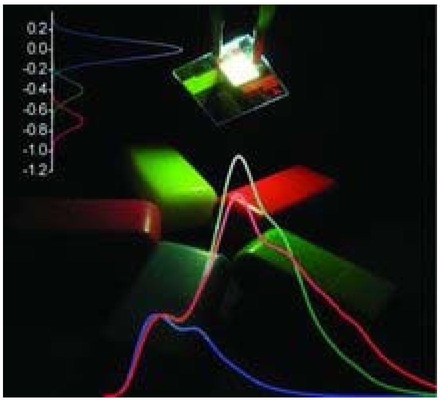
Nanostructures, particularly those from peptide self-assemblies, have attracted great attention lately due to their potential applications in nanotemplating and nanotechnology. Recent experimental studies reported that diphenylalanine-based peptides can self-assemble into highly ordered nanostructures such as nanovesicles and nanotubes. However, the molecular mechanism of the self-organization of such well-defined nanoarchitectures remains elusive. In this study, we investigate the assembly pathway of 600 diphenylalanine (FF) peptides at different peptide concentrations by performing extensive coarse-grained molecular dynamics (MD) simulations. Based on forty 0.6–1.8 µs trajectories at 310 K starting from random configurations, we find that FF dipeptides not only spontaneously assemble into spherical vesicles and nanotubes, consistent with previous experiments, but also form new ordered nanoarchitectures, namely, planar bilayers and a rich variety of other shapes of vesicle-like structures including toroid, ellipsoid, discoid, and pot-shaped vesicles. The assembly pathways are concentration-dependent. At low peptide concentrations, the self-assembly involves the fusion of small vesicles and bilayers, whereas at high concentrations, it occurs through the formation of a bilayer first, followed by the bending and closure of the bilayer. Energetic analysis suggests that the formation of different nanostructures is a result of the delicate balance between peptide–peptide and peptide–water interactions. Our all-atom MD simulation shows that FF nanostructures are stabilized by a combination of T-shaped aromatic stacking, interpeptide head-to-tail hydrogen-bonding, and peptide–water hydrogen-bonding interactions. This study provides, for the first time to our knowledge, the self-assembly mechanism and the molecular organization of FF dipeptide nanostructures.

- Highly Efficient and Thermally Stable Polymer Solar Cells with Dihydronaphthyl-Based [70]Fullerene Bisadduct Derivative as the Acceptor
  Meng, X.; Zhang, W.; Tan, Z.; Li, Y.; Ma, Y.; Wang, T.; Jiang, L.; Shu, C.; Wang, C. *Adv. Funct. Mater.* **2012**, *22*, 2187–2193.
  Abstract:



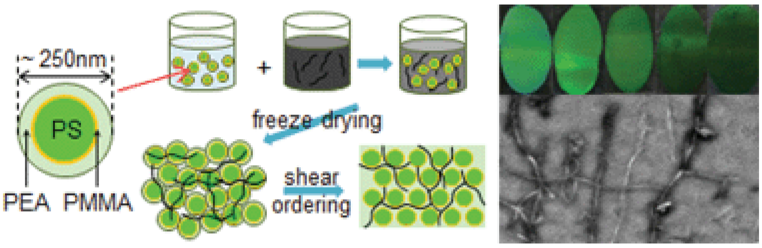
The efficiency of polymer solar cells (PSCs) can be essentially enhanced by improving the performance of electron-acceptor materials, including by increasing the lowest unoccupied molecular orbital (LUMO) level, improving the optical absorption, and tuning the material solubility. Here, a new soluble C_{70} derivative, dihydronaphthyl-based C_{70} bisadduct (NC$_{70}$BA), is synthesized and explored as acceptor in PSCs. The NC$_{70}$BA has high LUMO energy level that is 0.2 eV higher than [6,6]-phenyl-C_{61}-butyric acid methyl ester (PCBM), and displays broad light absorption in the visible region. Consequently, the PSC based on the blend of poly(3-hexylthiophene) (P3HT) and NC$_{70}$BA shows a high open-circuit voltage (V_{oc} = 0.83 V) and a high power conversion efficiency (PCE = 5.95%), which are much better than those of the P3HT:PCBM-based device (V_{oc} = 0.60 V; PCE = 3.74%). Moreover, the amorphous nature of NC$_{70}$BA effectively suppresses the thermally driven crystallization, leading to high thermal stability of the P3HT:NC$_{70}$BA-based solar cell devices. It is observed that the P3HT:NC$_{70}$BA-based device retains 80% of its original PCE value against thermal heating at 150 °C over 20 h. The results unambiguously indicate that the NC$_{70}$BA is a promising acceptor material for practical PSCs.

- Device Physics of White Polymer Light-Emitting Diodes
  Nicolai, H. T.; Hof, A.; Blom, P. W. M. *Adv. Funct. Mater.* **2012**, *22*, 2040–2047.
  Abstract:



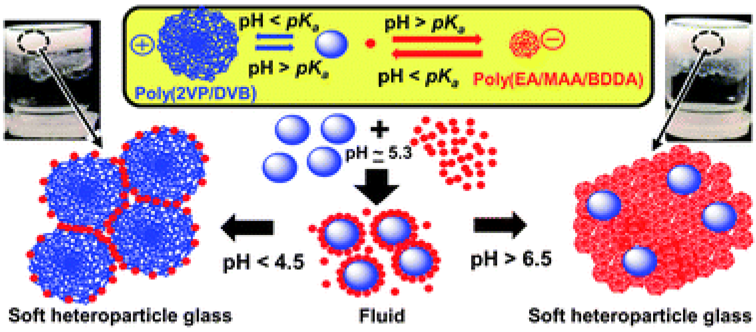
The charge transport and recombination in white-emitting polymer light- emitting diodes (PLEDs) are studied. The PLED investigated has a single emissive layer consisting of a copolymer in which a green and red dye are incorporated in a blue backbone. From single-carrier devices the effect of the green- and red-emitting dyes on the hole and electron transport is determined. The red dye acts as a deep electron trap thereby strongly reducing the electron transport. By incorporating trap-assisted recombination for the red emission and bimolecular Langevin recombination for the blue emission, the current and light output of the white PLED can be consistently described. The color shift of single-layer white-emitting PLEDs can be explained by the different voltage dependencies of trap-assisted and bimolecular recombination.

- Electrically conductive polymeric photonic crystals
  Imai, Y.; Finlayson, C. E.; Goldberg-Oppenheimer, P.; Zhao, Q.; Spahn, P.; Snoswell, D. R. E.; Haines, A. I.; Hellmann, G. P.; Baumberg, J. J. *Soft Matter* **2012**, *8*, 6280-6290.
  Abstract:



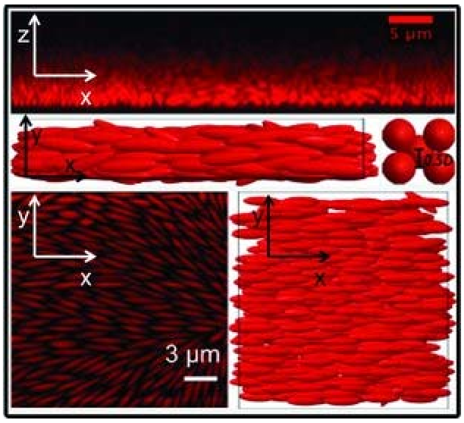
Electrically conductive polymeric 3D photonic crystals are prepared by the shear ordering of composites consisting of monodisperse core-shell polymer spheres and single-walled carbon nanotubes (SWNTs). Strong iridescent colour indicates that the highly ordered opaline structures are not disrupted by the presence of the conductive nanotube networks. Thermal annealing leads to a significant increase in the overall electrical conductivity of thin-film samples yielding DC conductivities of 10^{-4} S cm^{-1}, with percolation thresholds of less than 0.4 wt% of SWNT. Such composites with open networks of carbon nanotubes held apart by lattices of hard spheres, give combined conductive properties and structural colour effects, within a tuneable viscoelastic medium, with many potential functional applications.

- Dual pH-triggered physical gels prepared from mixed dispersions of oppositely charged pH-responsive microgels
  McParlane, J.; Dupin, D.; Saunders, J. M.; Lally, S.; Armes, S. P.; Saunders, B. R. *Soft Matter* **2012**, *8*, 6239-6247.
  Abstract:



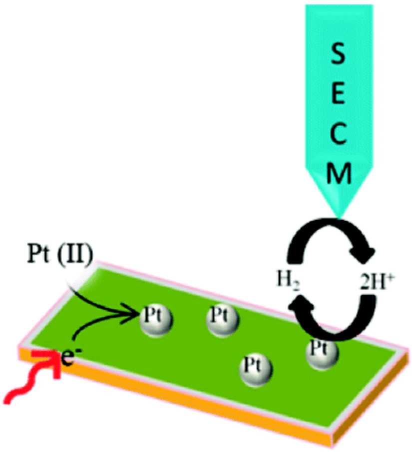
pH-Responsive microgels are crosslinked polymer particles that swell when the pH approaches the pK_a of the polyacid or polybase chains. In this study we investigate for the first time pH-triggered physical gel (soft particle glass) formation from concentrated mixed dispersions of heteroaggregated pH-responsive microgels. The two microgels studied are poly(ethyl acrylate/methacrylic acid/1, 4-butanediol diacrylate) (referred to as PEAMAA) and poly(2-vinylpyridine/divinylbenzene) (referred to as PVP). The anionic PEAMAA particles are alkali-swellable and the cationic PVP particles are acid-swellable. Concentrated homodispersions formed physical gels at either low pH (PVP) or high pH (PEAMAA). The hard sphere (latex) particle size ratio ($R = d_{PEAMAA}/d_{PVP}$) was 0.15. Uniquely, the PEAMAA/PVP microgel heterodispersion allowed R to be varied by an order of magnitude (from 0.04 to 0.61) at a fixed particle number ratio simply by adjusting the solution pH. Concentrated PEAMAA/PVP heterodispersions formed physical gels at both low and high pH. Dynamic rheology measurements showed that at low pH the presence of collapsed PEAMAA particles greatly increased the storage modulus (G') and also the critical yield strain (γ_c) of the mixed PEAMAA/PVP gels compared to the parent PVP homoparticle gel. A remarkably high G' value of 0.12 MPa was obtained for a mixed PEAMAA/PVP gel containing 90 vol.% water. Our new, versatile method for preparing pH-responsive dispersions that form physical gels at two different pH values could lead to dual-action injectable gels for soft tissue repair.

- Liquid Crystal Order in Colloidal Suspensions of Spheroidal Particles by Direct Current Electric Field Assembly
  Shah, A. A.; Kang, H.; Kohlstedt, K. L.; Ahn, K. H.; Glotzer, S. C.; Monroe, C. W.; Solomon, M. J. *Small* **2012**, *8*, 1551–1562.
  Abstract:



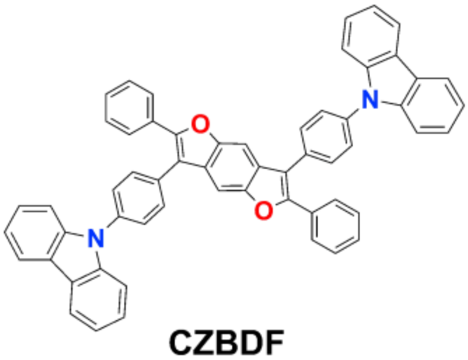
DC electric fields are used to produce colloidal assemblies with orientational and layered positional order from a dilute suspension of spheroidal particles. These 3D assemblies, which can be visualized in situ by confocal microscopy, are achieved in short time spans (t < 1 h) by the application of a constant voltage across the capacitor-like device. This method yields denser and more ordered assemblies than had been previously reported with other assembly methods. Structures with a high degree of orientational order as well as layered positional order normal to the electrode surface are observed. These colloidal structures are explained as a consequence of electrophoretic deposition and field-assisted assembly. The interplay between the deposition rate and the rotational Brownian motion is found to be critical for the optimal ordering, which occurs when these rates, as quantified by the Peclet number, are of order one. The results suggest that the mechanism leading to ordering is equilibrium self-assembly but with kinetics dramatically accelerated by the application of the DC electric field. Finally, the crystalline symmetry of the densest structure formed is determined and compared with previously studied spheroidal assemblies.

- Photoreduction of Catalytic Platinum Particles Using Immobilized Multilayers of Photosystem I
  LeBlanc, G.; Chen, G.; Jennings, G. K.; Cliffel, D. E. *Langmuir* **2012**, *28*, 7952-7956.
  Abstract:



Using the abundance of available electrons generated by immobilized multilayers of the photoactive protein complex Photosystem I (PSI), we have photoreduced platinum particles that are catalytically active for the H_2/H^+ redox couple. The resulting platinized PSI films were optimized using electrochemical measurements and then characterized using X-ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), and scanning electrochemical microscopy (SECM). These results demonstrate a novel method for generating immobilized platinum catalysts that are readily available on the surface of a photoactive PSI multilayer.

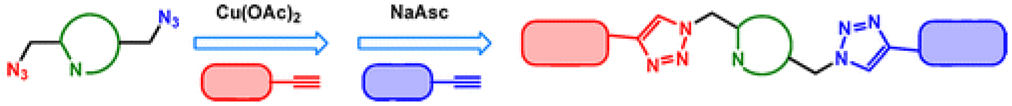
- Carbazolyl Benzo[1,2-*b*:4,5-*b*′]difuran: An Ambipolar Host Material for Full-Color Organic Light-Emitting Diodes
  Mitsui, C.; Tsuji, H.; Sato, Y.; Nakamura, E. *Chem. Asian J.* **2012**, *7*, 1443–1450.
  Abstract:



CZBDF

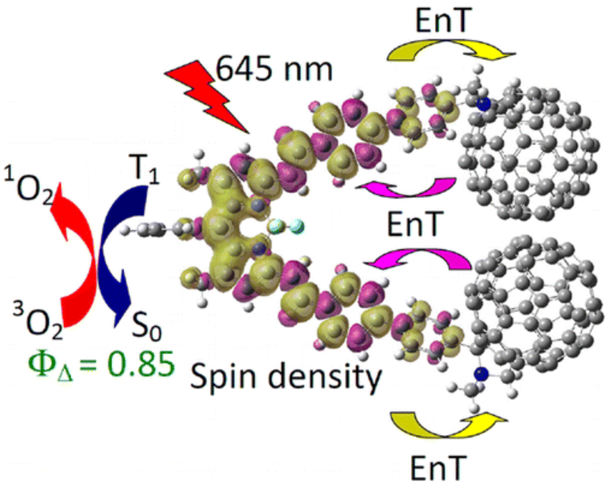
We have designed an ambipolar material, 3,7-bis[4-(*N*-carbazolyl)-phenyl]-2,6-diphenylbenzo[1,2-*b*:4,5-*b*′]difuran (CZBDF), and synthesized it by zinc-mediated double cyclization. Its physical properties clarified that CZBDF possesses a wide-gap character, well-balanced and high hole and electron mobilities of larger than 10^{-3} cm^2 V^{-1} s^{-1}, and a high thermal stability. Using CZBDF as a host material for heterojunction OLED devices, a full range of visible emission was obtained. Notably, CZBDF also enabled us to fabricate RGB-emitting homojunction OLEDs, with performances comparable or superior to the heterojunction devices composed of several materials.

- Chemoselective Sequential "Click" Ligation Using Unsymmetrical Bisazides
  Yuan, Z.; Kuang, G.-C.; Clark, R. J.; Zhu, L. *Org. Lett.* **2012**, *14*, 2590-2593.
  Abstract:



Unsymmetrical bisazides containing chelating and nonchelating azido groups undergo chemoselective three-component copper(I)-catalyzed azide–alkyne conjugation reactions with two different alkyne molecules. In conjunction with the reactivity gap between aromatic and aliphatic alkynes, a bistriazole molecule can be generated with excellent regioselectivity by mixing two alkynes and a bisazide in a single reaction container. This method is applicable in aqueous solutions at neutral pH, which may lend utilities in bioconjugation applications.

- Styryl Bodipy-C60 Dyads as Efficient Heavy-Atom-Free Organic Triplet Photosensitizers
  Huang, L.; Yu, X.; Wu, W.; Zhao, J. *Org. Lett.* **2012**, *14*, 2594-2597.
  Abstract:



C_{60}-styryl Bodipy dyads that show strong absorption of visible light ($\varepsilon = 64\,600\ M^{-1}\ cm^{-1}$ at 657 nm) and a long-lived triplet excited state ($\tau_T = 123.2\ \mu s$) are prepared. The dyads were used as heavy-atom-free organic triplet photosensitizers for photooxidation of 1,5-dihydroxynaphthalene via the photosensitizing of singlet oxygen ($^1O_2$). The photooxidation efficiency of the dyads compared to the conventional Ir(III) complex $^1O_2$ photosensitizer increased 19-fold.