RUTHERFORD AND THEORY

By Sir Nevill Mott, F.R.S.

There are many stories about Rutherford and the advent of quantum mechanics. Arthur Tyndall, who was with Rutherford on a boat to a British Association overseas, told me that he asked, ‘How is physics these days, Rutherford?’ Rutherford replied, ‘There is only one thing to say about physics, the theorists are on their hindlegs and it is up to us to get them down again’. But I do not believe that these stories go to the heart of the matter. Rutherford was far too great a man not to see how theory and experiment must intermingle to give a true view of nature, in the atomic nucleus as anywhere else. But he liked theories expressed in a way he could understand—and I think we all do.

I have no personal memory or experience of how he reacted to the Gamow-Gurney-Condon theory of a decay, but Alan Wilson tells me that he and R. H. Fowler and Rutherford were involved in discussions on this topic, that he cottoned on to the ideas very quickly and was wholly favourable. And here may I pay tribute to Ralph Fowler, my research supervisor, who presided over theory in the Cavendish in the thirties and to whose kindly and wise advice many of us owe a lifelong debt.

My own first researches were involved with showing that quantum mechanics gave the Rutherford scattering formula (I never heard his comments on that), and then the prediction that if the nucleus was helium, so that the two particles were identical, this was no longer so. Chadwick did the experiment and I remember vividly the day he showed me his results, in his typically pessimistic way which left me till the last moment thinking that he had disproved my prediction. Then he took me along to Rutherford who said ‘If you think of anything else like this, come and tell me’—enormously high praise, which I shall never forget.

Another memory I have is of a meeting here (or rather in Burlington House) at which Sir Arthur Eddington demonstrated his theory according to which the fine structure constant should be 136. Rutherford got up and almost shouted, with the strength of his tremendous authority, that it was 137 point something or other and what did Eddington make of that. Also on the fine-structure constant, Charlie Ellis remembers at dinner in Trinity how he burst out one evening and said, ‘How can a fellow sit down at a table and calculate something that would take me, me, six months to measure in the laboratory?’
Charlie will forgive me if I say that I do not know whether to believe this story or not. I only know from my own experience that he was extremely receptive to a useful theory.

May I finish with a story from Danniil Danin’s article on Rutherford and Kapitza which has been translated from the Russian. According to this article the late Academician Ioffe sought to introduce Kapitza to Rutherford. Rutherford remarked discouragingly that there were only thirty places at his disposal at the Cavendish and that, unfortunately, these were all occupied. Then Kapitza, taking his courage in both hands, said calmly ‘30 and 31 make a difference of roughly 3 per cent and after all, Professor, you do not usually insist on greater accuracy’. Rutherford was won over and Kapitza, as all the world knows, was admitted to the Cavendish. We greatly regret that he is unable to be here tonight.