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News

W. W. Sawyer passes away



Mathematician's Delight. Image from [5m@5hYdez's flickr account](#), reproduced with permission.

Walter Warwick Sawyer was a mathematician and author who made a major contribution to mathematical education. He recently passed away in Canada, aged 97.

Sawyer was born in 1911 and won scholarships to [Highgate School](#) and [St John's College, Cambridge](#). After becoming head of mathematics at [Leicester College of Technology](#), he became interested in the applications of mathematics to industry, and developed a scheme in which apprentices learnt mathematics by handling physical objects. In 1943 he published his first and most successful book *Mathematician's Delight*, which has been in continuous publication since and has sold about 500,000 copies.

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In 1948 he became the head of mathematics at the University of Ghana, and from 1951 to 1956 he lectured in Canterbury College, New Zealand. During the period 1957 to 1964, Sawyer became a loud voice criticising many aspects of mathematics education, and in 1965 was appointed Professor jointly to the Departments of Mathematics and Education in the University of Toronto. After retiring in 1976, he wrote his final book, *A First Look at Numerical Functional Analysis*.

Sawyer was very much concerned with the practical applications of mathematics. He considered that students taught mathematics without an appreciation of its application would have no more understanding of what they were learning than a machine. His love of mathematics is seen in the title of his first book, *Mathematician's Delight*, whose aim was to "dispel the fear of mathematics":

"Many people regard mathematicians as a race apart, possessed of almost supernatural powers. While this is very flattering for successful mathematicians, it is very bad for those who, for one reason or another, are attempting to learn the subject."

He considered that teachers should work with students' minds and talents, rather than force foreign concepts on them.

"Education consists in co-operating with what is already inside a child's mind... The best way to learn geometry is to follow the road which the human race originally followed: Do things, make things, notice things, arrange things, and only then reason about things."

Sawyer's understanding of how we learn mathematics, along with his practical approach, has meant that *Mathematician's Delight* is one of the most successful introductions to mathematics ever written. It tackles algebra, graphs, logarithms, trigonometry, calculus and imaginary numbers, all with real-life examples. Sawyer's overarching thesis is that the theory within mathematics is not as important as its real-life application for example, the Pyramids were built on Euclidean principles three thousand years before Euclid formulated them.

An interesting recollection of Sawyer's explains how it dawned on him as a teacher early in his career that if he could communicate the purpose of mathematics, students would stay interested in his classes:

"In a class I was taking there was one boy who was much older than the rest. He clearly had no motive to work. I told him that, if he could produce for me, accurately to scale, drawings of the pieces of wood required to make a desk like the one he was sitting at, I would try to persuade the Headmaster to let him do woodwork during the mathematics hours in the course of which, no doubt, he would learn something about measurement and numbers. Next day, he turned up with this task completed to perfection. This I have often found with pupils; it is not so much that they cannot do the work, as that they see no purpose in it." (A European Education)

In *Mathematician's Delight* he compared learning mathematics without context to a deaf child learning to play the piano:

"Nearly every subject has a shadow, or imitation. It would, I suppose, be quite possible to teach a deaf and dumb child to play the piano. When it played a wrong note, it would see the frown of its teacher, and try again. But it would obviously have no idea of what it was doing, or why anyone should devote hours to such an extraordinary exercise. It would have learnt an imitation of music, and it would fear the piano exactly as most students fear what is supposed to be mathematics. What is true of music is also true of other subjects. One can learn imitation history kings and dates, but not the slightest idea of the motives behind it all; imitation literature stacks of notes on Shakespeare's phrases, and a complete destruction of the power to enjoy Shakespeare."

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In his book, *A Concrete Approach to Abstract Algebra*, Sawyer explains how practical examples are the key setting up a mathematics course, and how, even if this takes longer, it is a better approach than simply stating "every axiom" as the student will be able to apply mathematics in other areas of life:

"In planning such a course, a professor must make a choice. His aim may be to produce a perfect mathematical work of art, having every axiom stated, every conclusion drawn with flawless logic, the whole syllabus covered. This sounds excellent, but in practice the result is often that the class does not have the faintest idea of what is going on. Certain axioms are stated. How are these axioms chosen? Why do we consider these axioms rather than others? What is the subject about? What is its purpose? If these questions are left unanswered, students feel frustrated. Even though they follow every individual deduction, they cannot think effectively about the subject. The framework is lacking; students do not know where the subject fits in, and this has a paralyzing effect on the mind."

"On the other hand, the professor may choose familiar topics as a starting point. The students collect material, work problems, observe regularities, frame hypotheses, discover and prove theorems for themselves. The work may not proceed so quickly; all topics may not be covered; the final outline may be jagged. But the student knows what he is doing and where he is going; he is secure in his mastery of the subject, strengthened in confidence of himself. He has had the experience of discovering mathematics. He no longer thinks of mathematics as static dogma learned by rote. He sees mathematics as something growing and developing, mathematical concepts as something continually revised and enriched in the light of new knowledge. The course may have covered a very limited region, but it should leave the student ready to explore further on his own."

His books include:

- Mathematician's Delight (1943);
- Prelude to Mathematics (1955);
- A Concrete Approach to Abstract Algebra (1959);
- What Is Calculus About? (1961);
- Introducing Mathematics (1964);
- Vision in Elementary Mathematics (1964);
- A Path to Modern Mathematics (1966);
- The Search for Pattern (1970);
- An Engineering Approach to Linear Algebra (1972);
- A First Look at Numerical Functional Analysis (1978).

Marc West



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