Book Review
A Jewel in the Crown
A history of crystal growth research at RRE/RSRE, Malvern, UK
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contributed by Robert Feigelson

The invention of the transistor at Bell Telephone Laboratories shortly after World War II, and this device's strong requirement for high quality Si single crystals, led to an explosion of interest by organizations worldwide to set up laboratories where single crystals of novel materials for advanced device applications could be grown and characterized. Such an undertaking necessitated auxiliary studies on how crystals grow, the thermodynamic properties of the growth systems, novel growth methodologies, and the formation of process-induced defects and their influence on properties, etc. This in turn led to crystal growth becoming a field in its own right as evidenced by having its own journal and national and international organizations and conferences. In the U.S. most of this work was done in commercial laboratories, such as the Bell Telephone Company, but in England the work was mainly undertaken in one very prominent government laboratory which evolved out of the British wartime telecommunications and radar research activities - the Royal Signals and Radar Establishment (RSRE) in Malvern.

This book was written by two prominent scientists who worked at RRE/RSRE and had, therefore, an intimate knowledge of its operation and the research performed therein. They and other scientists and engineers, working there over the years, made many important contributions to both bulk and thin film crystal growth, materials characterization, equipment design, and to the evolving crystal growth organizations and conferences.

This book is, in a sense, an extended obituary for an important crystal growth laboratory and the researchers that worked there. It covers a four-decade era in which numerous new materials and devices of all types were invented and deployed, both for industrial and military applications. The laboratory underwent many consolidations, reorganizations and re-namings over this period, until finally it ran out of compelling arguments for its existence, in spite of initiating many innovative collaborative schemes with outside industrial, government, and university organizations. It was eventually disbanded due to lack of interest by their government and reductions in funding. It was not alone. The crystal growth field as a whole (China not withstanding) has seen a dramatic contraction of its historic laboratories (including Bell Labs itself), who were, in this period, so heavily involved in the theory, growth, and characterization of crystals, and which drove (no overstatement here) the technological revolution and led to the devices that most of our society depends upon today.

This 126 page book is essentially a historical document rather than an in-depth discussion of the various scientific material, and is easily accessible to the layperson (politicians take note). Discussed are the important contributions made by various scientists and engineers at the laboratories, the scope and importance of the materials and physics research carried out during its existence, its management structure and how it evolved over the time period. For those who were active in the crystal growth community during this period, many of the names will be very familiar, both due to their pioneering research and innovations as well as from direct interactions at various international conferences. To those who have come to the field more recently they will also find familiar names largely through the very large number of publications they authored.

Several names stand out in this book for their major contributions to the bulk crystal growth field. Most visible is Brian Mullin, for (amongst other achievements) his pioneering work on the high pressure LEC Czochralski growth of GaAs, Brian Cockayne for his work on oxide crystals, and Don Hurle for his insightful work on understanding various aspects of crystallization behavior, particularly melt convection. Some of the other major achievements made by a variety of their topnotch research teams (too numerous to mention here) include the fields of solid state lasers, IR detectors (cadmium mercury telluride (CMT) was invented here), and infrared windows (ZnS(Se)), as well as crystal puller automation technologies, and shaped magnetic fields to improve melt convection. Thin film activities at RSRE began early on with chemical vapor epitaxy and later expanded into such as technologies as MOCVD and MBE. MOCVD was used to grow high quality films of III-V compounds and solid solutions, including GaAs and InP. Once again Brian Mullin played an important role, applying his talents to the thin film deposition of semiconductors, first using chemical vapor epitaxy (CVE) for GaAs and later the MOCVD deposition method for CMT.

This book is very informative, well-written, and easy to read. For those involved, or who were involved in growing and characterizing crystals, it will be quite an interesting read. It is recommended because it reveals what an important laboratory the British government established and maintained over a long period of time before its sad demise (as illustrated by a photo of the boarded-up laboratory building M , that opened to such fanfare several decades earlier). It might also serve to show how long-term research, together with talented researchers from local universities, paid dividends both to technology and country esteem. One should think more than twice before killing the goose if it lays golden eggs.

One minor quibble! It is a bit confusing trying to follow the evolution of lab and department name changes over the time period of the labs. It's not the author's fault.

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