Draft of the letter from Max Born to C. V. Raman and the story of the unsuccessful attempt of Raman to get Born and other refugee-scientists from Germany to India

Rajinder Singh and I have been corresponding with each other for sometime. Rajinder Singh is a Research Fellow in the University of Oldenburg, Faculty of Physics, Department of Higher Education and History of Sciences, Germany. He is deeply interested in the historical evolution of Indian Science and the interaction it has had with the science and scientists of Europe. Recently, he sent me a copy of a letter which Max Born had drafted, addressed to C. V. Raman, which makes interesting reading. Being a draft, it has many phrases and sentences crossed out. However, these are clear enough to be read. In the version reproduced below, the crossed parts have been included and shown in italics and put in brackets. We do not know the exact form in which the letter reached Raman in Bangalore as we have not been able to trace this letter here.

Within nine months of Raman taking up the Directorship and becoming the Head of the Department of Physics at the Indian Institute of Science (IISc), he offered Born not only a Full Professorship in the Department but also Headship of the Department of Physics to be in collaboration with himself. This would be surprising to some of the detractors of Raman as they thought that Raman would be reluctant to share things with others. From the Born–Rutherford correspondence, we know that Rutherford tried to persuade Born to accept Raman's offer because he felt that Born could spread modern theoretical physics to India and to another continent. Further, the salary offered by Raman was much higher than that which Born was receiving in Cambridge. However, it is clear that Born was wavering as is seen from this letter. Raman seems to have acceded to Born's suggestion of giving him an opportunity for visiting India for a short period. Raman created an extraordinary Visiting Chair for Born, who accepted it.

Max Born and his wife Hedi came to India on this short assignment. They came to like India, the Ramans and the conditions of work at IISc. Wrote Born: 'Frankly, I like Raman very much in spite of his too human drawbacks; his conceit, his naivette and his bringing himself to the front.' What is important is the fact that Hedi also liked India. 'We liked Lady Raman right from the beginning. When Raman appeared, he looked to Hedi like a Prince of the Arabian Nights.' I am told that along with Lady Raman, Hedi visited many of the children's schools in Bangalore and liked them very much and Born himself visited the Central College and lectured there. So it may be assumed that the problem of the education of children was at least temporarily solved.

Born enjoyed his stay in India at the Institute and his lectures were greatly appreciated. He found that the research students at IISc were very intelligent and so accepted Raman's original offer of a permanent position at IISc. Lord Rutherford was appointed Chairman of the Selection Committee and Born's name was first in the recommended list.

At a meeting in the Institute, Raman spoke of the extraordinary merits of Born as a scientist, as a teacher and as a human being. Then unbelievably, a professor of the Institute, an Englishman, (little known in the field of either Science or Engineering) spoke in a most derogatory manner about Born, referring to him as one who was rejected by his own country, a renegade and therefore a second-rate scientist and hence not fit to be part of the faculty of IISc, much less to be the Head of the Department of Physics along with Raman. All this about the great Max Born. One could have wept. We know Born did.

When many intellectuals were fleeing Germany under Hitler's tyranny, Raman who believed in excellence *per se*, had

Feb. 18th, 1934. 246, Hills Road, Cambridge.

Dear Professor Raman,

I have received your kind letter of Jan 27th, and I wish to thank you very much for your offering me a position at your Institute. It is, indeed, a great honour to me, and I have considered it very carefully. If I would be 10 years younger I should not hesitate to accept it. But being a little over 50 it is not quite easy to go into an unknown country, very far from Europe, and with a very different climate. I would like to explain you my position quite frankly. —

Box. The first part of Born's letter to Raman.

Box. Text of draft of Born's letter to Raman.

246 Hills Road, Cambridge
February 18th, 1934

Dear Professor Raman,

I have received your kind letter of Jan 27th and I wish to thank you very much for your offering me a position at your Institute. It is indeed, a great honor to me, and I have considered it very carefully. If I would be 10 years younger, I would not hesitate to accept it? But being a little over 50 it is not quite easy to go into an unknown country, very far from Europe, and with a very different climate. I would like to explain you my position quite frankly.

The University of Cambridge gave me a lectureship (*for 3 years I have*) with very little duties (only 3 hours a week lecturing) and a (*sufficient*) salary*. So I can do scientific research with more intensity than ever, not much less than that you are proposing (*I don't think that I should be dismissed after three years.*) You were appreciating yourself the advantage of Cambridge being a centre of our science, and the collaboration with (*Rutherford and his staff*) the Cavendish Institute. When I, however, would think of leaving Cambridge (*which I must confess to you*) it would be for two reasons. One is the climate in England where sunshine is very rare and fog very frequent. (*More important is the fact that presumably my position here will be always a sècondary one, and that there is little hope my financial condition shall be bettered in time. Therefore, I should consider your offer.*) You offer me a full professorship and as a head of a department in collaboration with you. – On the other hand, if I go to India, there seems to me very little chance of returning to Europe. There are many Indians coming to Europe, and many Europeans to India; but most of them do it for a limited restricted time. Moreover, there is the difficulty of the education of my 3 children. I would not like to be separated from them for many years. Concerning the climate I have heard most favourable reports about Bangalore. But in my age it is certainly a risk to go into a tropical country. All these reflections make it difficult for me to accept your most honourable and kind offer. If I had been in India earlier and would know the conditions of life there, I could decide better. Would it be possible for you to give me the opportunity of visiting your country, giving lectures there for some months and take a final decision after that? But I am sure you are more interested in (*having a theoretical physicist permanently and*) fixing this question once for all as soon as possible, and that you cannot think of delaying a permanent appointment any longer.

(*I would be glad if I could help you to find a younger man for your university. There are several excellent people: Peierls, Nodheim, Heitler, Bethe and others*).

Yours very sincerely

Max Born

an agenda to get some of these to India: Max Born, Schroedinger, Hevesy (of radioactive fame). V. M. Goldschmidt (the father of solid state chemistry), Ewald (pioneer in optics and crystallography) and Kuhn the biochemist and a host of others. After this public insult, Max Born could not possibly accept Raman's offer and all the German professors who were first inclined to come, naturally refused to come to India. India, I feel, missed an incredible golden opportunity. It is almost certain that the last sentence which has been scratched out in the draft must have been in the original letter received by Raman for he made offers to Peierls and Bethe, who would have emigrated to India, had Born been appointed. One wonders to think how science in India would have been completely transformed as early as 1936 if Born and his colleagues and other refugee-scientists had come to India.

Contrast this with what happened in other countries – they set up funds to support refugee-scientists and Peierls went to England and Bethe to USA, and both set up remarkable and very renowned schools of theoretical physics in these countries.

In his characteristic manner, Raman had flouted many rules in offering these scientists positions at IISc and for this and similar reasons, Raman himself lost his position as the Director of IISc, but retained his Professorship almost definitely due to the intervention of Lord Rutherford.

ACKNOWLEDGEMENTS. Thanks are due to Rajinder Singh and the Staats Bibliothek Zu Berlin for attracting our attention to the draft.

S. RAMASESHAN

Raman Research Institute,
Bangalore 560 080, India

Seventy years have passed since the discovery of the Raman effect. February 28 marks the anniversary of the observation of the line spectrum of Raman's 'new radiation' and is observed as the national 'Science Day' every year. To commemorate the passage of seven decades since Raman's spectacular discovery, we reproduce three of the early reports on the Raman effect.

– Editors

A new type of secondary radiation

[Reproduced from *Nature*, 1928, **121**, 501–502]

If we assume that the X-ray scattering of the 'unmodified' type observed by Prof. Compton corresponds to the normal or average state of the atoms and molecules, while the 'modified' scattering of altered wavelength corresponds to their fluctuations from that state, it would follow that we should expect also in the case of ordinary light two types of scattering, one determined by the normal optical properties of the atoms or molecules, and another representing the effect of their fluctuations from their normal state. It accordingly becomes necessary to test whether this is actually the case. The experiments we have made have confirmed this anticipation, and shown that in every case in which light is scattered by the molecules in dust-free ligands or gases, the diffuse radiation of the ordinary kind, having the same wavelength as the incident beam, is accompanied by a modified scattered radiation of degraded frequency.

The new type of light-scattering discovered by us naturally requires very powerful illumination for its observation. In our experiments, a beam of sunlight was converged successively by a telescope objective of 18 cm aperture and 230 cm focal length, and by a second lens of 5 cm focal length. At the focus of the second lens was placed the scattering material, which is either a liquid (carefully purified by repeated distillation *in vacuo*) or its dust-free vapour. To detect the presence of a modified scattered radiation, the method of complementary light-filters was used. A blue-violet filter, when coupled with a yellow-green filter and placed in the incident light, completely extinguished the track of the light through the liquid or vapour. The reappearance of the track when the yellow filter is transferred to a place between it and the observer's eye is proof of the existence of a modified scattered radiation. Spectroscopic confirmation is also available.

Some sixty different common liquids have been examined in this way, and every one of them showed the effect in greater or less degree. That the effect is a true scattering and not a fluorescence is indicated in the first place by its feebleness in comparison with the ordinary scattering, and secondly by its polarisation, which is in many cases quite strong and comparable with the polarisation of the ordinary scattering. The investigation is naturally much more difficult in the case of gases and vapours, owing to the excessive feebleness of the effect. Nevertheless, when the vapour is of sufficient density, for example with ether or amylene, the modified scattering is readily demonstrable.

C. V. RAMAN
K S. KRISHNAN

210, Bowbazaar Street, Calcutta, India
16 February

A change of wavelength in light scattering

[Reproduced from *Nature*, 1928, **121**, 619]

Further observations by Mr Krishnan and myself on the new kind of light-scattering discovered by us have been made and have led to some very surprising and interesting results.

In order to convince ourselves that the secondary radiation observed by us was a true scattering and not a fluorescence, we proceeded to examine the effect in greater detail. The principal difficulty in observing the effect with gases and vapours was its excessive feebleness. In the case of substances of sufficient light-scattering power, this difficulty was overcome by using an enclosed bulb and heating it up so as to secure an adequate density of vapour. Using a blue-violet filter in the track of the incident light, and a complementary green-yellow filter in front of the observer's eye, the modified scattered radiation was observed with a number of organic vapours, and it was even possible to determine its state of polarisation. It was found that in certain cases, for e.g. pentane, it was strongly polarised, while in others, as for example naphthalene, it was only feebly so, the behaviour being parallel to that observed in the liquid state. Liquid carbon dioxide in a steel observation vessel was studied, and exhibited the modified scattering to a notable extent. When a cloud was formed within the vessel by expansion, the modified scattering brightened up at the same time as the ordinary or classical scattering. The conclusion is thus reached that the radiations of altered wavelength from neighbouring molecules are coherent with each other.

A greater surprise was provided by the spectroscopic observations. Using sunlight with a blue filter as the illuminant, the modified scattered radiation