

THE SEARCH

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The walk with my father marked the beginning of a theme that was to take a great part in my life. Of course, it really went further back than a chance starlit evening. Yet that evening was a symbol, and I have never forgotten it.

The astronomical phase lasted irregularly for several years, gradually declining until I found, rather to my surprise, that it had gone altogether. In its first violence it stayed until I went to the secondary school in the town. I had looked forward avidly to my first science lessons; and when they came I was puzzled and disappointed. The chief science master, Luard, was a figure in the school, I had heard of him before he took us for our first chemistry lesson, of his bitter tongue and fits of anger. Everyone feared him, it seemed -- and yet "he's interesting sometimes," said a boy who had been a year or two at school.

When I saw him come into the class-room, I was not sure whether it could be he. Even to a boy, eager to be impressed, he was not an impressive man. He was thin, with a yellowish sallowness, and wore pince-nez. Although he could not have been more than forty, he was going bald and his voice sounded flat and tired. He taught us in an indifferent, uninterested way; during that lesson, and the rest of the term, we did nothing but stand in the laboratory and heat little pieces of wood and similar things, and tiny portions of powders from bottles on the benches, in tubes which Luard called "combustion-tubes." He told us to notice what happened. Zealously I looked and wrote down: "The black powder did not appear to change. The white powder did not appear to change. The specimen of wood went first brown, then gave off fumes, then went black." I studied the tubes very carefully. For the first few months I still thought I must be missing something. This business couldn't be as pointless as it seemed. But no one explained what I was doing. It became just a drill, like any other drill, one of those inexplicable pieces of school routine, a good deal less interesting than the French verbs that I was beginning to learn in the lesson before we went to the laboratory. School "science," I decided, was something quite different from my own exciting private science, my world of space and stars.

Then one day, just before we broke up for Christmas, Luard came into the class-room almost brightly.

"We're not going into the laboratory this morning," he said. "I'm going to talk to you, my friends." He used to say "my friends" whenever he was lashing us with his tongue, but now it sounded half in earnest. "Forget everything you know, will you? That is, if you know anything at all." He sat on the desk swinging his legs.

"Now, what do you think all the stuff in the world is made of? Every bit of us, you and me, the chairs in this room, the air, everything. No one knows? Well, perhaps that's not surprising, even for nincompoops like you. Because no one *did* know a year or two ago. But now we're beginning to think we *do*. That's what I want to tell you. You won't understand, of

course. But it'll amuse me to tell you, and it won't hurt you, I suppose -- and anyway I'm going to."

Someone dropped a ruler just then, and afterwards the room was very quiet. Luard took no notice and went on: "Well, if you took a piece of lead, and halved it, and halved the half, and went on like that, where do you think you'd come to in the end? Do you think it would be lead for ever? Do you think you could go down right to the infinitely small and still have tiny pieces of lead? It doesn't matter what you think. My friends, you couldn't. If you went on long enough, you'd come to an atom of lead, an atom, do you hear, an atom, and if you split that up, you wouldn't have lead any more. What do you think you would have? The answer to that is one of the oddest things you'll ever hear in your life. If you split up an atom of lead, you'd get -- pieces of positive and negative electricity. Just that. Just positive and negative electricity. That's all matter is. That's all you are. Just positive and negative electricity -- and, of course, an immortal soul." At the time I was too busy attending to his story to observe anything else; but in the picture I have formed later of Luard, I give him here the twitch of a smile. "And whether you started with lead or anything else it wouldn't matter. That's all you'd come to in the end. Positive and negative electricity. How do things differ then? Well, the atoms are all positive and negative electricity and they're all made on the same pattern, but they vary among themselves, do you see? Every atom has a bit of positive electricity in the middle of it -- the nucleus, they call it -and every atom has bits of negative electricity going round the nucleus -- like planets round the sun. But the nucleus is bigger in some atoms than others, bigger in lead than it is in carbon, and there are more bits of negative electricity in some atoms than others. It's as though you had different solar systems, made from the same sort of materials, some with bigger suns than others, some with a lot more planets. That's all the difference. That's where a diamond's different from a bit of lead. That's at the bottom of the whole of this world of ours." He stopped and cleaned his pince-nez, and talked as he swung them:

"There you are, that's the way things are going. Two people have found out about the atoms: one's an Englishman, Rutherford, and the other's a Dane called Bohr. And I tell you, my friends, they're great men. Greater even than Mr. Miles" -- I flushed. I had come top of the form and this was his way of congratulating me -- "incredible as that may seem. Great men, my friends, and perhaps, when you're older, by the side of them your painted heroes, your Cæsars and Napoleons, will seem like cocks crowing on a dungheap."

I went home and read everything I could discover about atoms. Popular exposition was comparatively slow at that time, however, and Rutherford's nucleus, let alone Bohr's atom, which could only have been published a few months before Luard's lesson, had not yet got into my Encyclopaedia. I learned something of electrons and got some idea of size; I was fascinated by the tininess of the electron and the immensity of the great stars: I became caught up in lightyears, made time-tables of a journey to the nearest star (in the Encyclopædia there was an enthralling picture of an express train going off into space at the speed of light, taking years to get to the stars). Scale began to impress me, the infinitesimal electronic distances and the vastness of Aldebaran began to dance round in my head; and the time of an electronic journey round the nucleus compared itself with the time it takes for light to travel across the Milky Way. Distance and time, the infinitely great and the infinitely small, electron and star, went reeling round my mind.

It must have been soon after this that I let myself seep in the fantasies that come to many imaginative children nowadays. Why should not the electron contain worlds smaller than

itself, carrying perhaps inconceivably minute replicas of ourselves? 'They wouldn't know they're small. They wouldn't know of us,' I thought, and felt serious and profound. And why should not our world be just a part of an electron in some cosmic atom, itself a part of some gargantuan world? The speculations gave me a pleasant sense of philosophic agoraphobia until I was about sixteen and then I had had enough of them.

Luard, who had set me alight by half an hour's talk, did not repeat himself. Chemistry lessons relapsed once more into exercises meaningless to me, definitions of acids and bases which I learned resentfully, and, as we got further up the school, descriptions of the properties of gases, which always began "colourless, transparent, non-poisonous." Luard, who had once burst into enthusiasm, droned out the definitions or left us to a text-book while he sat by himself at the end of the laboratory. Once or twice there would be a moment of fire; he told us about phlogiston -- "that should be a lesson to you, my friends, to remember that you can always fall back on tradition if only you're dishonest enough" and Faraday -- "there never will be a better scientist than he was; and Davy tried to keep him out of the Royal Society because he had been a laboratory assistant. Davy was the type of all the jumped-up second-raters of all time."

Those moments, though, came too rarely and I gave up anticipating chemistry lessons as anything but dull.

It was a long time before I understood Luard. I had to go to two Universities, to listen to the educational theorists, to examine in University scholarships myself, before I fully realised why he had lost heart and made his lessons so conventionally arid. Indignantly I discovered the mixture of vested interests, muddled thinking and memory of their own past that had made men adhere to the "logical" method of teaching science. "If you want to interest your pupils," I remember someone telling me as I was pleading for a gleam of something to catch boys' imaginations, "you can put them in the position of the original discoverer." Put them in the position of the original discoverer! The pedagogic nonsense of it all! When you think of the chances and stumbling, the flashes of insight and the sheer mistakes, that have gone to every discovery since science began! And then to expect to teach in that way. "The real method of teaching science apart from the frills," the man went on, "is to go from the observations to the conclusions. Start with simple experiments, note your deductions from them, and don't worry them with the new-fangled stuff. It's the way of experience, Miles, it's the logical way, and you can't do better than that." The logical way. They might as well teach French by starting with an agglutinative language like Eskimo and follow the logical changes in language through the Basque down to the European tongues. They might as well teach Biblical history by making the boys spend forty years in Sinai.

And this pedantry goes on when there is every chance of rousing a child's enjoyment, from stars to motor-cars, from atoms to the lives of birds. When I think of the conspiracy of dullness in which these exciting years are wrapped, I no longer wonder at the drab routine the Middle Ages made of Aristotle: I wonder instead that they kept him so fresh and clear.