Stanley Fiorini: Mathematician & Historian

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Professor Stanley Fiorini is often regarded as the father of graph theory in Malta, and is a well-respected historian. *The Second Malta Conference in Graph Theory and Combinatorics*, of 2016, was held in celebration of his 75th birthday and his career as a mathematician. I sat down with Professor Fiorini on the 20th of August 2019, warmly welcomed at his own home, for a two part interview to discuss his early encounters with mathematics, introducing graph theory in Malta, and his work as a historian.

X: Firstly, perhaps you would like to introduce yourself?

S: Well, I'm Stanley Fiorini, 78 years old next birthday, in November. I've lived a happy life and I've always done things that I enjoy doing. I've never done something unless my heart wasn't in it fully, so I tended to move from one area to another, depending on the circumstances. I don't know what else, ask me!

X: If I had to meet a young Stanley in class, would I have been immediately able to say that he's going to be a mathematician, or maybe even a historian?

S: Well, I've always had an orderly life, and that's very conducive to logical thinking. All my copybooks at school were very neat. I was very proud of presenting very neat work, underlining answers in red and that kind of thing.

I also loved problem-solving from very early on, doing puzzles, which I still enjoy doing, and also on reflection before this interview, creating puzzles. That was kind of an embryonic element of the tendency to do research, which is creative work. So if you were very perceptive, then you might put all this together and say, yes, he could be a mathematician.

I also loved music. I was born in a very musical environment, with my elder sister's piano always in the background. My father, too, was always playing his gramophone records. These two things I think do go together, mathematics and music. The music I love best is Johann Sebastian Bach, who is very orderly and mathematical. I got to love him with a passion, especially when later on I took up playing the violin.

So perhaps yes, from early on the indications were there. I also did well at school, since I always had the benefit of very good teachers in mathematics, both in primary and in secondary school. I only failed once, and I do attribute that to bad teaching! But I will not repeat in what year or in what circumstances.

The Mathematician

X: You mentioned that you had teachers that promoted mathematics. Do you consider that maybe during your education there was that one particular teacher that gave you an extra push or maybe there was that one formative moment?

S: Well, in Form 5 Mr. Frisk used to inspire me with his originality in dealing with mathematical problems. Afterwards, for my A-Levels, I was taken under the wing of Edwin Borg Costanzi, who had recently returned from Oxford. It started with going to his evening classes in Valletta, in the Evans Labs, there was in that class Joe Formosa who was a technician in the University physics lab in those days. Then afterwards I used to go to private tuition under Edwin, who kept on urging me to go to Oxford where he himself had studied. This I did at great sacrifice because financially I wasn't prepared for it.

Edwin also introduced me to his former tutor, Jack De Wet, from South Africa. For my first year, Jack was my tutor at Balliol. In Oxford I had excellent tuition; foremost in my mind is Keith Hannabuss, also of Balliol, to whom I subsequently arranged for Joseph Muscat to go and work with; Joseph did extremely well at Oxford.

Perhaps I should say something about Oxford, and how the system worked. Oxford is an excellent university, with a beautiful mathematical institute, in the sense that there you came across all the 'beautiful minds' you wanted to meet. In combinatorics, Dominic Welsh is foremost. Among students in my year, there were Peter Cameron and Paul Seymour,

both of them bright luminaries in the combinatorial world, even now in the States, where they settled.

The terms were short - eight weeks of term, six weeks of vac, which was no vacation at all, as in those six weeks you had to absorb what had gone right over your head during the preceding eight weeks. So we hardly had any holidays during the year. Then we had very long summer holidays, during which I used to come down to Malta, and work and work. But as I said, financially it was very difficult. The only accommodation I could afford was a tiny cubicle, perhaps eight feet by four, in which the bed had to be folded up during the day to make room for a tiny makeshift desk.

The space was so restricted that you froze if you did not put on your heater, and if you did put your heater on, then you were scorched! So I spent my days in the Radcliffe Science Library, from morning till night, except for meals. We had one exam, called moderations, at the end of the first year, with three papers on algebra, analysis and methods. Then the final examination after three years, in which you faced 27 hours of examination in five days. Three hours in the morning, three hours in the evening, Monday to Friday lunchtime. No kids' gloves treatment; nothing like what Maltese students are regaled with today and no one ever questioned the system. This meant that you had to be prepared to your teeth, and have all the stuff at your fingertips; no exam-free couple of days before each test to allow for last- hour cramming and then forgetting all about it.

You had the first six papers of standard stuff: algebra, analysis, etc, and then you had three papers on what we could call electives, a choice of a couple of topics from a wide variety of options available. I opted for functional analysis and combinatorics; this is where I came across a certain Robin Wilson, who tutored me and introduced me to graph theory. And that was my initiation into the subject. I immediately took to it because it's very attractive, in the sense that you have very difficult problems which are immediately accessible, to mention, for example, the Four Colour Problem. Robin stimulated me highly exposing me to such problems like the Zarankiewicz Problem, the Reconstruction Problem, and, of course, colourings in general and edge-colourings in particular.

When I returned to Malta and started teaching at Junior College, I had kept mulling over these new concepts, working at them, and also trying my hand at creating solutions, rather than regurgitating other people's stuff. I also started using the computer to obtain certain solutions; at the time handling computers was very different from what we are used to these days. The machine in the computer lab at Oxford occupied a whole house. To write a programme you had to write a card for every single statement in it, ending up with a pack of cards several centimetres high; this you then fed into this machine, out of which came your solution. I'm very thankful to Carmel Galea (of Megabyte), who was more adept at computing than I was, for helping me out with my programming at the time. We were then both teaching at Junior College. There was also Irene Sciriha teaching there, she was doing applied mathematics. I enjoyed that year - I still remember students, some of whom still come up to me and remind me of those happy days when I introduced them to a different way of teaching- what I had learnt at Oxford, of course.

X: How then did your Ph.D come about?

S: Edwin again who came to my rescue, bringing to my notice a conference that was to take place at St. Andrews University, Scotland, and offering me financial support to attend – how lovely! By that time I had met Joan, my future wife, whom I informed that I was going to St. Andrews for the ten-day conference. This was a workshop with three areas of instruction, one of which was given by Frank Harary, who had striven hard to promote graph theory. Another was on optimisation, given by Vargas, and the third on algebra, given by Cohn.

That was very enjoyable, both content-wise and for the opportunity it provided to renew old friendships. For example, at this conference among others there was Hilton from Reading. At the time I was working on a graph theory problem to which I was trying to apply some complex analytic methods. In Oxford, at the time there was Dr. Hilary Priestly of St. Margaret's, who had lectured me on the subject, and I thought that before going down to London's Heathrow, I could pop in at Oxford and have a chat with her about this. I went to Oxford and I couldn't find her as it was summer vac, but I did meet Robin Wilson again, whose very first words were, 'Ah! You're the one I want to talk to'.

In the meantime, he had moved from Oxford to the Open University where, at the time, he was rooting around for his first potential PhD students. It so happened that his first candidate, for some reason, had been unable to accept the offer, and Robin was now looking for a replacement. He told me that he had the money for a PhD studentship, asking me if I'd be willing to accept and to start in October. That was in August, my future wife didn't like it at all, but agreed for me to go back in October. I started working on edge-colourings, which is what Robin wanted to do. He had just produced a little paper with Beineke, which became my spring-board.

Thank God, my former financial headache was now over, because now I had the scholarship. At this

stage I must show my gratitude to my family that supported me as best they could throughout my difficult undergraduate days. I had then approached the financial aspect of my study very näively. I knew that at the time tuition was once a week, and it cost two quid for an hour's tuition. So I said to my self, "Fine: eight weeks of term, eight tutorials at 2 quid, eight times two is sixteen, I need some money for food, and some money for accommodation." I think that in the end I was packed off with about 500 quid at the time, and that was just not on. Another 500 I had to borrow from a kind person, and my family supplemented as best they could, for which I am eternally grateful.

So I went back to the Open University and started working. The intention was that Joan and I would get married within a year's time, in January next. I came down to Malta in Christmas when we got officially engaged, waiting for another year to get married.

I must mention something you'd appreciate. I was living in digs at the moment, and I was having my meals at Greyfriars College – the college of my undergraduate days, which no longer exists. Coming back to my digs one evening, I suddenly spotted a logical flaw in a fundamental statement I had made, and on which I had built a couple of months' work. I had a terrible experience of a nervous attack - my tongue became heavy, my hands were heavy. I just had to lie down on my bed and weather it out. An experience like this at the beginning of your research career could be very disheartening, but somehow, although I couldn't amend the flaw, there were other areas I could attend to and in the end it worked out well. In fact within two years I had completed my thesis "On the Chromatic Index of Simple Graphs". During my third and final year I was kind of doing a postdoc and also helping Wilson with teaching at Balliol, a part-time post which he had retained, and that brought me into contact with some very good graph theory students from the college. It was a time to start accumulating a of problems and topics of interest.

X: I have heard on multiple occasions that you are considered as the father of Graph Theory in Malta. What was it like introducing this new area at the university?

S: I came back to Malta in 1975, by which time we had had our baby girl, Christina - luckily she came after I had completed my thesis, as otherwise it would have been impossible working with all the din that babies produce in their first months - I had a stock of problems to work on, and also to introduce to students in Malta.

You bombastically said that I'm the father of Graph Theory in Malta - well, let's not exaggerate too much. Graph Theory had not been taught here before and so it did begin with me, and that's all that needs to be said. At the time there was Josef Lauri, who was doing a Masters, when our department had introduced the subject at Masters level. The number of staff members of the Maths Department was very small in those years. There were many foreign lecturers at RUM then - Edwin Borg Costanzi was still firmly seated in the Rector's chair, and he preferred to work with foreigners. As for Maltese in Maths, there was me, Joe Pulè, and Albert Leone Ganado. Albert eventually moved to computing. That was all in 1975. Again, Edwin had an excellent idea on how academics could carry on with their research, despite our rather heavy teaching load. In 1976, he gave me a chance to go back to Oxford for six months, which he paid for, allowing me to concentrate on my research from Easter till October, provided I crammed all my teaching duties in the first couple of semesters. But during those six months, I could worked solidly without distractions. That's where I got my ideas on working with reconstruction [1, 2, 3]. I produced about four papers within those six months. Some of them jointly, one with Manvel, and I also typed out my thesis, which I published with Wilson - "Edge Colourings of Graphs" [4].

X: It almost feels like all of this was accidental...

S: Yes, I would call it force of circumstance. I always led myself by the principle – accept life as it comes, always take what you have, make the best of that, and something good will come out of it. Don't waste time - time management is most important for me. So as soon as we finish this interview, I'll be going back to my history, interspersed with some shopping which the wife has to do!

As I was saying, in those six months, I produced the gist of nine papers, and typed out my book. Then in 1977, dark clouds started looming on the horizon for the university, because there were problems with the doctors. I had to get involved with union work, from the university point of view, as I was secretary of the union for university staff, and when things got rough we dissolved our house union and joined the Malta Union of Teachers, as we needed strength in numbers. And things started becoming impossible to concentrate and do any research in that ruckus. Funds for the library dwindled, you couldn't find books, there was no way to go to conferences. The university was shrinking, many people were leaving, many good people, including and especially the doctors started leaving. By 1979 I couldn't take it anymore. Joe Pulè had gone to Ireland, where he still is, and again Edwin gave me the advice not to burn my boat as yet. I was going to sell my house, as I had a buyer, a good buyer. I still had contacts with the Open University, so I arranged for

someone there to come to Malta, on an exchange basis. He, for his own personal reasons, needed to be away from there and so he came here to teach, and I went there to replace him.

His job was that of 'staff tutor' at the Bristol office, which means that he was organising the teaching of mathematics in the whole of the southwest of England, from Cheltenham in the north to the Scilly Isles in the south. I went to Bristol, and I had to travel to these various places where tuition was going on, and organise the teaching of mathematics. So, administratively it was a very rewarding job. Also, I had started tutoring Lauri for his PhD on graph reconstruction, and I said, "Why don't you come over to the Open University and finish your PhD here?". I arranged for his financial support, he came over, and for some time he lived with us until he got his own accommodation. It was working beautifully as we were coming up with important results, which you can see in publications [5, 6, 7]; and he finished his PhD there. That was for two years - he had already done one year in Malta before, then did two other years at the O.U., finishing in good time. Then I came back to Malta in 1982. Why did I come back to Malta? I could have stayed there, the Open University had offered me a very good job, so I could have taken that. But, I realised while in England - well, I must say that I liked England, it's my second home, I had spent 12 years there, so from that point of view I was happy - but I realised that I was exiling myself from something very dear to me: my attachment to my roots. And I suddenly wanted badly to rationalise this irrational attachment. So I said, I'll go back come what may. And it was really come what may, for soon again I was out on strike under orders of the union for the Imnarja occasion.

The second part of this interview will be published in the coming months.

Further Reading

1. A theorem on planar graphs with an application to the reconstruction problem: I, QJM Oxford (2), 29 (1978) 353-361.
2. A theorem on planar graphs with an application to the reconstruction problem: II, Journal of Combinatorics, Information and Systems Sciences, 3 (1978) 103-119; (with B. Manvel).
3. On the edge-reconstruction of planar graphs, MPPS Cambridge, 83 (1978) 31-35.
4. Edge-colourings of Graphs, Research Notes in Mathematics, No. 16, Pitman, London (1977) (with R.J. Wilson).
5. The reconstruction of maximal planar graphs, I: Recognition, JCT(B), 30 (1981) 188-195; (with J. Lauri).
6. Edge-reconstruction of 4-connected planar graphs, JGT, 6 (1982) 33-42; (with J. Lauri).
7. On the edge-reconstruction of graphs which triangulate surfaces, QJM Oxford (2), 33 (1982) 191-214; (with J. Lauri).