# The Closing Bracket ...

Professor William Thurston (1946–2012), who passed away in August of this year, was one of that rare breed: a high level research mathematician who made worthy contributions to school level mathematics education. His work in geometry had an enormous influence on mathematics at the research level (it won him a Fields Medal, in 1982); and his paper titled "Mathematical Education" was studied very closely by the team (appointed by NCERT) that prepared the Mathematics Position Paper of the National Curriculum Framework 2005.

The following poignant question once appeared on the 'Math Overflow' site: "What can one contribute to mathematics? I find that mathematics is made by people like Gauss; while it may be possible to learn their work and understand it, nothing new is created by doing this. It seems plausible that, with all the clever people working so hard on mathematics, there is nothing left for someone such as myself to do. Perhaps my value would be to act more like cannon fodder?" Thurston's deeply thoughtful and humane response to this has great value for us and is worthy of careful study. Here are some extracts:

*It's not mathematics you need to contribute to. It's deeper than that: how might you contribute to humanity and to the well-being of the world by pursuing mathematics? Such a question is not possible to answer in a purely intellectual way, because the effects of our actions go far beyond our understanding. We are deeply social and instinctual animals, so much that our well-being depends on many things we do that are hard to explain in an intellectual way. That is why you do well to follow your heart . . . . Bare reason is likely to lead you astray. None of us are wise enough to figure it out intellectually. . . The product of mathematics is clarity and understanding. Not theorems, by themselves. Is there any real reason that even such results as Fermat's Last Theorem, or the Poincaré conjecture, really matter? Their real importance is not in their specific statements, but their role in presenting challenges that led to developments that increased our understanding. . . . The world does not suffer from an oversupply of clarity and understanding. How and whether specific mathematics might lead to improving the world is usually impossible to tease out, but mathematics collectively is extremely important. . . . I think of mathematics as having a large component of psychology, because of its strong dependence on human minds. Dehumanized mathematics would be more like computer code. Mathematical ideas, even simple ideas, are often hard to transplant from mind to mind. . . . Because of this, mathematical understanding does not expand in a monotone direction. . . . The real satisfaction from mathematics is in learning from others and sharing with others. All of us have clear understanding of a few things and murky concepts of many more. There is no way to run out of ideas in need of clarification. The question of who is the first person to set foot on some square meter of land is really secondary. Revolutionary change does matter, but revolutions are few, and they are not self-sustaining — they depend very heavily on the community of mathematicians.*

May that act as an inspiration to the community of math writers like ourselves!

– Shailesh Shirali