

# Proper Referencing of Prior Art

IN SEPTEMBER 1999, we had published an editorial [1] in IEEE TRANSACTIONS ON ELECTRON DEVICES (T-ED) emphasizing the need for authors to pay special attention while referencing previously published related information. As I had mentioned at that time, omitting related work is not only unfair to researcher(s) who have made earlier contributions to the field but it also gives a distorted view of the topic to the reader. More importantly, it demonstrates an author's lack of knowledge of prior art in their area of research. Hence, there may be significant room for improvement in the technical quality of the manuscript.

Since then, we have continually sensitized the authors to this important issue before adopting the following measures. Every year, the Electron Devices Society (EDS) confers its prestigious Paul Rappaport and the more recent George Smith [2] awards for best papers published in our flagship publications IEEE T-ED and ELECTRON DEVICE LETTERS (EDL), respectively. To reward proper citation philosophy in EDS publications, we have now instituted clear guidelines to take this factor into account in the paper selection process for these awards. Also, we have tightened up the manuscript review process for both T-ED and EDL to make incomplete citations as grounds for rejection.

Another related development worth noting is the publication of an EDS archival DVD. In the not-so-old days, literature search was a major undertaking. One had to physically visit a library, locate the bound volume, and make a photocopy of the article. To help relieve this arduous task of information search and retrieval, in December, 2004 we published an archival DVD. This DVD [3] includes all issues of T-ED from 1954 to August 2004, all issues of EDL from 1980 to August 2004, and all technical digests of the International Electron Devices Meeting from 1955 to 2004. Later issues are available on IEEE Xplore. All articles are in fully searchable PDF format. Since EDS publications capture a substantial portion of important publication activity in the field of electron devices, this DVD should greatly facilitate the referencing process.

A question worth addressing is what constitutes a professional, ethical, and thorough citation philosophy and under what conditions one *may not* have to cite prior art. In most cases, the answer is rather obvious. For example, Ohm's law is *common knowledge*, can be found in *most* textbooks, and, hence, should be used without citation. Next, let us look at some other illustrative examples. Consider the patent disclosed by Shockley dealing with ion implantation [4] in 1957. If a paper discusses a new method of doping semiconductors, it is obligatory to refer to ion implantation and to Shockley's original patent. Absence of ion implantation in the discussion can result in several shortcomings. First, it will give the reader an incomplete view of the current state of the art in the field. Second, proposing a new technique of doping semiconductors without full knowledge of ion implantation and its strengths and weaknesses would make

the contribution amenable to straightforward enhancement. Discussing ion implantation but not referring to the original patent is unfair to the original contributor. On the other hand, if a paper deals with optimizing the doping profile in a junction it may not be necessary to quote Shockley. Let us dig deeper to bring home a subtle point. Let us suppose that an author publishes paper A in the year 2005 on ion implantation properly citing *Shockley* and *subsequent related work* in the field. It could be viewed as highly unethical to restart the clock as of 2005 by solely referring to an author's own work in all future papers dealing with this topic even if they are extensions of paper A. This would give a false impression to a novice that the author is the pioneer in the field, since it would appear that nothing ever took place before 2005.

How about topics are related but not the same? Consider the work done by van der Ziel on thermal noise in JFETs [5] in 1962. If a paper deals with flicker noise in JFETs, it may not be necessary to quote van der Ziel, although it would be desirable. If, however, the paper deals with the calculation of thermal noise in a newly invented device, referral to van der Ziel's original contribution will demonstrate the breadth of the author's knowledge bringing, the author more credibility and respect. Further, the author will be recognized for the fact that he/she has already assimilated van der Ziel's contributions and, wherever possible, the current work takes advantage of this knowledge.

It must also be emphasized that in addition to original contributions, key developments thereafter that impact the current research should not be ignored either. Also, discussion of results from competing research groups that are either at odds or support the current findings constitute a well-written manuscript. Such practices will create a healthy environment where prior knowledge is leveraged to its fullest extent. This will shorten R&D cycles and accelerate the pace of knowledge creation and economic growth. Also, it will result in proper credit being given where it is due, resulting in a win-win situation for everyone involved.

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## REFERENCES

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- [4] W. Shockley, "Forming Semiconductor Devices by Ionic Bombardment," US Patent 2787564, Apr. 1957.
- [5] A. van der Ziel, "Thermal noise in field effect transistors," *Proc. IRE*, vol. 50, no. 8, pp. 1808–1812, Aug. 1962.