

HAEMOGLOBIN

A SYMPOSIUM based on a Conference
held at CAMBRIDGE in June 1948
in memory of SIR JOSEPH BARCROFT



Editors

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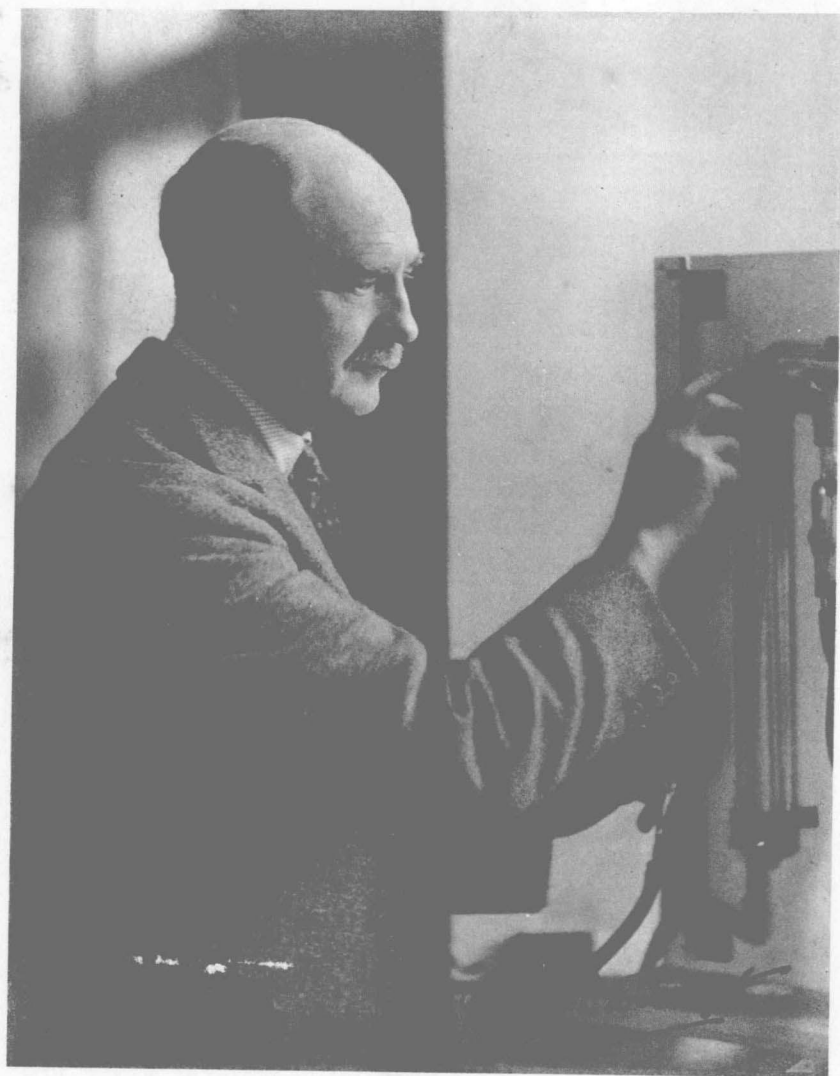
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PREFACE

WHEN Joseph Barcroft returned to Cambridge after World War I, he resumed the series of researches on haemoglobin on which he had been so actively engaged in the Cambridge Physiological Laboratory before that war. His enthusiasm, energy and inspiration acted like a magnet on workers in many other laboratories, so that by the end of World War II active projects on haemoglobin were being undertaken in no less than six different Cambridge laboratories. Two annual meetings of the various workers were subsequently held under Barcroft's chairmanship, and at the latter of these meetings in November 1946 he himself fixed the next meeting for the last Friday of November 1947. His sudden death on 21 March 1947, however, prevented him from keeping this engagement to which he had looked forward so much. Soon after his death some of his colleagues in Cambridge met together and decided that the next of the haemoglobin meetings should be on a much larger scale, and should be devoted to his special memory and honour. Invitations were sent out to leading workers on haemoglobin in many parts of the world, and a three-day conference, of which this book is the outcome, was held in Cambridge from 15 June to 17 June 1948, inclusive.

The proceedings opened with a morning devoted to biographical tributes by eight physiologists who had known Barcroft intimately at various stages of his life. At the end of the session a coloured cinema film with sound accompaniment was shown of Barcroft performing one of his typical haemoglobin experiments. The remaining sessions, five in number, were given to specialist papers on recent advances in different aspects of the subjects. These papers are grouped together in this book in almost the same way as they were arranged at the conference. On the afternoon of Tuesday, 15 June, Lady Barcroft and Professor Henry Barcroft entertained the members of the conference to tea in the Physiology Laboratory, and on the Thursday afternoon demonstrations, followed by tea, were given in the Molteno Institute. Social parties also took place on each of the two first evenings of the conference. The total number of visitors from outside Cambridge was about fifty, and the attendance at the meetings was sometimes as much as one hundred or more. Some of the visitors were accommodated at King's College, by the kindness of the Provost and Fellows.

At the end of the conference, which all agreed had been extraordinarily active and successful, it was unanimously resolved that the local Committee (Mr. G. S. Adair, Dr. R. Hill, Professor D. Keilin,

Mr. J. C. Kendrew, Dr. M. F. Perutz and Professor F. J. W. Roughton) should take steps to publish the whole proceedings in the form of a memorial volume within a year's time if possible. Professor F. J. W. Roughton and Mr. J. C. Kendrew were appointed editors, and Messrs. Butterworths Scientific Publications Ltd publishers. We believe that the astonishing range of subjects comprised in this volume would have given the utmost delight to the late Sir Joseph Barcroft, who was indeed the fountain-head of so much of all this varied work. If so, there can be no more fitting memorial to him.

F. J. W. R.
J. C. K.

Cambridge
March 1949

BIOGRAPHICAL NOTE

JOSEPH BARCROFT was born on 26 July 1872, at the Glen, Newry, Co. Down, N. Ireland. He came of a Northern Ireland Quaker family and was the second of the five children of Henry Barcroft, D.L. and Anna Barcroft. He was educated at the Friends School at Bootham, York, and the Leys School, Cambridge. In his last school year he passed the London B.Sc. Examination. He went up to King's College, Cambridge in 1893 and took a First Class in the Natural Sciences Tripos Part I in 1896, and again a First Class in Part II in Physiology in 1897.

In 1899 he won the Walsingham Gold Medal for research in Physiology and a Prize Fellowship at King's College. Shortly afterwards he was appointed to a Lectureship in Natural Sciences at that College, and in 1904 to a University Demonstratorship in Physiology. In 1910 he was elected F.R.S. and between this year and 1914 took part in, or led several high altitude expeditions. During World War I he was head of the Physiological Branch of the Chemical Warfare Service at Porton, and was awarded the C.B.E. He returned to Cambridge after World War I, first as Reader in Physiology, and then, six years later on the death of Professor Langley, he succeeded to the Chair of Physiology at Cambridge, which he held till he retired in 1937 under the age rule. During this period he was knighted and received many academic honours. Earlier in the inter-war period he had held the chairmanship of the Medical Research Council committee on haemoglobin, the Fullerian Professorship of Physiology at the Royal Institution, and had led an Anglo-American High Altitude Expedition to the Andes (1922). He also visited America on several occasions to deliver lectures sponsored by distinguished foundations or to receive other academic honours.

He continued in active research at Cambridge after retirement from his Chair until the outbreak of World War II, when he was promptly called back to his old service at Porton, with which indeed he had maintained active contact between the wars. Fortunately gas warfare did not materialize in World War II, so he returned in 1941 to the Cambridge Physiological Laboratory as head of the Agricultural Research Council Unit in Animal Physiology. During this period he was also deeply concerned with food and nutrition problems, being President of the Nutrition Society for several years. In 1943 he was awarded the Copley medal, which is the highest research honour in the gift of the Royal Society. After World War II he resumed active research on foetal physiology and on haemoglobin in which he had

been a leader for fifty years. He died suddenly of a heart attack, in the midst of active work on 21 March 1947.

Barcroft published three to four hundred original papers and several text books, including two classics, *The Respiratory Function of the Blood* and *Features in the Architecture of Physiological Function*. It is unnecessary here to refer to his personal qualities, as these are reflected so clearly in the tributes given in the first section of this book.

In 1903 he married Mary Agnetta (Minnie) Ball, a daughter of the famous astronomer Sir Robert Ball. She survives him with two sons, Henry (now Professor of Physiology at St. Thomas's Hospital, London) and Lieut-Col. Robert Ball Barcroft.

F. J. W. R.

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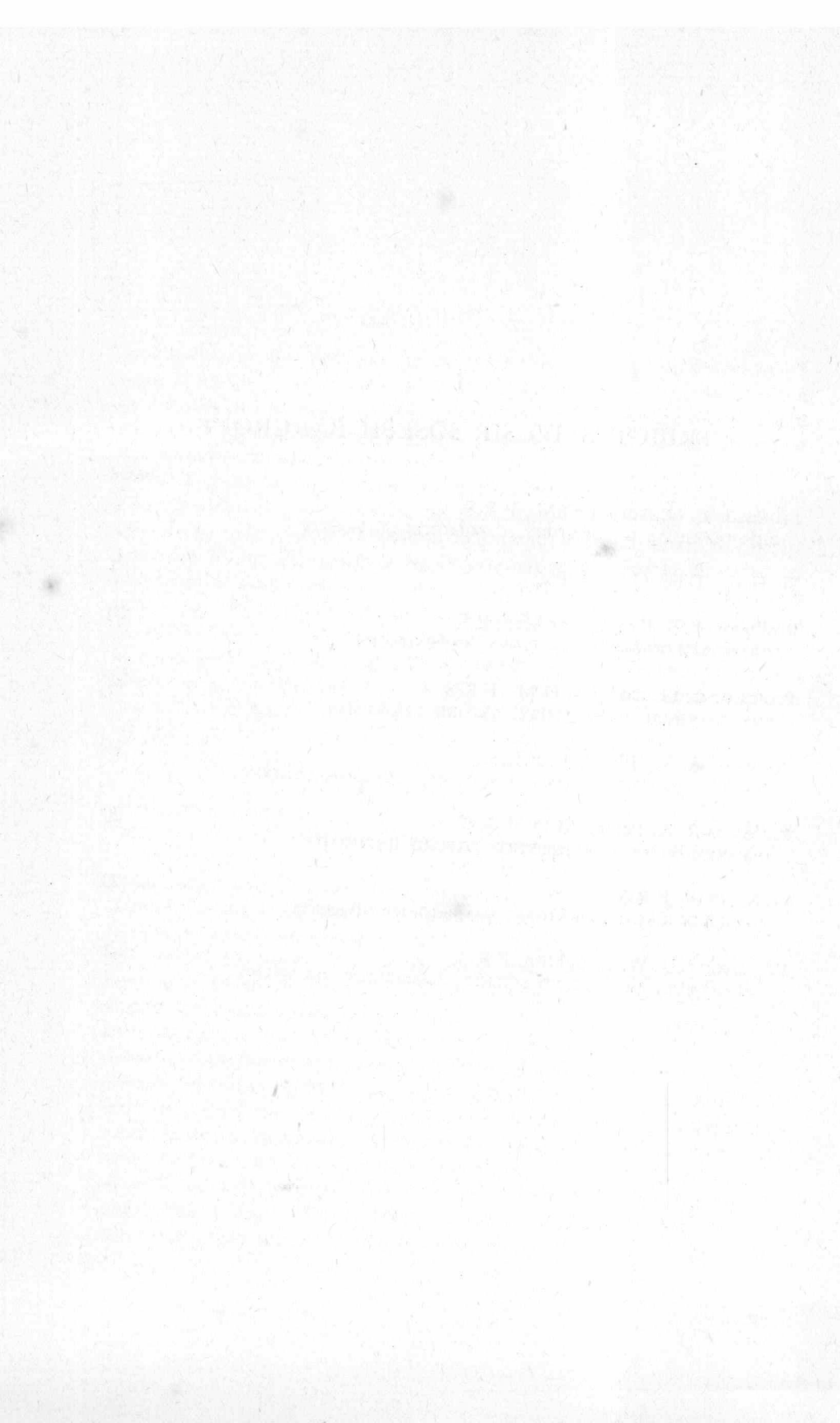
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Professor E. D. Adrian

PROFESSOR ROUGHTON's conference on haemoglobin opens to-day with a special meeting in commemoration of Sir Joseph Barcroft and it takes place in the lecture theatre which he had built and in the laboratory where he worked for thirty years. It is a very great honour for me to welcome you in this laboratory. We are proud to have so many distinguished visitors in the field which he opened up. I said this was a special meeting, but of course in a sense your whole conference is a tribute to Barcroft—just the sort of tribute he would have liked, and he would have been eager for you to get down to the job of scientific discussion. In spite of that I do not think he would have minded our spending this morning talking about more personal things. He would not have been Joe Barcroft if he had not valued the friendships he made and the affection that everyone felt for him ; to-day's meeting gives us the opportunity of thinking of the man as well as of his scientific achievements. As to those, it is obviously right that the conference should be about haemoglobin ; that was his major interest and he never left it. But one of the most remarkable and characteristic things about him was the way in which he could open up one field after another. He could be commemorated by a meeting on foetal physiology, on the spleen, on adaptation to high altitudes or on many other subjects. When war broke out he was called down to Porton as an expert on defence against gas attack, and then to our great good fortune he came back to Cambridge to direct the Unit of Animal Physiology which had just been set up by the Agricultural Research Council. In those last four years, back in his own laboratory, he showed just the same power of inspiring his team and starting fresh lines of work. Just before his death he was thinking out a new attack on some of the problems of animal metabolism, and if he had lived you would have seen him busy with isotopes and mass spectrographs, developing quite new lines and going in search of the latest techniques to employ them. The fact was, of course, that he never really grew old and he never lost the knack of reducing a problem to its simplest elements and then finding an answer by the most direct method. One of his most fruitful methods was to look for help in all directions, to bring in new recruits and to act as a catalyst in translating their ideas into practical outcome. Many worked with him and experienced his

Tributes

remarkable power of forging ahead all the time. I will not take up time in emphasizing what you know already, but I would like to say one thing. When he retired from the Chair of Physiology in 1937 he was sixty-five but still at the height of his powers as an investigator. It was quite unthinkable that he should not go on in the laboratory as before, but as you know it is not always an easy matter for an Emeritus and an acting Professor to work together in complete harmony, and I should like to put it on record that his presence here, besides being an immense asset to our research strength, was never anything but a great comfort and encouragement to his successor. Of course, I never thought it would have been otherwise. Barcroft was a very wise and kindly man as well as a great physiologist.

I have only one other thing to add and that is that when he retired from the Chair here, we thought we should like some record of him which would give a little more information than the ordinary portrait or photograph, so we asked him to let us make a film showing him doing an experiment on haemoglobin. It was made by Professor Winton and by John Freeman, our expert photographer, and although we had no sound equipment, we did the best we could by making some gramophone records of his voice to add as a commentary. If there is time at the end of the meeting, I think we might show that film.



Sir Henry Dale

I HAVE been asked to speak of our friend Barcroft's work up to about 1909-10. My friendship with him had begun nearly twenty years earlier, when we were boys together at the Leys School. At that first encounter I looked up to him with a certain awe, for he was a prefect, my senior by nearly three years, and I was a callow newcomer. By the time we came together again in the University, however, he was only a year ahead of me in academic ranking, since he had taken, under medical advice, a prolonged rest between school and university. The need for this was probably due to overwork in his last year at school, in which he had achieved the unusual feat, for a schoolboy, of graduating B.Sc. by examination at the University of London, then only an examining and degree-giving body. Whatever had been amiss, the medical advice seems to have been good, for Barcroft, when he had once begun the life of research, kept to it with unflagging energy and continued success right up to the day of his sudden death at an age