



## ImmunoHorizons: The Immunology Education Destination

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We all have that moment when we first fell in love with immunology. We might have become interested at first when we wanted to know how we fight disease or how vaccines work or why we sneeze and itch so much. But there was something that really made us fall in love. It could have been when you saw your first precipitin line when you ran an Ouchterlony and could visualize Ag–Ab complexes. Maybe it was the beautiful symmetry of an Ab molecule. Perhaps it was the elegant specificity that arose out of gene recombination. Or maybe it was the orchestra of an immune response that culminated in memory. For me I think it was the prospect of understanding cellular communication at the molecular level—that, and the fact that immunologists seemed to have a sense of humor. I still remember one of my first graduate immunology classes when the professor was describing hapten–carrier interactions and referred to the carrier as the schlepper molecule. If there was a high hapten ratio it was a big schlepper. I could relate.

All of those examples highlight the importance of making a connection in class between the material and the students. Often the instructor can project so much passion (because who isn't passionate about immunology?) that the students have no choice but to become entranced. But the right topics, the right depth, and the right pedagogical approaches are all critical in making that connection. Two recent *On the Horizon* articles turn a spotlight on the importance of immunology education.

The American Association of Immunologists (AAI) Education Committee recently published its recommendations for an undergraduate immunology course curriculum (1). Across 15 tables, the committee has presented a detailed outline of topics that can or should be covered in an immunology course. Each table lists the foundational concepts, the key subtopics, and the related advanced topics that can be pursued when time (and the class level) permits. Experimental approaches are also listed and highlight how much of our immunological insights is derived from advances in our ability to interrogate the

immune response. The curriculum progresses from basic concepts to integrating those initial lessons into broader and systemic immune responses in the context of immunity to infection and disease. The authors finish with a statement on diversity, equity, and inclusion that is informative in considering approaches to teaching the material in the 21st century.

Justement and Bruns (2) take a more pedagogical approach in addressing undergraduate immunology. From the perspective of undergraduate biology education needing broader reform, the authors propose that the multidisciplinary scope of immunology is ideal for providing undergraduates the framework for learning concepts in biochemistry, cell biology, and genetics that are foundational not just for immunology but for scientific study in general. With that approach, immunology education is both a goal and a tool for educating students and preparing them for a variety of fields. The article summarizes not only topics for some of the proposed courses but also skills and competencies that are critical for student success. This approach would revolutionize immunology education, but also produce a much more immunologically informed student body. In the middle of a pandemic in which only half of Americans are vaccinated, the need for immunological literacy has never been more important.

In discussing immunology education, it is also useful to highlight the numerous immunology teaching and education resources that are found on the AAI Web site (<https://www.aai.org/Education/Teaching-Resources>). Material spans teaching tips, laboratory exercises, material designed to reach a lay audience, and how to use resources from *The Journal of Immunology* in your classes. There are even a couple of games. If you're an educator looking for innovation, this is a great starting point. Some material is so up to date that it even includes sections on COVID-19.

*ImmunoHorizons*, ever peering at the future of immunology, looks forward to more submissions on the pedagogy of immunology. We invite original research articles that are focused on immunology education. As a peer-reviewed society

journal, we are committed to improving immunology education and making the next generation of scientists more immunologically literate. Imagine how immunology education now will impact how we handle the next pandemic.

**Mark H. Kaplan**

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On Twitter @statfourwork

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