Preface

High fuel costs and potential shortages of petroleum-based energy resources have placed increasing emphasis on the need both to conserve our present resources and to develop alternate energy sources. Proposed alternatives that represent renewable energy sources are particularly intriguing; some of these are nuclear energy, solar energy, geophysical forces, and biomass. This issue contains a grouping of five papers that represent a few of the many contributions by workers within IBM in the various areas of energy research.

Three of these papers deal with efforts to make silicon and gallium arsenide photovoltaic solar cells more cost competitive with traditional electrical generation schemes. The paper by G. H. Schwuttke, T. F. Ciszek, K. H. Yang, and A. Kran presents work on the development of a capillary action shaping technique and die design for pulling high quality single-crystal silicon ribbons from a melt. This technique is aimed at elimination of the wasteful process of slicing substrate wafers from Czochralski boules. The authors discuss the economic and technological outlooks for the process.

The paper by A. E. Blakeslee and S. M. Vernon discusses their work on a metal-organic vapor growth technique for deposition of large-grained polycrystalline GaAs thin films. Eventually, the authors hope to grow high quality films on foreign substrates to produce inexpensive but highly efficient photovoltaic GaAs devices.

G. D. Pettit, J. J. Cuomo, T. H. DiStefano, and J. M. Woodall present extensions of their earlier reported work on the use of textured tungsten surfaces for solar cell substrates. These surfaces have been successful in increasing the efficiency of solar cells by enhancing the solar absorptance-to-emittance ratios (based on multiple reflections of incident radiation) of thin films deposited on them. The paper discusses the authors' work on a thin conformal antireflective anodization coating of WO_3 on textured tungsten surfaces.

The search for new solar cell materials, and in particular, the feasibility of using thin films of organic photovoltaic materials for solar cell applications, is addressed in the paper by V. Y. Merritt. The author discusses her work on Schottky barrier cells containing organic photoconductors based on squarylium and cyanine dyes, and stresses the need for continuing efforts to understand the various factors which affect conversion efficiencies in these systems.

The last paper in the grouping is concerned with energy conservation. S. Jurovics discusses his work on the development of an optimization technique for energy consumption in buildings. The method is particularly applicable to the design of energy-efficient buildings. The author presents a mechanism for economical and potentially dynamic analyses of the effects of varying architectural, construction, and usage parameters on the heating and cooling requirements of buildings. The method is pertinent to building materials research, and may be particularly useful for ascertaining the sensitivity of energy loads to changes in the various parameters.