Personal Reflections on Research-Teaching Linkages

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"I just want the facts, man . . ."

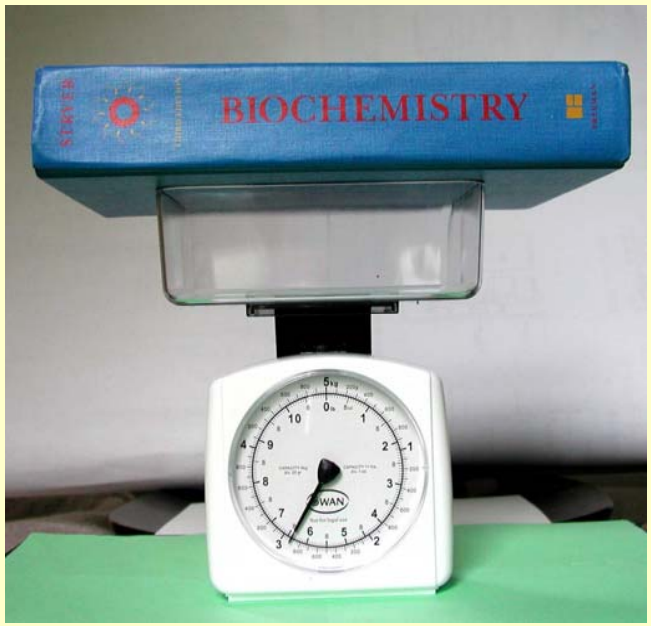
What do we teach, what is in the textbooks?

I believe that in Biochemistry and probably all the other Biosciences we have always taught:

- The facts
- Techniques
- Experiments
- The interpretation of experiments

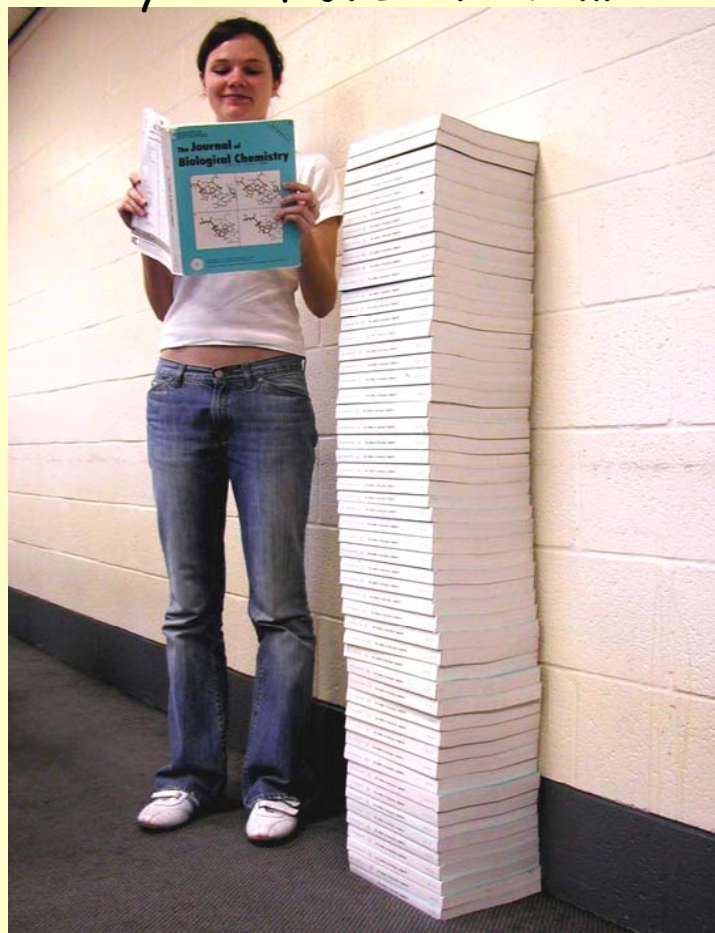
The information explosion

The amount of information in Biochemistry and the Biosciences is increasing exponentially



3kg plus

One year of *J. Biol. Chem.*



Knowledge: a mountain or a stream?*

"Is knowledge a mountain of fact for the learner to conquer or is it an ever-changing stream of theories and new conceptions through which one must learn to swim? Should students master facts or develop problem-solving skills?"

[*D E Dermer (1997) *Science* 275, 1859]

Knowledge: a mountain or a stream?

Is information a mountain to be conquered, or a stream to be embraced?

Present traditional methods of teaching are not equal to the task of dealing with an increasing mountain of knowledge

What's in the textbooks?

Even from 'A' level, the textbooks have described experiments and their interpretation as well as how to design experiments – controls, replicates, etc.

Some examples* . . .

(*removed from this version)

What are laboratory practical classes for?

- Teach technical skills
- Illustrate equipment
- Show how information is obtained (controls, replicates, etc)
- Teach the planning of experiments
- Reaching conclusions
- Teach writing reports
- Learn about safety, ethics
- Etc, etc

This may be a fairly gentle process leading up to a lab research project in the final year

Hasok Chang (UCL): "Enrich yourself, and the world"
Times Higher Education Supplement 2007

"I have been in favour of making research an integral part of learning ever since having an inspiring experience of independent research during my own undergraduate years."

The research project

This can be the ultimate experience in the undergraduate course – experience of actually doing novel research

What does the Subject Benchmark say?

However, there may be limitations because of space and costs ['wet' *versus* 'dry' projects]

Advantages: see how research is done, look at background literature, plan experiments, see problems and troubleshoot, interpret, present data

To what extent can this be taught or prepared for?

Final-year teaching

In many Biochemistry courses they teach the final-year course on the basis of the current literature.

Clearly this requires that students be able to access and read the scientific literature efficiently.

(This ties in with the research project:
= "Enculturation")

Learning how to do research

"I was brought up to believe that finding out how to find things out was rather more important than what you actually found . . . in trying to educate young scientists, simply telling them how things were, that was the lazy way. In other words knowing how we know is at least as important, for a real scientist, as what we know."

Tim Hunt, 2005

Building the R-T link into a curriculum

Does it happen formally or informally?

If formally, how is it built into programmes?

Who is going to do the teaching?

(Most teaching staff have experience of carrying out research even if they are no longer research active?)

Conclusions

1. Teaching in the Biosciences has always taught about the research that produces the facts.
2. Students are taught that the facts can change if new evidence demands it.
3. Teaching is done by individuals who understand how research is done.
4. The research project and final year teaching reinforces this.
5. It is unclear whether incorporation of R into T is properly planned and its effect assessed.