Exploring mathematics: a powerful tool

The Newton-Leibniz dispute

Anna Southgate
This set the scene for a bitter and pointless dispute between the supporters of Newton, and the supporters of Leibniz, as to who invented calculus first.

As we've seen, both were leading figures in the creation of calculus as a powerful working theory, but they were by no means the only contributors. Descartes, Fermat Wallis, Barrow and Pascal, all played key roles.

Jeanne Peiffer
It was a truly international effort which was started by Descartes and Fermat, at the beginning of the seventeenth century. It was developed in later centuries by other French mathematicians.

Jeremy Gray
And we haven't even mentioned the work of James Gregory yet. He was a Scottish mathematician, and in 1668 he published some work, which was quite similar to the things that Newton and Leibniz were discovering, and he was in Italy at the time. But his work was even harder to read, and wasn't much appreciated in his lifetime I'm afraid.

Anna Southgate
The Newton/Leibniz dispute became more and more acrimonious, and contributed to a growing divide between mathematicians in Britain, and those in Europe.

Niels Jahnke
The dy/dx notation wasn't used in England until the 1820's, and only after a campaign which involved Charles Babbage, the inventor of the calculating engine, finally it was introduced into English mathematics.

Anna Southgate
And by then, long after the deaths of Newton and Leibniz, yet another notation had been developed, back where our story began, in France.

Jeanne Peiffer
By the early nineteenth century, a new notation was introduced by Lagrange in Paris, which was again the centre
of the mathematical universe. Lagrange called the gradient, derivative of f, and noted it f'(x). Today, the two notations dy/dx, and f'(x) are used almost interchangeably.

Anna Southgate
The result of all these new ideas, is today's calculus. So, if we want to find the gradient of a curve, at any point on the curve, we use the derivative notation, f'(x), or dy/dx, and in many cases there are standard formulas.
Also, if I want to find the area under a curve, this time you use Leibniz's long S, the integral notation, and again, there are many standard formulas. The remarkable thing about this, is that these two are actually related. In fact, to find the area formula I work backwards from the gradient formula and this is what Leibniz and Newton discovered.

Jeremy Gray
There's a bit in the Principia that I very much like, right at the end of the preface, when Newton says,

"and I heartily beg, that what I have done, may be read with forbearance, and that my labours, in a subject so difficult, may be examined, not so much with the view to censure, as to remedy their defects".