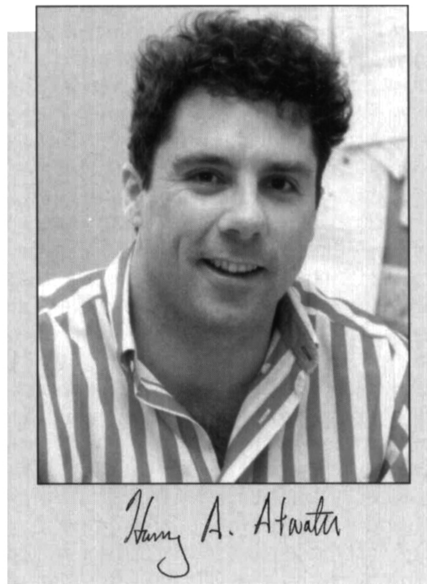
# Materials as Information



As each day passes it is becoming more apparent what it means to live in the information age. Our computers go faster, our e-mail boxes fill up ever more rapidly, our notion of the "desktop" has changed from a wooden surface to a virtual space on a monitor. The explosive growth of the value of information is manifest in the stock market where, for example, the market valuation of Yahoo recently exceeded that of Boeing. Employment trends are shifting also: Whereas 26% of the U.S. workforce was in manufacturing in 1970, that percentage has declined to 15% today. If this trend continues, then by 2035, the workforce percentage in manufacturing will be 2.6%—the same percentage currently working on farms. In the midst of all this information flowing around them at blinding speed and deafening volumes, materials researchers can be excused for having a nagging sensation that somehow materials and materials research will be less central to human progress and welfare in the coming century than during the last.

I believe that, to the contrary, materials and materials research will be even more important in the next century. And here is a reason why: Materials and materials research are information.

> "How do we assess the value of a material?"

In the headlong rush into the information age, we might ponder the question, "How do we assess the value of a material?" One approach is to consider its value as a raw material resource, that is, to determine the world's available supply and demand, the costs of extraction and shipping, and so on. Following this line of reasoning, one would quickly arrive at what is essentially the commodity price. Apart from hoarding or inciting speculative trading in commodities' future markets, there is very little that one can do to affect the value of a commodity material. Consumers hardly ever use commodity materials themselves anyway (how many kilograms of any pure element or compound do you have at home?), but use them as part of a more complex system. So another approach is to consider the end-use value of materials when they are added to a larger functional system (e.g., an automobile, an airplane, or a computer). One can argue compellingly that almost all of the added value of a material integrated into a system is information—information gleaned from often extensive research and development about the material's initial purity and method of synthesis, about its structure and evolution with processing, about its performance and reliability during use, and about its synergistic or detrimental interactions with other materials that comprise the finished product. Indeed, it is information content that distinguishes a high value-added material from a commodity. If researchers need subtle or complex—and little known—information in order to synthesize a material, it can have high added value. If no subtle or complex information is required to make the material—or if these methods are widely known—the material is likely to be a commodity. Over time, there is a driving force to make critical information about synthesis, structure, properties, and performance widely available, resulting in the evolution of materials and the systems that contain them from high value-added products to commodities. Of course, a delicate balance between intellectual property concerns and the value of open information exchange determines the rate at which this transition happens. Let us leave that subject to the lawyers...but the fact that lawyers get involved is an indication of the value of the information.

In the lingo of Hollywood, we as materials researchers are on the "creative" side of the house. We are the providers of information about the structural and functional materials of technical and scientific importance. We discover new materials which previously did not exist, and new processes for making known materials. We reveal information about why one arrangement of atoms conducts or insulates, transmits or reflects, bends or breaks, and why another does not. Rarely does all the information we need come from our own laboratories, and new information about important materials is generated every week. Thus it benefits us as researchers to have the fastest access to the best and most comprehensive information about the materials we are researching and developing and other information important for professional development.

During 2000, the Materials Research Society is devoting special attention to building its Website into the "Materials Gateway" so that MRS members can derive significant membership benefits by expanded use of the Internet. This will include expanded electronic publication of MRS Symposium Proceedings, which will be available at the MRS Website to MRS members. At the 2000 MRS Spring Meeting we will take our first steps toward archiving key meeting events in downloadable audio/video form. Other projects underway include development of an online Buyers Guide for materials research. The *Journal of Materials Research* will soon be available to subscribers in a fully online version. Also planned for development during 2000 is a materials information and properties database for use by MRS members, and a user customizable MRS Website profile.

In addition to its potential as a resource for MRS members, the Materials Gateway can also serve the public as a window from the wider world into the world of materials research. Given that the importance of public appreciation of science in general and materials research in particular has never been greater, we need to explore the potential for creating a positive definition of the notion of materials research in the public eye. I invite you to participate in brainstorming MRS's possible Internet futures by contacting me at the points listed below with your thoughts, enthusiasms, questions, and comments.

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