G – Gaurav Suri
W – William Campillo
S – Steven Mijajlovic

//Start of call

[*Introductions*]

Interview starts at 5:20

S - One of the first things that come to our mind is what essentially motivated you to write this book?
G - For me the motivation of the book was, a childhood love of mathematics and a strong interest in philosophy. And philosophically I became more and more interested in, Epistemology, which is a field that thinks about how do we know the things that we know. One of the fields of knowledge which we are most certain is mathematics. Mathematics is a great way to investigate that question or to think about that question. When I started the book I did not even know that we would publish it as a novel, it started as an examination about what do we know and how do we know it.

W - The novel format widens your audience, and I wonder who this book was intended for?
G - The audience of this book is anyone who has the openness to perceive the beauty and importance of mathematics. It should be acceptable of any from a middle school background and beyond. The audience is really anyone open to mathematics. This could span kids from 15 years old, all the way to people getting into mathematics after a long time gap. It was not an age sort of thing we had in mind, but openness to mathematics and philosophical curiosity.

W - There seems to be an idea of limitless, a theme of infinity, why choose that theme for the book? Why is that going through the whole book?
G - Actually there are two themes going through the book. One is a theme on Euclidean Geometry, and the other is infinity, set theory and infinity. The reason for geometry is that human notions of proof started with geometry. The reason to choose the infinite part of the book was that as mathematics was developed we were able to find or seek certainty in ideas that are more abstract. It also connects with some philosophical and religious ideas that we were setting up in the book. So for those reasons it made sense to use infinity as a parallel theme.

S - To build on that idea, was there any intention behind the cover art of an infinity symbol, or depending on interpretation a Mobius strip, and a cycler?
G - It was intended to be the infinity symbol, but can be interpreted as a Mobius strip. It was a design that could say look we are thinking about infinity in this book,
and in some sense this quest for knowledge and understanding is also a long term infinite quest. There was definitely that angle.

W - Are there any of the characters from the book based on real life experiences, or people you have encountered in real life.

G - You might say that some of Ravi's experiences are ones of my own. Any character that you write about is an amalgamation of people you have encountered.

W - *Follows up with a question about influential teachers*.

G - At Purdue University in Indiana, his name was C. D. Alaprantis, who taught me real analysis, a brand of mathematics and his style and aesthetics really influenced me I kind of modeled the teacher around that. What had happened was two years after the book came out Alaprantis' daughter had called me and told me he was very sick and he was dying.

Explains how Nico's character and spirit was inspired by CD Aliprantis, a Purdue mathematics professor.

W - Are you currently a teacher?
G - I am currently a researcher at Stanford University - philosophy and decision making. I am studying neuroscience, studying and researching neuroscience, and that's what I do currently.

W - I am wondering also, somewhere in the epilogue, there is mention of being the best teacher you can be and I wonder through this book you are also looking at important mathematical ideas which have shaped us and important philosophies?
G - Yes, this is most relevant to our conversation. My own experience with mathematics came about from other people, teachers and friends Teachers because they have inspired me to see mathematics for almost being an art form, for being profoundingly beautiful and profoundingly meaningful. And friends, because we did mathematics together. I think other people, especially teachers are important in helping kids see that this is one of the heights of human pursuits. One of the hallmarks, at least in my eyes, of human civilization is mathematics, Teachers being able to open students to perceiving this as beautiful and meaningful and worthwhile journey. I hope we have enough feel for this so that younger readers of this book would feel inspired to be open to mathematics and especially if it is done in a context of teaching where they have support from teachers.

S - *Mentions the number trick from Bauji in early stages of the book and how it was presented to the math team.*
I feel you bring up a point that is often missed in mathematics and the teaching of mathematics, that the role of a teacher is to figure out how much scaffolding each student must be given, because some students may require a great deal of scaffolding.

S - I'm curious about "Bauji's" character. Was he based on your own grand father? Were there different characters who were woven together to make him up?

G - My maternal grandfather, he was referred to as "Bauji". I never knew him, He died when I was three years old, but what I heard about him was an inspiration for the mathematician character, but he wasn't a mathematician he was a medical doctor. But parts of him I guess were based on what my grandfather must have been like.

W - I wonder how long you thought about these mathematical ideas before you decided to write about the thoughts that are in this book?

G - I think the curiosity about whether mathematical questions are certain, meaning, if there are people in other planets would their mathematics look exactly like ours or is mathematics a human enterprise, varied with culture, and that mathematical truths are a product of human biology. This question has been with me for a long time. I always used to talk to friends of mine, including Hartosh the co-author, and ask is it true in some sense that there is an infinite number of primes in every universe, meaning all alien civilizations would come to the same conclusion that there is an infinite number of primes? The answer is tantalizing and I never quite figured it out. In a sense we thought about the book for a long time. The actual writing of the book was surprisingly efficient. Once we decided this was going to be a book it went really fast. I think we wrote it end to end in a year and a half maybe two years.

W - What other kinds of things do you wonder about?
G - Well when I do mathematics it seems really natural. It seems that I'm thinking about real things, just like you can think about bridges or engines and cars and whatnot. When I do mathematics it feels like a real thing like you're working with real notions and yet when I think about doing mathematics it seems like a lot more tied to our brains and who we are as a species. Thinking about that led me to thinking about the nature of our brains, how we see patterns - how we see connectedness in things and thinking about us. What does it mean for something to be true? What is the nature of truth and how is it connected to our biology? These are things that I wonder about.

W - I was instantly interested in your book as soon as I opened the front cover to find a foreword by Keith Devlin. I recently read his book *The Math Gene* in which he writes about some of the ideas you just talked about, especially how the mathematician's mind works. He equates mathematics to gossip. Is this how your mind processes mathematical ideas?
G - I've read the math gene and I've had the opportunity to spend some time with Keith. He has a really terrific idea. I think the notion of mathematical concepts, some people see them as gossip, it's interesting because that notion is a fluid notion, it almost always varies with people. Richard Simon, the American physicist, he used to say when someone was describing a model to him he would construct the reality of that model lin layers. He would imagine a truck and he would see the properties of the truck, so - one property would be color is blue and another property is the yellow stripes on the side and then pretty soon he would be building this picture. Then someone would say something that would counter the model, the properties and the model that he already had, and he would say something like, "no, but that's yellow". The guy would have no idea of what Richard was talking about, but Richard was building the physical model of abstract ideas So people think about mathematical ideas differently, and what's fascinating is how beautifully mathematics works in the universe, there would be no real reason for mathematics to work in the universe but it does.

W - A big moment in the book is when Bauji, the grandfather, receives a news report of Eddingtons expedition to a remote island so that he could observe light coming from stars around the sun during an eclipse. Was it this event, this time period, the year for the grandfather's jailing to coincide with this one event?
G - Yes, it was an exciting time in human history. Einstein had come out with his theory of general relativity, it was the first time that general relativity was tested, and general relativity was basically a theory which was based on mathematics. The mathematics around the theory of general relativity is beautiful. In fact somebody had asked Einstein, "What would

you have done if Eddington's measurements around the eclipse showed that the theory of general relativity was not true". Einstein said, "Well I would have felt sorry for God. The meaning of that statement is that Einstein saw the beauty of the mathematics and would have been disappointed if that beauty did not describe the actuality of how the universe works. I think that's a real interesting insight into the nature of mathematics and how people do mathematics.

S - I'm interested in how you inspire students you encounter, your colleagues, and children with mathematics. How do you motivate them and peak their curiosity about mathematics?
G - I think that this is a crucial question because in mathematics educations there are two sort of orthogonal things that need to be done. One vector is that if you learn mathematics, one needs to learn the language of mathematics, that one needs a lot of drilling in mathematics. I have an eleven year old son and I often will sit down with him as he does his math homework and I realize that kids have to be drilled into learning how to add fractions, figuring out what decimals really mean, how percentages work. These are the tools, the basic tools of conceptualizing and learning the language of mathematics - so that's one way. The other vector which is equally important, maybe more important, is to see that mathematics is beautiful, and you do that with puzzles and you do that with games. You do that in a way that really captures the interest. You have to do both and one can be a lot of fun, but if you haven't done the first one, meaning the drilling, then you can't have the fun. So, I think the challenge in inspiring young people is to realize that mathematics requires a foundation, not to ignore that foundation but also not to ignore what makes it beautiful. I think it must be both and a good teacher, or somebody who wants to inspire people (to study math) should be aware that there are these two dimensions of learning and appreciating mathematics.