

Historical Article

Comments on Shirakawa's Response



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As both an active researcher in the synthesis of conjugated materials and a chemist-historian that has spent the last decade attempting to detail and clarify the history of conjugated and conducting polymers,^{1,2} I am overjoyed that Prof. Shirakawa has elected to provide additional personal details relating to the discovery and development of polyacetylene films. Shirakawa has provided this material in response to my most recent *Substantia* paper that details newly revealed accounts by Hyung Chick Pyun (1926-2018), who was a visiting Korean scientist that carried out the initial experiment that led to these films.³ This material is critical to advance our understanding of this important historical event. At the same time, however, I was quite disappointed to find that Shirakawa viewed my paper as biased, particularly as this puts me in the unpleasant position of having to defend my integrity as a chemist-historian. I approach my historical efforts with great care and the integrity of these efforts is something that I take quite seriously.

According to Merriam-Webster, when used as a verb (as the case here), bias means “to give a settled and often prejudiced outlook to”. In a more general way, bias typically refers to an emphasis in favor of or against an idea or entity, usually in a manner that is closed-minded, prejudicial, or unfair. Of course, the goal and expectation within history is that descriptions of historical subjects, general interpretations of the past, and historical explanations are fair and not misleading. This does not mean that bias does not occur within history and the historian C. Behan McCullagh describes four common ways in which historical writing can be biased.⁴ Still, McCullagh goes on to explain that such cases are only biased if they occur because the historian wants a particular outcome, normally to further certain personal interests. Of course, one can describe Pyun's account as biased, which would be valid. After all, it is a personal account with significant self-interest, as are many such personal accounts, and was written by a man who felt grievously wronged. Still, the use of such sources does not necessarily make the resulting historical analysis biased. Historians have long been aware that written documents reflect the concepts and interests of their authors.⁴ This issue is generally dealt with by not taking material at its face value, but to construct explanations of its origins that will account for its features as much as possible, after which efforts are made to find coherence among the various expla-

nations to decide what really happened. This is precisely the approach taken in the analysis of Pyun's account and its incorporation into a larger view of the discovery of polyacetylene films, including highlighting aspects that were known to be inaccurate.

Shirakawa is also critical of the sources used in the analysis and presentation of the discovery of polyacetylene films, stating "Most descriptions in the article are based on Pyun's accounts and third-party records, such as press reports by the Nobel Foundation and Royal Swedish Academy of Sciences at the time of the Nobel Prize announcement and award. The article lacks any of my own input, except for my printed Nobel Lecture and scientific papers." This, however, is a misrepresentation of the sources used. While third-party sources were indeed used, this was only in discussion of how the event has been commonly portrayed by others, as well as highlighting errors in many of those descriptions of the event. In terms of constructing a more accurate narrative of the discovery of polyacetylene films, the primary sources beyond Pyun's account were Shirakawa's scientific publications, his published Nobel Lecture,⁵ his Nobel autobiography,⁶ and a reflection by Shirakawa on the polyacetylene film synthesis that was published in the *Journal of Polymer Science: Part A. Polymer Chemistry* in 1996.⁷ All of these sources were written by Shirakawa and include his personal descriptions of various aspects of the event. As such, the published narrative included all available sources at the time. Of course, as I pointed out in the *Substantia* paper:³ "the truth is Shirakawa has actually said very little on the subject and what has been said is somewhat vague." While Shirakawa is now sharing additional material that will further add to our understanding of these events, the previous work cannot be criticized for not including details that had never been communicated.

I look forward to a deeper study of this new account from Shirakawa, which will likely change our view of the details of this event. The addition of new sources is a common aspect of historical study, which can often result in refinement, correction, or even drastic re-evaluation of historical events. As with the previous account of Pyun, this will require analysis of Shirakawa's newly presented account and renewed efforts to find consistency between all of the available sources to decide what really happened. Clearly, this will require more significant time and effort than what I have been able to dedicate for the preparation of this short commentary. However, initial review seems that Shirakawa is now implying that Pyun's initial experiment did not produce polyacetylene films, but only "a black flappy or spongy matter". This failed experiment

then served as motivation for further experiments by Shirakawa and his students, which ultimately resulted in the successful generation of polyacetylene films. As emphasized by Shirakawa, Pyun was not involved with these additional experiments and stated that "Pyun's contribution was minimal". This new narrative, however, does not seem to be consistent with multiple statements Shirakawa has made in the past. Such statements include an acknowledgement "to Messrs. H. C. Pyun and T. Ito for the preparation of poly(acetylene) films" in his 1971 paper,⁸ as well as the following statement from his autobiography that describes Pyun's initial product as a film:⁶ "when a visiting scientist tried to make polyacetylene in the usual way, he only produced some ragged pieces of a film." And then, there is of course the acknowledgement to Pyun made in his Nobel lecture:⁵ "...and to Dr. Hyung Chick Pyun with whom I encountered the discovery of polyacetylene film by the fortuitous error." Finally, I must point out that Shirakawa makes various statements concerning the history of organic semiconducting materials that are not supported by our current understanding of the historical record. Rather than enumerate these specific points, I will just encourage the reader to consult my extensive work on this topic for the most current analysis of this history, as well as discussion of the associated historical record.^{1,2}

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