Stuff: The Materials the World is Made Of
Ivan Amato
(Basic Books, New York, 1997)
ix + 294 pages, $25.00
ISBN: 0-465-08328-5

"Stuff" is a word with many overtones: It used to denote a textile fabric ("fine silken stuff"), the English chide something fallacious for being "stuff and nonsense," teenagers wave their hands vaguely and mutter about "science and stuff," and somebody thoroughly old-fashioned and censorious is apt to be called "stuffy." There is nothing stuffy about this book; it is about "stuff and science" rather than "science and stuff," and it most certainly is not stuff and nonsense.

Ivan Amato, an experienced professional science writer, has undertaken the challenging task of painting a portrait of modern materials science and its emergence from the lengthy era of pure empiricism. His book is aimed primarily at readers who know little or no science but in spite of that, a great deal in it is certain to interest professional materials scientists as well. In expounding such concepts as wave mechanics, bandgap engineering, or phase diagrams for the benefit of nonscientists, Amato uses simile and metaphor with great panache; innocent readers may gain only the illusion of a proper understanding, but that encourages them to persist and gradually edge closer to a deeper insight. Amato also uses metaphor, sometimes vigorously mixed, to underline his more general assertions. Here are some examples of Amato's enjoyable use of language: "Some trends solidify; others evaporate as quickly as dew on a summer's morning. The field [of materials innovation] as a whole, however, seems on the verge of a critical mass of human and technical capability that will result in an explosion of technological bedazzlement." – "The band gap in a semiconductor is too big for electrons to jump without some external impetus such as a little heat, light or voltage (which is like a slope for a river of electrons)." – "Sivco's MBE performance using [Al] Cho's meticulously raised metallic Medusa is the equivalent of a Yitzhak Perlman rendition of a baroque concerto, replete with presto bursts packing more perfectly executed notes per unit time than seems possible." – "The quantum mechanical portrait of the atom that finally stuck reflected the maddening dualisms and ambiguities that no one could dispel from the atomic world." – Amato paints a beguiling picture of a Materials Research Society meeting; he is so impressed by his experience of Boston just after Thanksgiving that he credits a Fall Meeting with 10,000 members attending; it is perhaps just as well that only 4,000 of us actually come. He refers to the "slide shows" in Boston, "Many quietly recede into oblivion. Some, however, take root and even grow into great branching subdisciplines. And some of these trigger research wildfires that change the world." The metaphors are mixed, but the assertion, here as elsewhere in the book, is valid.

The first part of the book starts with knapped flint tools of the Paleolithic Age, goes on to the heroic days of empiricism (bronze, iron, steel, European porcelain), presents some key events such as the discovery of x-ray diffraction (but not Willard Gibbs's genial contribution...that, presumably, was too much for even the most ingenious metaphor!). The next section is headed "The Birth of a Superdiscipline" and includes some specific episodes such as the creation of synthetic diamond (both with and without high pressure) and biomimetics, and concludes with a brilliant series of pen portraits under the heading "Materials by Design." The longest accounts in the book are riveting presentations of bandgap engineering at Bell Labs by Federico Capasso and Al Cho, and Greg Olson's messianic endeavors at Northwestern University to design better steels from first principles. Amato clearly operates most effectively on the basis of interviews in depth, which is perhaps the reason for the paucity of presentations of European or Japanese research!

We all of us are faced by the need, on occasion, to present our profession to our parents, spouses, children, and friends: There could be no better way of doing so than to lend them this book. Before lending it, however, read it yourself: You will be surprised how much you learn that you did not know before. This is one of the very best, probably *the* best, among the many popular books on materials.

Reviewer: *Robert Cahn is a physical metallurgist turned materials scientist, currently attached in nominal retirement to Cambridge University. He has researched on intermetallics and many other metallurgical themes, has edited a number of journals and book series devoted to materials science, and has striven over the years to popularize materials science in the pages of* Nature. *He is a member of the Editorial Board of* MRS Bulletin.