Professor G. W. Series, F. R. S. – An obituary

George Series died on 2 January 1995 at the age of 74. He was a teacher, lecturer and researcher of very great distinction who specialized in the interaction of light with atoms. This much can be readily deduced from the papers and books he published, but the printed evidence falls very far short of conveying both the enthusiasm which he brought into his work and the extent to which contact with him inspired his students and fellow scientists.

His early studies were interrupted by the Second World War, when, true to his pacifist beliefs, he served with the Friends Ambulance Unit in Egypt, Italy and Yugoslavia, an experience which had a lasting effect on his innate humanity. As another result of these beliefs, he consistently refused to take advantage of any funds for research which emanated, however indirectly, from a military source. Consequently, he was obliged to confine all his subsequent research to small-scale, low-budget endeavours. Fortunately, the constraints imposed by simple and inexpensive apparatus only served to stimulate his ingenuity in devising extraordinarily influential experiments in which depth of thought and elegance of execution had perforce to be substituted for complexity of equipment. He accepted this situation with characteristic cheerfulness, and probably the nearest he ever came to exhibiting frustration and envy was to remark, of an early short spell he spent as a guest worker at Bell Telephone Laboratories, that 'if you needed an oscilloscope there, all you had to do was to go and draw one from stores'.

A spectacularly distinguished research career began with his doctoral investigation into the Balmer-α radiation from atomic hydrogen. By dint of cooling the hydrogen discharge in a bath of liquid hydrogen, he attained sufficient spectral resolution to observe the shift in the fine-structure components caused by the back-reaction of the emitted light on the atoms. Shortly afterwards, one aspect of this reaction, the Lamb shift of the ground state energy levels, was clearly demonstrated and accurately measured by the famous Lamb–Rutherford experiment.

As so often happens, his thesis work led to an interest in the interactions between light and isolated atoms which lasted for the rest of his life. A good deal of his subsequent pioneering work involved the creation of atoms in a coherent superposition of quantum-mechanical states, and the properties of the radiation emitted by such atoms. Even in retirement and throughout his long final illness, he was struggling with a possible alternative formulation to the displeasing divergent integrals of quantum electrodynamics.

The understanding he brought to the subject has found many applications – others, with the more sophisticated technology available to them, have demonstrated the elegant trapping of atoms in space with light, the formation

of atomic fountains and a plethora of accurate spectroscopic measurements, including measurements of the Rydberg and fine-structure constants to accuracies undreamed of in his postgraduate work.

A particularly striking prediction he made was concerned with the width of the Lorenzian curve, which plots the intensity of re-radiated resonance radiation as a function of an applied magnetic field. It was thought that this width was completely governed by the fraction of a microsecond which the atoms spend in the excited state before re-radiating. George realized that it ought to be possible, however, given fast gating and timing apparatus, to select for observation only those atoms which statistically had spent a longer time than the average in the excited state. The effect would be to produce a proportionally narrowed Lorenzian curve. At the University of Windsor in Canada we had an apparatus which could try out this idea experimentally, but at first there was only crushing disappointment. The width, far from being smaller, was increased. Fortunately, it took us only a few minutes to discover that the delay cable inserted into the system to select long-lived atoms had been mistakenly plugged into the trigger channel, thus selecting short-lived atoms instead. We put this right and the confirmatory letter was soon winging its way back over the Atlantic to George.

His academic reputation was mostly achieved at Oxford, starting with an Open Scholarship at St. John's College, where he achieved a first-class degree after just two years. His career there continued through a Nuffield Research Fellowship and a University Lectureship to his eventually becoming a Fellow of St. Edmund Hall. In 1968 he moved on to become Professor of Physics at Reading University, and in 1971 was elected a Fellow of the Royal Society.

As a teacher, the needs of his pupils were paramount. Once, despite literally being laid low with a persistent back problem, he continued to give tutorials to his students whilst laying on his back on the floor. This must, indeed, have taught them a sense of duty as well as love for physics.

His association with India stemmed from his admiration for the work of C. V. Raman, and from his collaborations at Oxford with S. Pancharatnam, in whom he found a kindred spirit. Despite the fruitfulness of the exchange of ideas between them, they were never joint authors, but there was no mistaking their mutual respect and administration, and George's memorial to Pancharatnam was to see to the posthumous publication of three of Pancharatnam's papers.

His association with Indian science was continued by his appointment as the Raman Visiting Professor of the Indian Academy of Sciences, and he subsequently became an honorary fellow in 1984.

Not only a researcher, his influence as a teacher was equally great. He pos-

sessed the rare ability to develop a theme by gradual, easily assimilated stages from the simplest beginnings, continuously through to the frontiers of research. He was insistent on the publication of significant results – 'What is the point in doing this beautiful work at all, if you don't tell anybody about it?' And on having the courtesy to one's readers of not requiring them to extract meaning from English of less than perfect clarity. Both aspects are apparent in his own published papers and books.

There was a particularly interesting conference at the National Bureau of Standards in the USA on 'Precision Measurement and Fundamental Constants' in 1970, in the days when physicists were allowed to have fun. Some of the participants enhanced already pretty lively sessions by writing limericks appropriate to their area of interest. George's contribution, relating to the fine-structure constant (α), whose reciprocal was erroneously supposed by Eddington to be exactly 137, was:

Take an 'e' and an 'h' and a 'c'
Combine them dimensionlessly
Then Eddington's number
From one over alpha
Leaves zero, three six and query

This ingenious rhyme neatly captured the whole ethos of the conference, which was all about striving to measure and then understand the physics behind the next decimal place. Since then the next two decimal places have, in fact, been measured but, coincidentally, the verse still applies.

His influence continues to spread ever onwards and outwards through the undergraduates he taught, the inspriational experiments he devised for undergraduate practical teaching courses, through his postgraduate students and postdoctoral collaborators, and through his fellow physicists in many different countries. In the network of contacts and interactions which directly or indirectly interconnects us all, the node which is George Series is indeed of very much greater significance than his own modest nature would have recognized.

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