"GEOMETRICAL INVESTIGATIONS"

John Pottage.

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U.S.A. (xxi + 480 pp.)*   £26.95 (stg.)

Here they are again - Galileo's famous trio - Salviati,
Sagredo and Simplicio, reconstructed with great literary
skill by the Professor of the History and Philosophy of Science
in the University of Melbourne.   In fourteen dialogues they
discuss various geometrical problems about ratios of perim-
eters, areas and volumes, leading up to the evaluation of the
perimeter of an ellipse and other matters.   The dialogues are
followed by interesting historical notes and geometrical pro-
blems for the reader to solve for himself, with some hints to
help him.   The book is beautifully reproduced, with many
diagrams.

The keyword of the book is <u>heuristic</u>, a word of which I
had forgotten the meaning, possibly for Freudian reasons.   It
means, of course, the art of discovery, but also includes a
method of teaching in which the student finds out things for
himself.   Throughout my life I have hovered between mathemat-
ics and physics, and if I now regard myself as a mathematician
rather than as a physicist, it is because when I was a school-
boy about 1912, physics was taught heuristically and mathemat-
ics was not.   The heuristic method, it seemed to me, was ess-
entially dishonest, involving a pretence that you did not for-
see the result of the experiment before you did it.   And all
this dithering took up so much time that you really got now-
here.

In these dialogues I was at first fascinated by the dis-
cussion in which the particular was gradually generalised, but
it seemed to me that Salviati was holding back.   The others
seemed to have learned little during their absence of three
centuries and so they were feeling their way.   I was shocked

when Salviati obtained the perimeter of an ellipse by integ-
ration; had I been writing the dialogue I would have made
Sagredo and Simplicio shout with one voice: "Why the hell have
you been wasting our time?"

It reminds me of Churchill saying "Give us the tools and
we will finish the job!"   In mathematics and physics we use
tools, and it is a delicate question in education how much
attention to devote to their manufacture and how much to their
use.   No teacher in his right mind would ask a student to
accept, *ex cathedra*, that the derivative of x^n is nx^{n-1}, but
neither would the student want to go through the proof every
time he needed to differentiate x^n.   The tool has been made:
now it is up to him to use it.   It is fascinating to think of
Euler using imaginary numbers as a tool without knowing what
he was talking about.

We should be grateful to Professor Pottage for reviving
the dialogue as a scientific literary form.   It has great
possibilities.   Why not switch from geometry to physics?
It was Galileo's physics, not his geometry, that got him into
trouble.   Perhaps we might meet his great trio again, repres-
enting, let us say, Einstein, Bohr and Schrödinger, but which
of them should take the dominating role of Salviati I do not
know.

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