2007 Nobel Prizes Span Nanoscience from Ideas and Motivation to Applications

This year's Nobel Prizes in Chemistry and Physics honored nanoscience from methods and motivations to novel phenomena that opened up new applications.[1,2] Gerhard Ertl of the Fritz Haber Institute in Berlin was awarded the 2007 Nobel Prize in Chemistry for his work in surface chemistry.[1] It is the field of surface science—the ideas put forward and the methods developed—that both motivated and enabled nanoscience as we now know it. In this issue, you will find a Focus article on the development of surface chemistry, describing the work of Ertl and key contemporaries.[3] From examining reactions at surfaces and realizing the importance of both nanoscale structure and the interface between nanoparticles and their supporting substrates, the need to measure and to control at this scale became clear.

Surface chemistry is critical to heterogeneous catalysis (the focus of Ertl's work), to semiconductor processing, and to many other areas. Heterogeneous catalysis is humankind's crude answer to nature's enzymes. We have a long way to go to catch up to the exquisite selectivity and chemical control that we know, by example, is possible; the work of Ertl and others has paved the way toward this end.

Gerhard Ertl, "for his studies of chemical processes on solid surfaces".

> **This year's Nobel Prizes in Chemistry and Physics honored nanoscience from methods and motivation to novel phenomena and enabling applications.**

Importantly, the early work in surface chemistry got us thinking as a community about what the nanoscale world looks like and what phenomena dominate in it. These are questions we are still trying to address. It is because of this long-term impact that the field of surface chemistry and those in it were honored this year with a Nobel Prize in Chemistry. Now, with more tools in hand, we are able to make greater headway studying the structures, dynamics, chemistry, and physical properties of what turn out to be remarkably complex assemblies. The door to this world has been cracked open slightly. As we see more, we hope to understand enough to gain greater and finer control of surface chemistry and catalysis; this has been and remains the promise of the field.

Albert Fert and Peter Grünberg of Université Paris-Sud and Forschungszentrum Jülich, respectively, were awarded the 2007 Nobel Prize in Physics for their independent discoveries of giant magnetoresistance.[2,4,5] Their discovery opened up both new science and new applications. It has invigorated and motivated the manipulation of spin using nanoscale structural control. Their ability to tailor spin systems is based on growing and stacking alternating layers of one material on another in precise thicknesses. This first discovery has motivated and led to others in the control of layered spin systems.

Albert Fert and Peter Grünberg, "for the discovery of Giant Magnetoresistance".

In startling time, giant magnetoresistance was turned into a technology by the disk drive industry and is a prime example of basic science influencing applied technologies in widespread and long-lasting ways. Look for a Focus

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article next month on the field of magnetoresistance and its future, highlighting the work of Fert, Grünberg, and key others.

Please join with me in congratulating all three Laureates and these fields for their Nobel Prizes!

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Editor-in-Chief

REFERENCES AND NOTES

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