

Don't let lecture notes rot

A scientist's legacy is defined not only by their research but also by their teaching. Stronger efforts should be made to preserve and celebrate the exposition of physics at all levels.

Our understanding of physics is shaped by the way we are taught. Compared with formal literature, the more informal nature of lectures allows instructors to give a personal perspective on the topic. One of the privileges of being a student is access to university faculty and their views on both the past and future of physics. Too often, this is as far as these insights spread. The Internet simplifies the task of dissemination, but creating a lasting, discoverable resource isn't as trivial as it may seem.

With some valuable exceptions, the nature of both primary research and review articles do not give authors the freedom to fully express their own views of the subject. Unless they are recorded and distributed more widely, they eventually exist only as students' anecdotes and will ultimately be lost. When scientists make the effort to share their lecture notes and other learning resources online, their work can be appreciated by students and researchers across the world that do not have the good fortune to hear them in person.

Even incomplete notes can be helpful. The late Christopher Henley used to post chapters from a draft condensed-matter textbook on his personal website. These usefully appeared in Internet searches and — at the time of writing — one chapter is cited as a reference for the brief Wikipedia article on supercurrent (<https://en.wikipedia.org/wiki/Supercurrent>). However, these notes also illustrate a common pitfall of online content: the phenomenon of link rot. Web pages are regularly moved, re-organized or deleted, and without careful attention old links become broken. In the case of the chapter cited by Wikipedia, it is currently only accessible because the Internet Archive happens to have stored it.

Traditionally, lecture notes have been preserved through publication as a textbook or review article. Several physics schools, such as the Les Houches School of Physics (<https://www.houches-school-physics.com>), have an admirable record of formally publishing their proceedings. More recently — and especially

during the boom in massively online open courses — initiatives such as MIT's OpenCourseware (<https://ocw.mit.edu>) have preserved video recordings and course materials for selected courses, particularly at the undergraduate level. However, these efforts typically involve some degree of selection or curation, focusing particularly on introductory courses or currently popular areas of research.

Online publishing allows the community to go beyond this level of publication by supporting the 'long tail' of content. Software provides a good example: the vast majority of software is not of interest to the vast majority of people, but when a program finds its niche it can attract a small but dedicated set of users from across the world. Given the specialized nature of research, the same is probably true of advanced physics lectures. Especially at graduate level or beyond, a lecturer is probably the only expert with their particular point of view on a subject and how it fits into the current state of the field. Teaching materials shared online are in a much stronger position to reach their full audience.

The software development community also shows the benefits of providing explicit copyright statements. Whether free or proprietary, source code posted online often comes with a licence. This clarifies the steps — if any — that should be followed to share or modify the software, and gives users the confidence to do so. Allowing redistribution makes preservation more straightforward. Permission to make changes might seem less pressing for teaching materials, but this covers valuable developments such as translations or adaptation to more accessible formats.

In the absence of more formal publication, deposition of notes on a repository or preprint server can alleviate the risk of link rot and typically provides the option to state a copyright licence, which can also be added to a personal homepage. In mathematics, the American Mathematical Society's Open Math Notes (<https://www.ams.org/open-math-notes>) exists to host materials that are works in

progress. However, once course materials are safely archived, there remains the challenge of discovering the most helpful among the many websites and arXiv submissions.

A typical method for finding research articles is by following references in papers. But more introductory material is often only cited to provide a quick justification for some 'well known' result. In the rush to publication, easy references to a standard text like Landau and Lifshitz will always dominate over a more unusual choice that won't be immediately recognized by most readers.

Personal recommendations are likely to have the most impact. Many professors already provide reading lists for their own courses. Particularly when accompanied with an explanation for why each item was chosen, these curated lists are an excellent way to find alternative approaches to the same topic. Physicists giving talks often quote expository work by famous scientists like Philip Anderson for rhetorical effect, but audiences might also benefit from being pointed towards particularly well-written introductions from other researchers. The increasingly common practice of placing slides online makes such references themselves more widely accessible, and provides some record of the citation.

More generally, we could all make more of an effort to read and digest other physicists' teaching, and share it with our colleagues. The focus on keeping up with the pace of the latest research makes it difficult to appreciate teaching resources that aren't the ones we learnt from. However, taking the time to read and appreciate others' perspectives — even in one's own speciality — can deepen our physical understanding. By making the effort to promote different and insightful ways to present a difficult topic we can help those entering the field to come up to speed quickly, rather than battling to understand terse research articles from first principles. □

Published online: 2 December 2020
<https://doi.org/10.1038/s41567-020-01122-x>