Bibliographic Visualizations of Early Work in Neutron Diffraction

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Introduction

Visualization of the literature of physics can provide interesting glimpses into such things as work relationships, a topic over the passage of time or the prominence of certain scientists in a particular area. Early work on neutron diffraction provided an interesting topic for exploration. Questions one might ask are:

- How prominent would a physicist like Clifford Shull appear in such visualizations?
- Who did he work with?
- What other clusters of physicists were active during the same timespan and when did their work appear in relation to Shull?

Study Design/Methods

Data needed for the visualizations were retrieved from Clarivate Analytics' *Web of Science*. This database provided extensive coverage of the topic and the particular instance of the database used included the "Century of Science" (a backfile including literature from 1900 forward).

For this search, bibliographic data existed for the years 1936 through 1955, with the exception of the war years (1941-1944). The final year of the timespan studied, 1955, corresponds with the year Clifford Shull left Oak Ridge.

A tab-delimited export of the data from the Web of Science Core Collection included 181 bibliographic records using a topic query of "neutron diffraction" OR "neutron scattering." Data were visualized using VOSviewer version 1.6.9 available from the Centre for Science and Technology Studies, Leiden University.

Conclusion and Observations

- In this case, a well-chosen Nobel laureate prominently appeared in the bibliographic visualization.
- The coauthor map easily shows work relationships.
- Overlays can easily depict average years of publication per scientist.
- Disconnected documents might prove quite interesting.
- Narrow topics of exploration work best owing to restrictions on the number of records that can be processed by data sources per export operation.
- Map creation wizards make the production of visualizations a far less difficult task.
- Zooming and scrolling allow for deep looks into clusters within a visualization.
- Hovering on items (nodes) or links (edges) allows reveals underlying data.
- Additional study of the network might lead to possibilities of historical archives.

Related Bibliography

- Clifford Glenwood Shull Collection. library.cmu.edu. Wed. 27 Feb 2019. http://diva.library.cmu.edu/Shull/
- Clifford G. Shull – Biographical. NobelPrize.org. Nobel Media AB 2019. Wed. 27 Feb 2019. https://www.nobelprize.org/prizes/physics/1994/shull/biographical/
- Clifford G. Shull – Nobel Lecture. NobelPrize.org. Nobel Media AB 2019. Wed. 27 Feb 2019. https://www.nobelprize.org/prizes/physics/1994/shull/lecture/
- Shull, Robert D. Clifford Glenwood Shull 1915 – 2001: a biographical memoir. nasonline.org. National Academy of Sciences 2019. Wed. 27 Feb 2019. http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/shull-clifford.pdf
- VOSviewer - Visualizing scientific landscapes. Centre for Science and Technology Studies, Leiden University 2019. Wed. 27 Feb 2019. http://www.vosviewer.com/

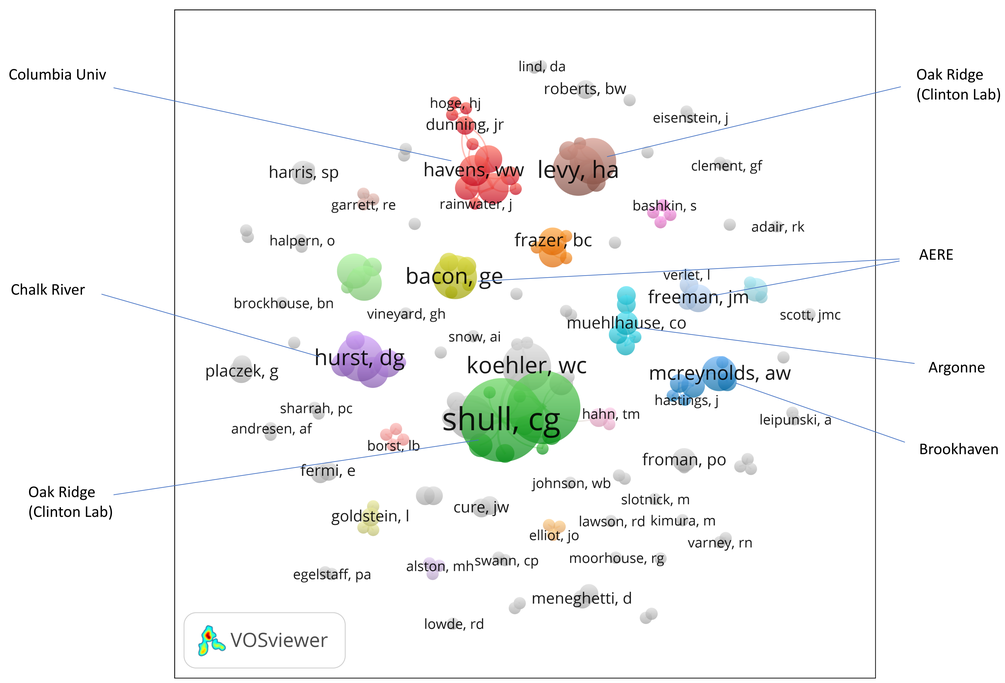

Figure 1: Author citation network of the entire corpus of neutron diffraction literature from the *Web of Science Core Collection* through 1955. Determination of affiliations was done separately, but might be historically important.

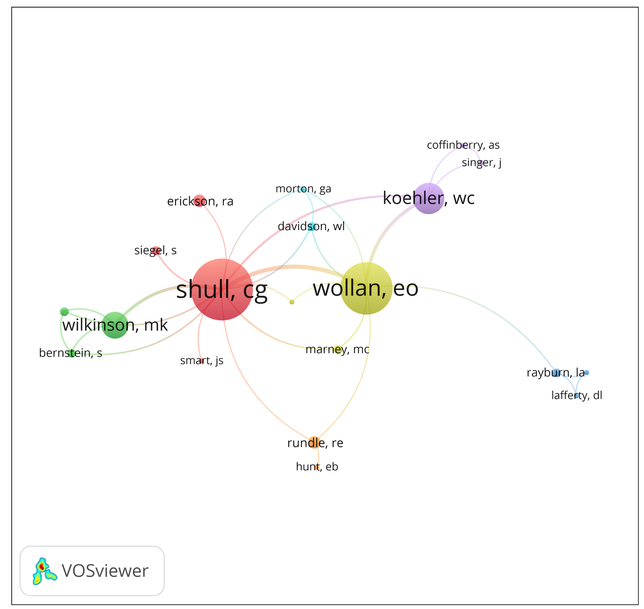

Figure 2: Zoomed-in view of the "shull, cg" cluster shows a more complete picture of Shull's work relationships. This easily shows the strong relationship with Ernie Wollan.

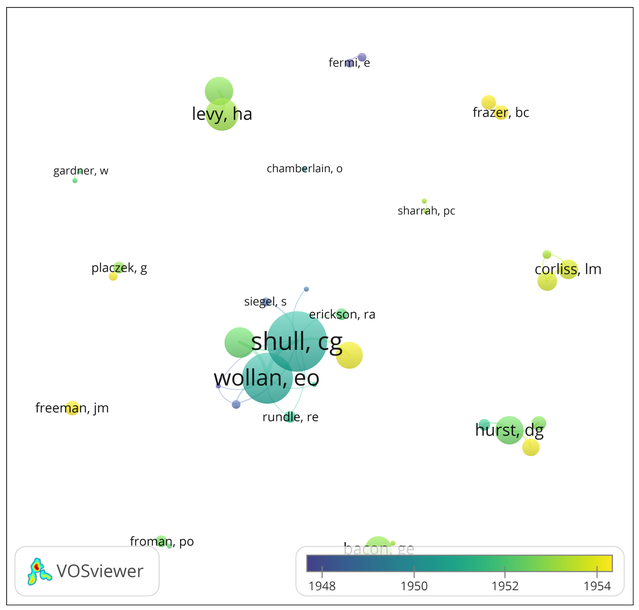

Figure 3: Co-authorship network of authors with at least 50 citations with average publication year overlay gives the viewer an appreciation of what has transpired when.

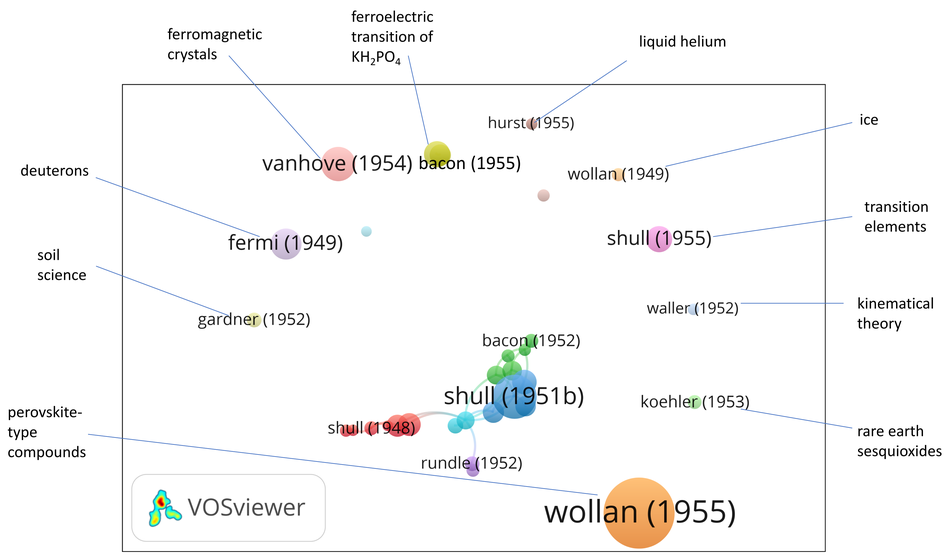

Figure 4: Document citation network where all documents have at least 50 citations; disconnected literature topics are identified.