

Some Mathematicians Like it Hot: Fourier and Descartes

Daniel Mathews

March 26, 2003

Those of us who study mathematics are all accustomed to bandying about mathematicians' names. We throw them around all the time when we do mathematics, quoting their theorems, using their methods, retracing their thoughts, imagining their genius, but most often scratching our heads. Their mathematics is often more than enough for anybody's brain to handle. Some mathematicians' names are enough to make your head spin; others are enough to make you want to scream!

Rarely, however, do we get a glimpse into the lives of great mathematicians. Rarer still is a glimpse into the quirks and idiosyncrasies that a life in mathematics almost invariably produces! For every great mathematician there is a story: sometimes heroic, sometimes controversial, sometimes romantic, sometimes tragic. Behind most there is at least one story of gross ineptitude.

The stories of Fourier and Descartes' demises are in a class of their own — flowing from gross miscalculations of elementary properties of the temperature scale!

Jean Baptiste Fourier (1768–1830) is certainly counted amongst the greatest mathematicians and scientists of all time. Anybody who has studied applied mathematics will have heard of Fourier series. Many of his discoveries came as a result of his investigations into what is today called thermodynamics — the nature of heat. In his work he developed the notion of the Fourier series, an infinite trigonometric series approximating any periodic function. Incidentally, what is today called Fourier's theorem, while stated by Fourier himself, was not proved properly until 150 years later, and indeed his writings were riddled with mistakes and inaccuracies. Nevertheless, his theorem broke new ground in areas where other great mathematicians like Euler, Daniel Bernoulli and Lagrange had not, and won him the Grand Prize of the French Academy of Sciences. But it was his work as a physicist — in particular, his fascination with heat — which took his predilections in an unexpected direction. He liked it hot!

René Descartes (1596–1650) is, of course, a household name in mathematics and philosophy. He signed his name *Renatus Cartesius* to his works (which were in Latin), hence the origin of the term 'Cartesian' to describe his thoughts. It's difficult now to believe that there was actually someone who invented the Cartesian coordinate system, and the whole idea of representing geometric points by

co-ordinates. But there was a time when these things were not invented, and before which nobody had used them, and nobody had even thought of them — and that time was not so long ago in historical terms. Before that all of geometry was in the vein of the ancient Greeks. His philosophy is also, of course, foundational to much Western thinking.

Returning to the thermophile Fourier, he served as a soldier in the French Revolution and under Napoleon, and accompanied Napoleon to Egypt in 1798. There, so the story goes, he suffered a disease of the thyroid which heat helped to relieve. And so Fourier developed a belief in the healing power of heat — the more heat, the better! Not only did this spur on his work in thermodynamics, it also gave him a much hotter lifestyle!

Fourier took to wearing layer upon layer of clothes, no matter what the weather. He stoked up the fireplace and cranked the heating to ever hotter temperatures. His house was unbearable for guests to visit. Even if Fourier did find it uncomfortable, he bathed gladly in the heat, believing it could only do him good. He became ever more wary of leaving his house, where much more moderate but ‘unhealthy’ low temperatures prevailed.

But it did not do him so much good. He cooked his own goose. The extreme heat exacerbated his heart condition and undoubtedly accelerated his demise.

Descartes also liked it hot, though perhaps not as hot as Fourier. He was happy enough to be snuggled under the sheets of his bed. Indeed, bed was where he spent a lot of his time. He was part of a wealthy family, and lived a pampered lifestyle. And despite his incredible mind, it was trapped in a very frail body (a very Cartesian distinction!). The story goes that his greatest discoveries — including, of course, the Cartesian coordinate axes — came to him while in bed. (Have you ever heard a better reason to sleep through your next 9am lecture?) His family let him sleep in as long as he liked, and his career as a gentleman officer in the Dutch and Bavarian armies also allowed him no shortage of rest!

Unlike Fourier, if Descartes had stayed warm, he probably would have been fine. But if you thought nothing could tempt Descartes out of bed, you thought wrong. Queen Christina of Sweden invited Descartes to become her personal live-in philosophy tutor. Descartes was offered a position in her court — a life amongst royalty. After some consternation, Descartes finally accepted.

Descartes had two problems.

The first problem was (and still is) that Sweden was not a very warm place. It certainly wasn’t the sort of place conducive to the longevity of people as fragile as René Descartes. However, you can suppose that Descartes could have spent plenty of time in bed and wouldn’t have caught too much of a chill. Indeed, for some time he did precisely that, as Queen Christina remained engrossed in the frivolities of the court.

This, however, did not last for long. Problem number two was Queen Christina of Sweden, once she regained a taste for philosophy: a young, healthy, energetic and demanding woman with little consideration for the frailty of her genius guest or his proclivity for extreme somnolence. And she was a morning person. (Not a mathematician, obviously.)

The disruption to Descartes’ usually rather light morning schedule was ter-

minal. The queen woke him three mornings a week at 5 am, which would be painful enough for a fit and healthy person, but was devastating for one like Descartes. No amount of coffee could save him; the extreme cold and early mornings ruined his health. He contracted pneumonia and was dead within months.

The moral of the story? Beware of those cold early morning starts - they can kill you!