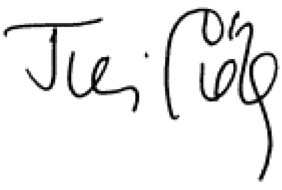

Julian Szekely

1934-1995

By Walter S. Owen

Julian Szekely, one of the most distinguished founders of modern materials engineering, died in the Massachusetts Institute of Technology (MIT) infirmary after a long and courageous struggle with cancer on December 7, 1995. He was sixty-one years old.

Born in Budapest, Julian was a student of engineering in Hungary at the time of the uprising of October 1956. He escaped and eventually reached London, England, where he continued his studies and graduated from Imperial College with a B.Sc. degree in chemical engineering in 1959. He was awarded a Ph.D. two years later. These academic achievements become even more remarkable when it is realized that, in the very short time available, he taught himself English to a level that enabled him successfully to defend his thesis in a public examination. Julian taught for a few years at Imperial College, and it was while he was there that he met and married Joy Pearn. In more than thirty years together, they raised a happy and devoted family, four boys and a girl, all of whom were with Julian in his last days.

In 1966 Julian was appointed to the faculty of the Department of Chemical Engineering at the State University of New York at Buffalo. He became a citizen of the United States in 1972. In 1975 he accepted an invitation to join the faculty at MIT and happily spent his last twenty years at the institute teaching courses in materials engineering, based in large measure on the results of his own research and experiences, and working with his graduate students and research associates. His research group, which attracted many senior researchers from other laboratories at home and abroad, always included a half dozen or more of the brightest graduate students at MIT.

Julian first became interested in steel through his association with the BISRA research group at Imperial College and his studies of mass, heat, and fluid flow in steel-making processes continued and expanded throughout the three decades he spent in the United States. The computational modeling techniques he developed to study and optimize these complex, interactive, dynamic processes have had an important influence on the design of modern iron and steel-making processes from the blast furnace to the continuous caster. Today, they are used in all major steel-making countries.

His interest in steel making soon led him to think about the steel industry in a broader context at a time when a large segment of the industry was being transformed from a small number of integrated steel plants, built in the immediate postwar period, to many smaller specialized units described as mini-mills. At the same time, the country was experiencing the first of several oil crises, and environmental problems were assuming ever-increasing importance. Julian devoted much effort to developing models of the energy consumption and environmental impact of steel plants and the processes they employ. His intense interest in these problems and issues was first expressed publicly at the C. C. Furnas Memorial Conferences of 1972, 1973, and 1975. The proceedings, edited by Julian, were entitled, respectively, *The Future of the World's Steel Industry*, *The Steel Industry and the Environment*, and *The Steel Industry and the Energy Crisis.* Julian's close association with the steel industry continued throughout his years at MIT through his contributions to many conferences, his memberships on committees of the National Research Council's National Materials Advisory Board, and his consulting visits to steel companies in the United States, Europe, and Japan. His continuing study and analysis of the problems of the world's steel industries culminated in what he described as "A Top Executive Steel Summit," held in Mattsee, Austria, only four months before he died, at which he made a major contribution to discussions exploring future directions that the industry might take.

At the same time as he was modeling and studying the big picture, he continued to study critical components of individual processes. One of the most important of these was the modeling of the swirling flow in the nozzles of continuous casters, a subject on which he published a number of papers in recent years. This, like much of his work, has had a major influence on the direction of research in Japan and Europe as well as in the United States.

Julian's enthusiasm for his work was tireless, his range of interests unlimited, and his output prodigious. The list of his most recent publications illustrates the amazing breadth and depth of his research interests. In 1994 alone he published twenty-eight papers, most of them the result of penetrating studies in materials processing using computational numerical methods. They include papers about the role of turbulence in weld pool behavior, mathematical models of arc welding processes, ferrosilicon production in a plasma arc furnace, and optimization of casting design. But, as always, in a few papers he set out his always-stimulating and often controversial views on everything from the future of the global steel industry to the shortcomings of engineering education.

Earlier, he had studied metal spray deposition processes and this led him to consider the difficult problem of the influences of surface stress and internal fluid flow on the size and shape of an isolated droplet in gravitational and magnetic fields. This was not a new problem but, by the imaginative application of numerical, finite element techniques, Julian found a way forward that has produced some elegant answers and, in his hands, has proved to be a powerful research tool for the study of related phenomena in soldering and other metal deposition processes.

In recent years he became interested in problems of electronic materials and made important contributions to our understanding of chemical vapor deposition and the growth of single crystals. It is not surprising that he should direct his attention to the potential for processes using electromagnetic stirring or electrostatic and magnetic levitation to produce new or improved electronic materials. These interests led, in turn, to studies of gravitational effects and, inevitably, to microgravitational processing. More than two decades of study of earthbound processing uniquely prepared him to enter the space age, and he seized the challenge with his unusual, unquenchable enthusiasm. He was a major contributor to the design of the experiment involving crystal growth in microgravity, devised by various American and German universities, which was flown in 1995 by NASA. This work is continuing, and a further experiment will be flown in 1997.

In total he, together with colleagues and students, was awarded eight patents and published more than four hundred scientific papers. He published four books, three of them with colleagues, and edited eight books of conference proceedings. His books *Fluid Flow Aspects of Metal Processing*, *Optimization in Process Metallurgy* (with W. H. Ray), and *Rate Phenomena in Process Metallurgy* (with N. J. Themelis) are widely used standard texts. In all this he had the loyal and enthusiastic support of the many students and associates who gathered around him at MIT; who were taught and inspired by him; and who continued his work in countries throughout the industrialized world. His teaching style, although sometimes unconventional, was always stimulating. He taught students to concern themselves only with demonstrable facts and quantitative arguments. He was a demanding supervisor and collaborator who inspired loyalty and respect in full measure. Julian always emphasized the importance of the contributions of all the members of his research team. His name stands alone only on publications in which he expounds his personal view of some global problem; all the others carry the names of those involved in the study. Some papers have as many as five authors.

Julian was elected to the National Academy of Engineering in 1982. His remarkable career and achievements were recognized also by many awards and honors bestowed by learned societies and organizations in many different countries. Some gave him the opportunity to astound his friends by his amazing ability to master foreign languages. It was perhaps not too surprising that he should respond to an award from the Max Planck Institute in flawless German or to the Institute National Polytechnique de Grenoble in excellent French, but that, in 1992, he addressed the Japanese Engineering Academy for more than an hour in fluent Japanese is surely a truly remarkable achievement. He spent a sabbatical in Japan where he had many friends, some of whom had studied with him in the United States, and he gave much thought to ways in which the close collaborations that exist between institutions in the two countries could be further strengthened and enriched. His horizon was not bounded by geography and in the last few years he was building collaborations with groups in China and South America, two places that presented him with more linguistic challenges.

A few sentences extracted from the resolution of the faculty of MIT on the death of Julian Szekely capture much of the personality of the man: "Julian was a man of boundless energy. He loved a vigorous game of tennis or squash as much as he enjoyed a spiritual conversation. Indeed, he could often be seen in the 'infinite corridor' with a student or colleague involved in animated discussion on a vast range of educational, technical, sociological, or political topics. He was a mentor of minority students and took special pride in their achievements." To that I can only add that he was a most distinguished scholar, and engineer, an enjoyable and valued friend, and a good man.