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This Week

Research Notes

Articles

Cover: Honeybees surround a computer-controlled mechanical bee that can simulate the dances bees use to communicate. The robo-bee – a collaborative effort by entomologists, engineers and experts in bioacoustics – represents the culmination of more than 60 years of bee-language studies and promises scientists new insights into honeybee communication, considered one of the more complex examples of symbolic representation in the animal kingdom. (Photo: Axel Michelsen)

Departments

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Letters

The birth of materials science

In "Making the Right Stuff" (SN: 8/12/89, p.108), Ivan Amato surveyed the creation of new materials by "molecular engineering" – virtually an atom-by-atom manufacture of new chip materials for advanced communications or of new alloys for Mach 20 aircraft. But missing was any description of how U.S. universities, industry and government came to acquire the knowledge and skills needed to fuel this materials revolution – a technological revolution that seems comparable to the revolutions now occurring in information technology and biotechnology. In fact, a unique government-university venture in 1960 played a key role, at the right time and the right place.

Materials science, now a widespread interdisciplinary research activity, got its start in 1960 by the creation of the ARPA IDLs: the interdisciplinary laboratories of the Advanced Research Projects Agency of the Department of Defense at 12 U.S. universities. This brought together well-established classical disciplines that until then had been quite rigidly separated: metallurgy, ceramics, polymer science, solid-state physics, crystallography and physical chemistry.

The funding climate at the time was, of course, propitious: The Soviet Sputnik success in late 1957 had awakened the U.S. public to the realization that we had serious competition from the USSR, and indeed the planning for the IDLs started soon after. But the scientific argument for the integration of the six disciplines was unassailable: All dealt with atoms and molecules in solids – whether metals, semiconductors, oxides or polymers – that were held together by quantum-mechanical forces, having internal structures that could be exactly determined, and having physical properties that could be measured by similar techniques. There was no good reason, except historical precedent, for such work to be carried out separately.

Today, there are nearly 100 U.S. universities involved in materials science, as well as many government and industrial labs. There are professional societies, many research journals, many textbooks and hundreds of yearly meetings for material scientists.

Is there a lesson for the future in this? Perhaps not. Market forces, not government support, seem to be the watchword today for the funding of technological revolutions. But 30 years ago Uncle Sam did something very useful that now provides a key element in helping the United States compete with Japan and Europe in the high-tech marketplace.

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Shattered logic?

The "Big dividends from pollution cleanup" (SN: 9/16/89, p.191), as calculated by three economists, are based upon fallacious reasoning. The 19th-century French economist Frederic Bastiat refuted this type of argument in his "fallacy of the broken window." In that

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