

## Multimedia in Biochemistry and Molecular Biology Education

### Commentary: Metabolism: Dull, Lifeless, and Boring?

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You can be assured that every commentary that has a question as its title will not answer the question it poses. The intersection of circumstances that gave rise to this question was first that teaching metabolism to my current class of undergraduates seems onerous due to the “why do we have to learn this?” mentality, and second the publication of a kindred editorial, “Biology: Dull, Lifeless and Boring?” [1] by John Tranter. I am finding it hard work to inspire students that they are getting a cutting-edge education when I am teaching them material that is little different in content to my own undergraduate education in the 1960s. The information is not much different, but the means of presenting it and the circumstances of teaching have changed dramatically in the computer age. Some students complain that metabolic pathways are nothing but rote learning. This complaint annoys me, but I am sure there are many teachers who have also come to this view because I know lecturers in traditional courses who have changed content to offer less detail about metabolism. This overcomes the problem of student reaction to rote learning, but I happen to be of the old-fashioned view that students should also know something as well as knowing how to find information. I also believe that students who do learn the pathways are in a stronger position to progress to an understanding of the chemical constraints and evolutionary selective factors that have made metabolism a 3-billion-year success story.

In “Biology: Dull, Lifeless and Boring?” [1], John Tranter asserts that biology often leaves students disaffected, lacking enthusiasm, and bored. He ascribes this result to teachers who lack inspiration and who fail to use multiple approaches to illustrate the material. “If the exam questions are routine, largely testing factual recall, all the more reason to show pupils that biology teaching can rise above the mundane” [1]. Tranter correctly identifies a culture of focused learning by students to achieve maximum marks at examination, a result that can be achieved with little understanding and wonderment. Some teachers also fall into a teaching style that optimizes student marks, but makes no reflection on understanding and motivation. Tranter additionally identifies underfunding of teaching as

a contributory factor and the adoption of risk-averse strategies for a litigious age. Good teaching and varied approaches will overcome most of the adversity that Tranter addresses.

In large classes, there are students who will succeed and enjoy metabolism independently of the teaching. There are some who could never be motivated to enjoy metabolism and seem to be over-represented in my impressions of current students. Admittedly, this is a subjective view distorted by selective feedback. Yet there is the majority that can be reached and inspired and saved from the ranks of the disaffected. The web and multimedia have made this ever more achievable and reminded me that “the good old days” were not quite so good. In going through the Calvin cycle, for which my students do not need to learn individual steps, I show a diagram from the Conn and Stumpf biochemistry textbook I used as an undergraduate [2]. A euphemistic description of the diagram would be “inaccessible.” I confide to the students that I never truly understood the subtleties of the Calvin cycle as a student, despite protracted staring at the diagram. Textbooks have come a long way in making metabolism livelier through multicolor artwork created by professional artists using computer drawing programs. In addition most, textbooks offer a CD of animations that can be used to bring metabolism to life. My class uses the Voet and Voet text [3], and the accompanying CD has an animation of the Calvin cycle that annotates each step. The animation works well when the textbook is used in tandem to show the big picture. We also issue our own in-house computer tutorials on metabolism that are assessable so that we exploit both intrinsic and extrinsic motivation to learn. I commend students to look up the mini maps of pathways on the web [4], created by the inimitable Donald Nicholson, who has a passion for metabolism. To somewhat misquote Shakespeare, there is nothing dull in metabolism, but failure to use the resources available makes it so.

#### REFERENCES

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- [3] D. Voet, J. Voet (2004) *Biochemistry*, 3rd Ed., John Wiley, New York.
- [4] D. Nicholson (2004) IUBMB-Nicholson Minimap, available at [www.tcd.ie/Biochemistry/IUBMB-Nicholson/](http://www.tcd.ie/Biochemistry/IUBMB-Nicholson/).

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