

Recollections of Paul Dirac at the ICTP

Paul Adrian Maurice Dirac (1902-1984) is an example of a scientist that has dwelled upon the deep questions at the frontier of science and humanism (Figs. 1 and 2). He appreciated the existence of a significant percolation between science and art, (Dirac, 1963, Hossenfelder, 2018):

This result is too beautiful to be false; it is more important to have beauty in one's equations than to have them fit experiment.

It was unfortunate that my interest in science and humanism had not yet been fully developed when I first met Paul Dirac during an early visit to Trieste. It happened during my association to ICTP in the period 1972-1974. For my good fortune, my visit coincided with two great scientists that were helping Salam in the academic activities of this unique Centre. They were Dirac himself and Ivar Waller (1898-1991), the Swedish professor of theoretical physics from the University of Uppsala, who was also a member of the Royal Swedish Academy of Sciences from 1945, and the Nobel Committee for Physics 1945-1972.



Fig. 1. Nobel laureate Paul Adrian Maurice Dirac chairs a session at the International Symposium on Contemporary Physics. ICTP, Trieste, 7-28 June, 1968. A curious feature of the photograph is that in 1968 there was a board for simultaneous translation that was eventually discarded. (Photo by the author, June, 1968.)

One morning, in order to start a friendly conversation during a coffee break, Waller asked me: "What kind of research are you working on?" I explained, as modestly as I could manage, that I was only attempting to implement some minor variations of the theory of gravitation that Albert Einstein had introduced in 1915, the theory of General Relativity. Salam had provided the input, as he was trying to rationalize a theory of strong nuclear forces that was based on Einstein's ideas ("strong gravity", Isham et al., 1971). The modification was intended to account, not only gravitation, but also for one of the sub-nuclear forces. I emphasised that my contribution would be at best a very simple step forward (Chela-Flores, 1974).



Fig 2. From left to right: Paul Dirac, Julian Schwinger and Abdus Salam at the inauguration of the Main (Leonardo) Building, ICTP (June), Trieste. (Photo by the author, June, 1968.)

In spite of my genuine modesty, Waller immediately said that I ought to speak to Dirac! The following day, without giving me the opportunity to express my anguish and hesitation for such an unexpected meeting, he told me that an appointment had already been made. When I went to his office, Dirac kindly asked me to sit next to him, where he usually received his colleagues, or young scientists from the emerging nations, as was my personal case. He asked me to describe my work, which I did underlying all its evident limitations. He, typically (I learnt later on) advised me to solve one problem at a time, and with great kindness ended the meeting. His accessibility was a significant, stimulating, lasting lesson.

My admiration for the great scientist increased when my understanding of humanism improved and I realized that Dirac had a broad and respectful cultural appreciation of the frontiers of science

and the humanities. Dirac anticipated my commitment for astrobiology. He tentatively accepted the position of a believer, provided the origin of life in the universe was a plausible process, according to the laws of science. Today, the following quotation would qualify Dirac to be an agnostic, not an atheist, or even less a New Atheist. What the remarkable English scientist said was the following (Kragh, 1990):

It could be that it is extremely difficult to start life. It might be that it is so difficult to start life that it has happened only once among all the planets. ...Let us consider, just as a conjecture, that the chance life starting when we have got suitable physical conditions is 10^{-100} . I don't have any logical reason for proposing this figure; I just want you to consider it as a possibility. Under those conditions...it is almost certain that life would not have started. And I feel that under those conditions it will be necessary to assume the existence of a god to start off life. I would like, therefore, to set up this connection between the existence of a god and the physical laws: if physical laws are such that to start off life involves an excessively small chance, so that it will not be reasonable to suppose that life would have started just by blind chance, then there must be a god, and such a god would probably be showing his influence in the quantum jumps which are taking place later on. On the other hand, if life can start very easily and does not need any divine influence, then I will say that there is no god.

Dirac raises an interesting point. He mixes the eventual success of what we now call astrobiology, with the non-existence of Divine Action. Sadly, I miss the opportunity to have a second meeting with him at the ICTP to discuss this issue. But, in his absence at least one possible consolation is to confront astrobiology with humanism. In such confrontation, it is essential to delineate the horizons and frontiers of science, in this case the science of astrobiology, although Dirac would not have referred to it in these terms.

But the significance of beauty, especially the beauty and rationality of pure mathematics in their applied sphere has been shared by other remarkable scientists, as mentioned by Albert Einstein (1949):

What a deep conviction of the rationality of the universe and what a yearning to understand, were it but a feeble reflexion of the mind revealed to this world, Kepler and Newton must have had to enable them to spend years of solitary labour in disentangling the principles of celestial mechanics!

References

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