

Daniel Solow Author's Award

Jim Hefferon

Saint Michael's College

Professor Hefferon's text *Linear Algebra* has been a model for the open source community. Made freely available in 1996, this was one of the first such texts, and it continues to be perhaps the most successful and the most popular. It has been downloaded millions of times, an average of about 1200 times per week in recent years. It has been adopted at scores of colleges, both in the United States and abroad, at institutions ranging from community colleges to research universities.

In particular, this text is known for its exercises and applications. In a review at theassayer.org/cgi-bin/as-book.cgi?book=29, Ben Crowell speaks to the quality of these aspects of the book.

One thing that makes this book very different from the undergraduate math texts I used is the many interesting applications. Some of these are in separate sections, and some are interspersed throughout the text. The physics applications—such as crystals, electrical networks, and dimensional analysis—are excellent. It's a measure of the quality of the book that I was intrigued by the applications that were outside my specialty, such as voting paradoxes.

The nomination packet for Dr. Hefferon's work spoke directly to how *Linear Algebra* works extraordinarily well for students. Not every student will have the same interests or abilities, but all can be encouraged and supported as they explore the parts of the subject that they can grasp and build on. As recent research has shown, active learning is demonstrably more effective than traditional lecture, and the book's approach helps teachers to get students involved. This is especially true of the application sections that are highlighted in Crowell's review, as they give plenty of opportunity to have students put recently learned theory into context.

Another way that *Linear Algebra* serves students is that it integrates modern technology, particularly Sage, with plenty of fundamental practice in computing and writing. The nominators highlighted how easy it is to supplement the text by using computational tools such as Matlab and Python. This sort of integration is much more smooth with a text with an online version than with a traditional print-only book, because material can be copied or made a link, instead of transcribed.

The clear writing style, tremendous variety of exercises, amenability to use with active learning strategies, and the careful attention to detail in preparation mean that the text is exceptionally adaptable.

The open source nature of the book means that the content is influenced and refined by the larger mathematical community, not just a single author and a handful of reviewers. Many who have used the book have suggested homework problems and other improvements, and contributors are credited in the text materials. Another way in which this book belongs to the whole community is that Prof. Hefferon is extraordinarily generous with his time when instructors using the book have questions or comments.

For being a trailblazer in the open source area and for the impact of the text *Linear Algebra* on undergraduate education, the MAA congratulates Dr. Jim Hefferon with the 2020 Solow Award.

Response

I am honored. Thank you to the MAA, the nominators, and the Solow committee. Thank you also to the community of people who have contributed to the text, particularly Lon Mitchell. And, I share this moment with my wife, who has been incredibly patient and supportive.

Linear Algebra is a key course in the development of students. The undergraduate class that I took seemed to me to consist of a great deal of puzzlement punctuated by brief moments of elaborate subscript

manipulation. When my graduate classes explained it, I felt invited into a world that made beautiful sense. As a teacher I wanted to pass that sense on, and I felt that the students in front of me needed an approach that both respected the mathematics and respected where they were. Today, I sometimes get emails from people saying that the text did help them see that the subject is about ideas. Those notes brighten my day.

The citation mentions the Free license. I wrote the text on a Free system, using Free tools, and since the subject is part of our common mathematical heritage, this approach felt right to me. I must however acknowledge the support that Saint Michael's College has given my professional activity even without a named publisher, which I believe was unusual. I hope that this award helps more scholars and educators see this kind of work as requiring expertise and specialized skills, as time-consuming, as a real contribution to the discipline, and as worthy of professional recognition. Again, thank you.

Biographical Sketch

Jim Hefferon graduated from the University of Connecticut with a thesis in the Theory of Computation. After three years at Union College, he has been at Saint Michael's College in Vermont for almost thirty years. He is active in the TeX community and helped run the archive site CTAN for a decade. Besides *Linear Algebra*, his work in freely available texts includes *Introduction to Proofs: an Inquiry-Based Approach*, and a *Theory of Computation* text that is under development.