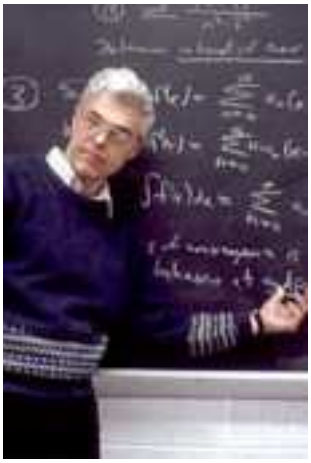

Know Your Wisconsin Mathematician

Interview with **Prof. Phil Straffin** by J. Sriskandarajah

What impression did grade school have on you mathematically? Was that where you became interested in mathematics?

I don't remember being very interested in elementary school mathematics, but I was good at it. My fifth grade teacher taught mathematics by having us do worksheets in a workbook. She was not happy when I brought her the workbook in the third week with all the worksheets for the year done. Poor Miss Patton had no idea what to do.

I felt the same way about mathematics in high school. I was much more interested, for instance, in Russian literature. I had no idea that a mathematics problem could be so hard and interesting that you could stay up late at night to solve it, but I spent many late nights discussing Dostoevsky.

What town did you grow up in?

I grew up in an unincorporated area of Westchester County, New York, which we used to describe as "across the tracks from Scarsdale." My high school—Edgemont—was small but good: of the 97 people in my senior class, 94 went to college. Claire Newman, who taught me calculus, had a Ph.D. in mathematics and was active in the NCTM.

And your undergraduate school was Harvard , M.A from Cambridge and Ph.D from UC-Berkeley, very impressive, Please elaborate on these experiences.

At Harvard it was assumed—or at least I thought it was assumed—that if you were good in mathematics you would take the graduate sequences in real and complex analysis in your junior and senior years, which I dutifully did. And I took courses from some wonderful mathematicians: Oscar Zariski, Lynn Loomis, John Tate, David Mumford. I learned that mathematics was hard and deep, but I still didn't have a sense that it was beautiful or exciting.

At Cambridge I had the great good fortune to have Ray Lickorish as my pure maths tutor and DeWitt Sumners as a fellow Marshall scholar. I learned what topology was, and I became fascinated by knot theory. (I also learned to play Sprouts from a graduate student named John Conway who hung around in the maths common room.) I decided I wanted to write a thesis in knot theory, and I went to Berkeley because John Stallings was there. Alas, when I arrived, Stallings told me that he was now interested in combinatorial group theory. I wrote my thesis under Emery Thomas in algebraic topology, but I missed the concreteness of knots.

Berkeley did two other things for me. It gave me a chance, during a mass Vietnam War protest, to put a flower in the barrel of a tank—surely a rare and valuable experience. And it gave me two chances to teach, that scary activity of standing in front of a class of students for an hour trying to say things which might be useful to them. The first was as a T.A. for Leon Henkin's pioneering course on mathematics for elementary school teachers. (One of the other T.A.'s, and our chief builder of geometric models, was a very smart graduate student named Bill Thurston.) The second was teaching abstract mathematics by the Socratic method to elementary school children in Oakland with project SEED in its first years. I learned that teaching was not only possible, but could be exciting.

How did you end up at Beloit College?

In my last year at Berkeley the campus was surrounded by Oakland police while helicopters sprayed tear gas. The ROTC building, the draft board and the university main gate—all within a block of our apartment—were bombed. Finally a fire bomb burned the building next door, and Judy and I ran out into the street carrying some strategic clothes and my thesis. We decided that it was time to leave. April 1970 was late in the first year of the Ph.D. job crunch, and there were just two jobs available on the west coast, so I applied to some small schools in the quiet Midwest. Beloit had a last minute opening, and I was very impressed with its interdisciplinary program. It seemed like a good place to go for a few years. Of course, I ended up liking it so much that I have stayed for 36 years.

When were you and Judy married?

Judy and I were married just before we went to Berkeley in 1967.

And how about your son?

Ethan was born at the end of my first year at Beloit. Judy and I had been very active working for a progressive Congressional candidate who won. Ethan was born nine months after election night.

Did your expectations for the students change ability-wise or activity-wise over the years?

I think my students would tell you that I've always had them do a lot of work. Surely doing mathematics is the only way to learn it, and I've also wanted my students to do projects in which they learn mathematics on their own, organize it, and present it clearly to me and to their peers. I taught Beloit's first "cooperative Moore method" courses in the late 70's, and developed our Mathematical Modeling course in which student teams work on real problems and write and present consulting reports.

However, I have cheered for and followed—and perhaps help lead through the ACM/GLCA Calculus Reform Project—the trend toward more activity-based and cooperative learning of mathematics. Although I like to lecture and may still do it for part of a class, I have students working in groups in almost every class. I enjoy circulating to help, and the feeling of clearing up problems quickly and reinforcing good problem solving techniques. In all my classes for the past five years I've allowed students, if they wish, to turn in problem sets in pairs. I've found that doing that works very well for many students.

As for your own professional career, what areas of mathematics did you study?

My thesis was in algebraic topology, systematizing the construction of secondary twisted cohomology operations, and my first paper was about new algebraic identities in the Steenrod algebra. Teaching in Beloit's interdisciplinary atmosphere broadened my mathematical interests considerably. For instance, I was inspired by a Chautauqua course from Bill Lucas and a sabbatical term working with him and other game theorists in the Department of Operations Research at Cornell University, to create an interdisciplinary course in Game Theory. This led to joint work with Steve Brams and other political scientists, twenty papers on voting theory, mathematical political science and game theory, and my MAA book *Game Theory and Strategy*.

Also in the 1970's I was inspired by Li and Yorke's paper "Period Three Implies Chaos" to find a graph theoretic proof of a generalization of Li and Yorke's result, which we in the West later learned had been proved in 1964 by Sharkovsky. This interest led to a sophomore level course on

in chaotic dynamical systems at Beloit, and work on the structure of the Mandelbrot set on a sabbatical with Bob Devaney at Boston University.

In the 1990's Darrah Chavey created a course on ethnomathematics at Beloit, and he and I, and students in their course projects, have developed a great deal of material for this course. It has also led to half a dozen research papers.

Finally, with the collaboration of Bob Messer at Albion College, the material I have taught at Beloit for many years in a "hands-on" geometric topology course is now available from the MAA in *Topology Now!* (2006). Our hope is that this will show students some of the ideas which first got me excited about mathematics at Cambridge.

How long were you department chair?

I was Chair from 1980 to 1990. My first initiative was to formalize Beloit's computer science offerings into a track in mathematics and computer science, and change the department name to Mathematics and Computer Science.

What does your wife think of mathematics?

Judy is an English professor and a poet. She likes to hear me talk about mathematics, but more for the sound of the language than the mathematics. Since she's listened to so much mathematics, she writes pretty good mathematical doggerel. When we got married and went to Berkeley she presented me with a celebratory ode which began "He held the torus high, from Cambridge to the West…"

How about your family, your son? Did any of them show any promise in mathematics?

Ethan has an MA in Computer Science from Stanford and writes parsers which turn the print versions of science and medical journals into web versions. As an undergraduate CS major he took a fair amount of mathematics, but he never was seriously attracted to it. I remember Ethan's best friend Chris, now a mathematics professor at Williams, trying to explain why abstract algebra is beautiful, and Ethan not quite believing it.

What are your hobbies, rock climbing….

Well, I'm not really a rock climber, but I am a pretty good non-technical mountaineer. Colorado has 54 peaks over 14000 feet, and I've climbed 40 of them, and more than 100 other Colorado mountains. I've hiked 5000 miles since beginning to split my time between Beloit and Colorado in 2002. Being out in high, wild, beautiful places makes me feel completely alive.

I also like choral singing, classical music and curling up with a good book on rainy days.

What do you think is the best part of mathematics and being a mathematician?

As a mathematics teacher, the best part is the people you get to work with. Beloit has been a wonderful place to have a career: eager students (as well as a few less eager ones), wonderful colleagues, a supportive administration.

As a mathematician, the best part the ideas you get to spend your time thinking about. Are there other areas where you can get so engrossed in a problem that when you look up it's several hours later (and maybe students are standing at the door telling you you're late for class)? Or wake up at night with a Eureka moment (and have your spouse turn over in bed muttering, "Oh, it's just

mathematical excitement…") And I've also been lucky enough to be able to follow my interests as they evolved into new areas.

How about the worst part?

Grading! I've always believed that to learn mathematics students need to turn in work and get feedback from me every week, and that they need to write. At three classes per semester, that's a lot of student papers

What of your work do you like the best? What are you most proud of?

Well, I certainly love teaching, and I'm proud of the first Wisconsin Section Teaching Award and of the Haimo Award. But I also love writing, though I find it hard work. In each area of mathematics I've worked in, I've tried to write something I could be really pleased with. In game theory, I'm most proud of the game theory book; in political science, a 1984 Mathematics Magazine paper on parliamentary coalitions with Bernie Grofman, which won an Allendoerfer prize; in ethnomathematics, Mathematics Magazine papers on the Maori game Mu Torere in 1995, and Chinese mathematician Liu Hui in 1998; in topology, the new Topology book.