space at Rothamsted, and the college has withdrawn its ban on the attendance of my assistants. Apart from small sources of income, such as the sale of mice, we must rely on the income of Francis Galton's trust, and this will suffice to make sure that the work he initiated will be continued.

It has been suggested to me that many American friends, who would be glad, from time to time, of statistical assistance and advice, have refrained from writing in the belief that I should be too busy. This is not so. I should, indeed, be glad to earn some support for my department by such professional services. Any sympathizer who considers that we could supply assistance worth $100 towards his own researches is invited to put up a problem; though I must add that I should be sorry if this offer were to prevent any friend, who might otherwise write to me for advice, from doing so as freely as before.

R. A. FISHER

ROTHAMSTED EXPERIMENTAL STATION,
HARPENDEN HERTS, ENGLAND,
GALTON LABORATORY

QUOTATIONS

CHEMISTRY IN THE SERVICE OF THE STATE[1]

I HAVE been invited to represent the State of Oregon in this dedicatory exercise. This building, erected under state auspices as an important structure on the campus of this state college, may appropriately claim the attention of the chief executive. So I bring you greetings in my official capacity, and tender my congratulations on this consummation of the hopes of the scientists and administrators connected with this institution and the state system of higher education.

Your committee on arrangements has appropriately planned a symposium to-day, with learned scientists invited as participants, in which certain phases of this great science of chemistry are being discussed. In such a forum I am not qualified to take part. In fact, as a representative of the political agency I appear here with a certain sense of humiliation. I realize that from time immemorial the political arm has seized the knowledge of the experimenter and the scientist for ignoble ends. This is particularly true of chemistry and its ally, physics. From the days of the crude catapult, from the time when Greek fire was used to destroy the enemy ships about Byzantium, from the time when the new mixture of saltpeter, charcoal and sulfur was used to hurl missiles with death-dealing force, down to the present day with its high explosive shells, its poison gas, its armored tanks and flying bombers, government has used the discoveries of science in the business of warfare and the killing or mutilation of enemies. To-day it almost seems as if government leers over the shoulder of the patient chemist and urges him to compound some deadlier substance for the destruction of his fellowmen. In this respect Dr. Faustus remains the symbol of chemistry: with all its aspiration to conquer matter in the service of mankind, its soul remains in pawn to the devil. For organized society persists in devoting the discoveries of science to diabolical designs; or ignores the evil consequences which attend the application of such discoveries.

The central problem of our time becomes therefore not so much scientific as ethical and philosophic. How can we employ the products of science for beneficent ends! Science itself is amoral. It is the use made of science which determines its moral coloring. The potion which Friar Lawrence gave to Juliet was only a soporific, from which after two and forty hours she would "awake as from a pleasant sleep." The dram which Romeo forced the hungry apothecary to sell him was so potent a poison that "if you had the strength of twenty men it would dispatch you straight." But in the complexities of modern life the line of demarcation between the good and evil uses of scientific discoveries is not so clear as between the harmless sleeping potion of Juliet and the deadly poison of Romeo. A new machine or a new compound creates social as well as economic reactions. Therefore as the scientist reveals more the secrets of nature and points the way to their utilizations, the philosopher, the economist, the moralist, the statesman must labor alongside of him lest man become the victim of his own intelligence.

I have one more thought. You here dedicate a building to a use. May I as governor of this state dedicate it to a principle: the fearless search for truth. That is a concession the political arm is sometimes loath to give, for usually government seeks to keep its branches subservient to the regime. Yet if there is anything which modern science stands for it is the quest for truth. In spite of resistance sometimes clerical and sometimes political that quest has proven its virtue. Now generally accepted in the field of the natural sciences, that principle meets opposition at times in its extension to the area of social relationships. Yet it is in this field there now are occurring those gropings which often eventuate in new experiments or new discoveries.

Let this building stand dedicated to the service of

[1] Address of the Honorable Charles A. Sprague, governor of Oregon, at the dedication of the new Chemistry Building of the Oregon State College at Corvallis.

science through search for truth in an atmosphere of freedom. The gnawing of the elements in this climate will eventually wear away this structure of brick and concrete. But if the climate of liberty is preserved, truths will here be revealed which will live on and on. I trust they will serve not only to gratify intellectual pride, but may, through beneficent and wise application, work for the betterment of man.

SCIENTIFIC BOOKS

THE LIFE AND LETTERS OF LORD RUTHERFORD

Rutherford: Being the Life and Letters of the Rt. Hon. Lord Rutherford, O.M. By A. S. EVE, C.B.E., D.Sc., LL.D., F.R.S. Pp. xvi + 451. New York: The Macmillan Company; Cambridge, England: The University Press. 1939. $5.00.

THIS important book, written by so close an associate of Rutherford as was the author, will be read with the greatest of interest by physicists. Rutherford's influence extended beyond the domain of his science, so that his life is one of moment to the layman as well as to the specialist. However, while there are many sections of the book which will appeal to those who fall in the former category, the greater part of the contents is such as will be comprehended only by the professional man of science. It is not implied that the work contains profound or abstract material. It is composed very largely of letters and accounts of scientific achievements which, while simple in form of presentation and of outstanding interest for the physicist who knows what they are about, are apt to form rather dull reading for the ordinary layman.

Some of the most interesting and informative letters are those written in Rutherford's student days to the lady who was afterwards to become his wife. They are surprisingly detailed. They cover descriptions of everything and everybody, and in them one sees the young Rutherford working out the details of his finances, his hopes for their improvement and his general plans and ambitions for the future. In some cases he becomes quite technical, describing his apparatus and experiments in some detail, so that one almost gets the suspicion that he is conserving time and effort in combining into what should have been a love letter the opportunity of writing up his notes. The letters portray, as might be expected, a prodigious energy and an unfailing confidence in ultimate success, together with a continual aliveness to the essentials necessary to secure it, not only in the scientific, but also in the diplomatic and economic domains.

Rutherford's early life in New Zealand is interesting as foreshadowing the career that was to come, and perhaps we see in embryo an element of that resourcefulness of later years embodied in one of his own stories of this period:

> My mother sent me out to bring the cow home to the paddock and to collect some fire wood as well. So I drove the cow and pulled a big branch of a tree behind me. Then I thought, why shouldn't the cow help me? So I tied the branch with a rope to the end of her tail and she went quietly home till she came to a narrow gate. Here the branch jammed and the last bit of her tail broke off!

We find him as a boy making cameras, taking clocks to pieces and making water-wheels, as did Newton. Later, as a student at Canterbury College, we find him already engaged upon his work on the magnetization of iron by high-frequency discharges, which was later to provide his first claims to recognition when, as an 1851 Exhibition scholar, he continued his work at Cambridge, England.

Rutherford came to Cambridge at a transitional period, at a period when the scholar of the old school was dominant in the halls of learning and when scientific research was only beginning to come into its own for recognition. A degree for research had just been established, and Rutherford was the first research student to arrive in this category. We learn how one or two demonstrators with ancient prejudices that no good things came from the Colonies were wont to pass the door of his laboratory with a sneer, until he politely asked them in, told them he was in some difficulties with his experiments, and sought their advice, with the resulting complete collapse of their dignity and profundity; for they quickly realized that they had not the faintest shadow of a notion of what he was doing. That Rutherford was not long in establishing himself in the esteem of his surroundings is borne out by a remark of Dr. Andrew Balfour to the effect that "We've got a rabbit here from the Antipodes and he's burrowing mighty deep."

At Cambridge we have a picture of the development of his young student life, of his rapid incorporation in the community of the active investigators who resided in or visited Cambridge, of the growth of those elements which cemented his plans for the future, and withal, of the beneficent and almost fatherly interest in him shown by his great master, J. J. Thomson. Last but not least, we see a story so typical of one destined to blaze new trails in science. We see young Rutherford continuing, carrying to success, and even to the point of the attainment of considerable reputation, a field of activity—his work upon magnetic detectors, and the like—which, while worthy in itself,