FOREWORD

In the year of the fiftieth anniversary of radar, we feel justified, even in a Journal of Research, in looking backwards as well as forwards, especially in a field to which GEC has made very significant contributions from the beginning.

Accordingly, we begin this issue with an introductory survey of technology trends over the first fifty years of radar, followed by papers on CH, the first operational British radar, and on the magnetron, perhaps the most important scientific innovation of the second world war, even taking the atomic bomb into account. These two papers, both written by authors with first-hand experience, describe technical advances which were instrumental in winning firstly the air battle over southern England in 1940 and then the sea battle against the U-boats in 1942–43: both of these battles were essentially defensive from a British point of view, and both marked a watershed in the fortunes of war. In both cases, GEC (or companies now in GEC) had a large part in the development, and it is interesting to recall, in these days of ten or fifteen year development cycles, that CH was operational as a complete system in three or four years from the initial proving experiment. By modern standards, of course, an individual CH station was a fairly crude instrument, with rather poor bearing and height accuracy and resolution, but, linked into a chain of stations reporting back to a filter room, its deficiencies were largely overcome, and the system proved admirably suited to its task.

Similarly, the magnetron progressed from the laboratory to operational use in a very short time scale, bringing quite new dimensions to radar. Thus an early magnetron, the CV76, which would fit easily on the palm of one hand, generated more peak power, and more mean power, at a hundred times the frequency, than a CH transmitter using valves which a man could just manage to lift. For the first time, radars were available which could fit into an aircraft and give good angular and range resolution. This breakthrough, incorporated in ASV (air to surface vessel) radars, led quite quickly to the final defeat of the U-boats, which dare not surface by day or night, even under complete cloud cover, within range of an aircraft equipped with ASV.

A third paper with a historical flavour, that by Ramsay, deals with radar guidance, beginning with the SCR584 of wartime vintage, which was a centimetric gun-laying radar using a magnetron, and which proved invaluable against the V1 flying bomb or 'doodle-bug'. The paper goes on to describe the growth in capability together with miniaturization of size, leading to the millimetre wave guidance systems of today. As the author says with some justifiable pride, all these later systems are of Marconi design.

Two papers follow to describe the state of the art of production radar systems. The Martello radar is designed for transportable long range three-dimensional surveillance, and illustrates several modern capabilities such as multiple beams in elevation, pulse compression, frequency agility and, in one version, an all-solid-state transmitter. The Foxhunter airborne radar, on the other hand, although necessarily smaller and lighter, is equally impressive in its capability to fulfil a very different role.

The paper by Brooks et al. on satellite-borne SAR (synthetic aperture radar) shows how such a radar can map the earth and sea with very great resolution from an orbit height of 800 km. Operationally, the value of such a system is its ability to map the land and sea surface of the globe with high resolution through cloud cover which prevents the use of higher frequency sensors: technically, the interest is in the ingenuity of the synthetic aperture technique and the enormous amounts of data storage and processing called for: the first real-time airborne digital SAR processor was developed at Marconi Research Centre in the early 1970s.

Finally, in a paper which uses the major trends of the last forty years to look forward to the future, Radford predicts the radar of the future: it may not have significantly more power or range than today's radar, but it will have significantly more finesse and subtlety.

Of course, even a complete issue can only cover a small fraction of GEC work on radar topics, which have also featured in several papers over the last year or more. However, this issue tries to combine something of the flavour of forty years ago with a description of some, at least, of the advanced systems of today. We hope that the issue will be of both historical and technical value to our readers.

M. J. B. Scanlan,
Editor.