Combining Function

One of the promises of nanoscience and nanotechnology is that we will be able to construct materials with key combinations of function. In nanodelivery, we would like to have targeting, therapy, and imaging combined so flexibly as to enable the preparation of "cocktails" of efficient low-dose medications that can be tracked as they reach their targets, release their payloads, convey that they have done so, and report their position and effectiveness.[1−3] In many other areas, we have generated wish lists of how new multifunctional materials might behave. As we discover, elucidate, and report the fundamental properties of materials at the nanoscale, it is exciting to see these remarkable materials and properties being put together so rapidly by our community to address the global challenges we face.

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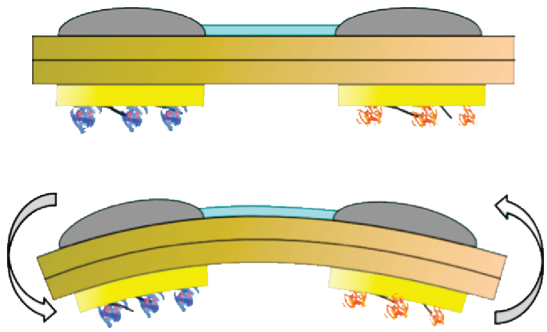
In this issue, we find a number of exciting examples of steps along this path. Two come from Zhong Lin Wang and his group.[4,5] In one, they combine photoexcitation and piezoelectricity to show how strain might be used to optimize energy conversion.[4] In the other, they harvest energy both mechanically and biochemically, simultaneously or individually, as a precursor to self-powered *in vivo* devices (see figure).[5] Expect to see further creative combinations of materials and function that address real-world problems.



Conceptual design of a combined biofuel cell and piezoelectric generator to harvest both chemical and mechanical energy to power *in vivo* devices, as detailed in ref 5. Image courtesy of Zhong Lin Wang. Copyright 2010 American Chemical Society.

We are also seeing advances in the patterning and placement of complex functional materials. An article by Whitesides, Aizenberg, Capasso, and co-workers, featured on the cover and described in a Perspective by Wiley, Qin, and Xia, describes advances in nanoskiving—patterning followed by sectioning *via* ultramicrotome.[6,7] As the latter point out, nanoskiving uniquely combines the pattern generation and replication steps of lithography.

Moving from discovery, to demonstration of phenomena, to manufacturing and application is going to require a plethora of approaches and creativity. We look forward to reporting across this range of efforts as well as to laying out the challenges so as to help catalyze these advances.

On a related note, we were delighted to learn that frequent contributor Michael Grätzel has been awarded the 2010 Millenium Technology Grand Prize from the

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IMAGE COURTESY OF ALAN HERZOG.

Prof. Michael Grätzel, winner of the 2010 Millenium Technology Grand Prize.

Technology Academy Finland for his development of the solar cells that bear his name.[8−11] We will feature Grätzel and his work on an upcoming issue.

Paul S. Weiss
Editor-in-Chief

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