

TWENTY YEARS ON

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PROTOCOL demands that I say what a great honour it is to have been invited to give the opening address today. But indeed I would say that without the demand of protocol, since I am overawed by the long list of distinguished guest speakers who have earlier filled this rôle, including, at the last Oxford Symposium, a much beloved great man of science, the late Sir Lawrence Bragg. It is indeed a great honour for me to join their ranks, an honour only slightly dimmed by the *sotto voce* comment of our Programme Secretary, who greeted the news of my acceptance of the invitation to speak with the remark: ‘an excellent choice—at least we can keep *him* under control and make him keep to the time-table.’

But even more than the honour, for me it is the pleasure of this occasion that stands out. At Cambridge in September 1957, as Chairman of the first of these Fundamental Research Symposia, I could not have dared to hope that twenty years later in 1977, we should be holding the sixth of a long line of events which have become established as classic occasions, indeed as milestones in the advance of scientific understanding of our industry and of our field of interest. Nor could I have dared to hope that twenty years later I personally should still be permitted to play a part in the mingling of the old and new generations, by introducing a theme and a programme that can already be seen to be outstanding and profound, even by comparison with all that has gone before.

At many earlier meetings both here and abroad I have dwelt upon the vital importance of fundamental research for the maintenance of technological progress. I make no apology for doing so again, especially at a time when once again one hears voices, in this country at least, raised in denigration of fundamental research, calling for all of our scientific resources to be directed into technological application. Partly this arises from misunderstanding of the meaning of the word ‘fundamental’ in this context. It is too often equated with ‘academic’, implying work carried out in cloistered seclusion, remote from the real world and in no way related to practical application. Nothing could be further from the truth as far as we are concerned. ‘Fundamental’

means work directed towards an understanding of the underlying basic principles of the chosen subject. It is a word both semantically and in reality concerned with hard fact, and related directly to the chosen subject, which in our case is a very practical, indeed prosaic matter: the production of millions of tons of pulp and paper for use in the lives of millions of people. We are not here to discuss the interactions of water and cellulose in an academic manner. On the contrary, the title of this week's Symposium is 'Fibre-Water Interactions in Papermaking'—a very down-to-earth subject: but a subject that will be dealt with in a truly fundamental manner.

The notion that technological progress can be maintained without fundamental research, or without the knowledge of pure science, contradicts the essential symbiotic relationship between these forms of scientific endeavour. In recent times this notion has been carried further, especially in this country. There is a school of thought which argues that the observable industrial decline of this country has been due to an undue concentration on fundamental research or on pure science and that the industrial success of others, notably our cousins in North America, has been due to their almost exclusive concentration upon technology.

This thesis has on occasion been taken further with the rather parochial argument that most of the great innovative ideas are generated in this country, but that we lack the capability or the will to apply them technologically. Conversely it is implied that the contribution of our transatlantic cousins is primarily concerned with technological aptitude, undiluted by the undue attention to fundamental research or to pure science which appears to sap the strength and practical drive of the British.

Nothing could be further from the truth. We delude ourselves if we think that success in technology can be separated from success in fundamental research or pure science. The pre-eminence of this country during the Industrial Revolution in both scientific advance and technological advance shows clearly the historic relationship.

Equally we delude ourselves if we think that this country holds unchallenged the leadership in fundamental research or in pure science that it held in earlier times, especially in relation to the U.S.A. It is undeniable that in the early part of this century this country, with Germany, led the world in pure science as well as in technology. As evidence, the recipients of Nobel Prizes awarded in physics, chemistry and medical subjects during the first three decades of the century included 14 British and 5 Americans. But during the next two decades there were 14 British and 24 Americans as prize-winners in the scientific subjects; and in the next twenty-three years there were 23 British and 62 Americans as prize-winners in the scientific subjects.

Certainly this record shows that this country still leads, albeit by a slim margin, on a *per capita* basis, in this independent judgement of scientific capability; and that is something to be proud of. But the record also shows that the massive technological success of the U.S.A. in the last half century has gone hand in hand with an equally impressive success in fundamental scientific achievement.

It is true that scientific understanding does not necessarily lead to technological progress. Both the incentive and the will to apply that understanding are also essential ingredients for industrial success. But the record shows undeniably that technological progress and industrial success cannot be divorced from scientific understanding. That is the message of both the industrial revolution of the 18th and 19th centuries and the 20th century 'Triumph of American science', as it has so aptly been termed by that distinguished English writer, C. P. Snow.

Let us now come closer to home, to the industry which we all serve irrespective of geography and nation, and to this Fundamental Research Symposium and its predecessors. It is my firm conviction that the scientific understanding derived from these Symposia, and from their sister conferences in the U.S.A. and Canada, has been an essential element in the substantial advances in papermaking technology and efficiency world-wide, over the last twenty years. It is futile to try to pinpoint specific examples of innovation or industrial advance which can be clearly attributed to our past deliberations. Neither science nor technology work like that, there has rather been a slow, steady inexorable advance both in scientific understanding and in technological control and efficiency, linked together by a network of innumerable strands of new knowledge.

Above all, the function of these Symposia has been the stimulation of ideas and innovation. They provide a forum for the interaction of the keenest minds in the industry, for generation of new lines of attack on old problems, and for generation of new problems and new avenues of development whose solution will be the challenge and achievement of the future. This is an unending process of shared learning, of shared understanding, which has had and will continue to have a profound effect upon the practical realities of our calling.

At the end of the day, or of the week, we shall have assembled yet another massive contribution to the scientific literature of the industry. I judge that the proceedings of our earlier symposia already provide the most valuable source extant for technical and scientific information within the industry. I know that I am not alone in my constant reference to these records for information and guidance on innumerable occasions of practical need.

The preprints of this Symposium already indicate the quality and scope of the proceedings, and the final record incorporating also the substance of the week's debate and discussion will consolidate still further the accumulated record of past proceedings.

When I look at my bookshelves and see these volumes, the distillation of so much intense thought and determined investigation, the summation of twenty years of international effort for the common good of the industry, I get the same feeling of pleasure and satisfaction as that which I feel today standing before you at the opening of this symposium. It is pleasure and satisfaction at having been permitted to play a creative part in the guidance and formulation of scientific endeavour in our great industry during these past twenty years. Perhaps, who knows, I might be present with you or your successors, as an elderly back-bencher, after yet another twenty years. It is certainly an intriguing prospect, and one which I shall strive actively to bring to pass.

Ladies and Gentlemen, since we are to visit Stratford-on-Avon later this week, perhaps I may be permitted to conclude in Shakespearian vein:

'If it be true that good wine needs no bush, 'tis true that a good play needs no epilogue'.

Even less therefore does it need an over-long prologue.

'Now sits expectation in the air', so let the play and the players come on stage and begin.