

The Contributions of Sir William Crookes to Cosmology

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Commentary

Sir William Crookes, undoubtedly, was a scientist and an inventor who has contributed immensely to the continuous progress of humankind *via* science and engineering. These achievements vary from photography (he was a pioneer in this area as well) to agriculture; and no need to mention his achievements in chemistry and physics, which must be already well-known. A summarized list of some of these achievements is shown in the next paragraph. Crookes was a visionary and a promoter of science. In fact, Crookes started the process of “popularization” of science, making knowledge more accessible to the general public, especially in the Victorian society. Within, this context, he was also a pioneer regarding the creation of scientific journals. The list of his achievements in science, for instance, is long and there are already good references in the literature which present and discuss in detail about these achievements.[1-3] Within this context, there are two contributions that Crookes has made to cosmology which seem to be forgotten or not fully recognized. One is regarding his indirect contribution to the discovery of electrons; and the other one is regarding his discovery of radiant matter (or as it is now known as plasma) (Figure 1).[4,5]



Figure 1: The Cosmos and Sir William Crookes.

List of some of the main scientific achievements of Sir William Crookes:

- Discovery of the selenocyanides;
- Discovery of thallium (a new element in the periodic table);

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- Discovery of lines of molecular pressure;
- Discovery of radiant matter;
- Inventing of the radiant matter spectroscopy;
- Discovery of new elements in gadolinite;
- Fixation of atmospheric nitrogen;
- Investigation of some possibilities of electricity (i.e., wireless telegraphy);
- Creation of the Crookes Tube (pioneering vacuum tubes);
- Description of the spectrum of terrestrial helium;
- Creation of the spintharoscope;
- Creation of the Crookes radiometer;
- Creation of eye-preserving glass for spectacles.

Focusing on the electricity, the discovery of this subatomic particle, the electrons, in 1897 is “officially” credited to Sir Joseph John Thomson, aka J.J. Thomson,[6] who worked with Crookes and learned a lot from Crookes’ productivity, creativity and free thinking towards science. Nevertheless, as a matter of fact, J.J. Thomson was only able to “discover” electrons because of Crookes’ previous hard work on electrical discharges in vacuum tubes in the late 1870s, when he created the Crookes tube. Within this area, *via* the discovery of electrons, a huge jump was possible to be made within physics, allowing the later development of quantum physics which provided the foundation of cosmology.

Regarding the radiant matter, this is another paramount discovery of Sir William Crookes. Radiant matter, which is the fourth state of matter, later called as plasma, is the most common state of matter in the (observable and measurable) Universe! It is similar to gas, but it has free electrons, and it is composed of positive charged particles called cations. Examples of plasmas in nature are: the stars (including our Sun), auroras, lightning strikes thus, “everything is plasma”,[7] in the cosmos, see **Figure 2**.



Source: <https://www.thoughtco.com/what-is-plasma-608345>

Figure 2: Examples of Plasma.

The discovery of plasma itself already justifies the name of Sir William Crookes to be associated with cosmology and become a recognized reference. The manuscript published by PINHEIRO, M.J., 2007,[8] is a good starting point. The title of the manuscript says it all: “Plasma: the genesis of the word”. As a hypothesis, I

would not be surprised when in future we might find out the nature of dark matter and dark energy (also, considering the assumption of being a dark fluid as FARNES, J.S. (2018) proposed) is a more refined type of plasma.[9]

Furthermore, considering Crookes' indirect contribution to the discovery of electrons (and he should have some credits for this), he not only allowed us to better understand microcosmic phenomena within nature, but also a better understanding of macrocosmic phenomena within the Universe (i.e., the cosmos).

Based on these two discoveries, which were essential for the development and strengthening of astronomy *via* cosmology, Sir William Crookes has contributed to cosmology. Although he received numerous and prestigious prizes and recognition (similarly to Edwin Hubble), he never won a Nobel Prize (either in chemistry or in physics). It is a scientific duty (and for those involved directly and indirectly with astronomy and its associated fields of knowledge) to recognize his contributions to cosmology and ensure the new generations do not forget these.

Keywords: Sir William Crookes; Science; Electrons; Radiant matter; Plasma; Universe; Cosmology; Cosmos

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3. [D'Albe F, Edward E. The life of Sir William Crookes" \(Cambridge Library Collection - Technology\). \(First edition in 1923\). ISBN 10: 1108061591 ISBN 13: 9781108061599, Publisher: Cambridge University Press, 2013;](#)
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5. [Preston ST. On some points relating to the dynamics of "Radiant Matter". Nature. 1881;23:461-4.](#)
6. Peter Achinstein on his book "The Book of Evidence" on chapter "Who really discovered the electron?", brings an interesting and insightful reflection, which I support and agree in line with the third paragraph of this article.
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