Flyby: Life Before, During, and After Graduate Studies with Mike Fellows

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I am a child of the space age. Growing up in the 1960's, this was perhaps inevitable. Despite the overwhelming focus on the manned missions to the moon, I was always most fascinated with the deep space planetary probes. The multi-decade journeys of Pioneer and Voyager measured out my high school and university undergraduate years and later the Galileo and Huygens missions saw me through graduate school and becoming faculty. I am currently awaiting the arrival of New Horizons at Pluto in 2015, wondering where and what I'll be then.

The common event in each such mission is, after years of traveling alone through space, a planetary encounter. Such encounters are often flybys, brief visits characterized by a few tantalizing (and possibly unrepresentative) impressions which end when, after stealing some of the gravitational energy locked up in the planet, the probe is flung outward in a new direction, changed forever and never to return.

Graduate studies with Mike Fellows was a lot like that.

I first met Mike over the Internet. On finishing my MSc, I attended the IEEE Structure in Complexity Theory conference in Boston in the summer of 1992. Among the talks I made notes to follow up on when I got home was one given by Rod Downey on parameterized complexity. When I got a chance to look at the conference paper, I realized it was the neatest thing I'd read in ages and decided to ask for some of the manuscripts cited therein. As Mike was the Canadian author and I was in Canada, I wrote to him. Just before I sent the message, I added a brief postscript that I might have solutions to some of the open problems mentioned in the Structure paper. Mike wrote back immediately, promising to put the requested manuscripts in the mail, and, with what I came to realize was his typical generosity, offered to fly me out to Victoria to give a talk.

After several months of e-mails back and forth, I went out to meet Mike. At the airport, I saw his characteristic goofy slightly-open-mouthed grin for the first time. The next three days were a whirlwind, the prototypical Mike Fellows Experience. I saw Mike teach, enthralling an undergraduate class. I got a first-hand taste of his intensity when working, when we spent a day together analyzing the complexity of a graph layout problem from computational biology. What I remember most is Mike talking research, babbling with almost insane energy and joy about all sorts of things I didn't understand (though he kindly assumed

H.L. Bodlaender et al. (Eds.): Fellows Festschrift, LNCS 7370, pp. 51–55, 2012.

that I did), skipping effortlessly from topic to topic, amazingly free and open with ideas and collaborative opportunities.

On the third day, I was exhausted. After I gave a talk on my MSc work, Mike and I had a very frank chat in the campus grad bar. Though he said I wasn't great at mathematics because I didn't have the killer instinct when working on proofs (with which I agreed), he liked my breadth of interests and offered to supervise me in a PhD. I thanked him, said I'd think about it, and we parted. Over the next six months, we worked on several papers together, I thought a long time about it, and finally decided a PhD with Mike just might work out.

When I arrived in Victoria to start my PhD in January 1994, I was pleasantly startled by both the extraordinarily mild (by my standards) winter weather and being in a computer science department that had a large and vibrant theory group. I got to know Mike's other PhD students, Mike Dinneen (MikeD), Mike Hallett (MikeH), and Patricia Evans (who with Fellows (MikeF) were known as Patricia and the Three Mikes). After we agreed that I would not have to change my name to Mike but could (despite the breaking of convention) remain Todd, I settled into what would become my routine for the next several years — courses, marking, research, evenings at the truly excellent on-campus cinema, and, of course, time spent with Mike Fellows.

Much of that time was spent in Mike's office. It was a corner office on the second floor of the Engineering Office Wing, with two walls as windows looking out on the lush West Coast forest that surrounds the UVic campus and the other two walls as long whiteboards with overflowing bookcases beneath. There were relatively neat piles of papers on every available horizontal surface of sufficient size, often capped with Mike's many manuscripts in progress. Boxes enclosing cryptic descriptions of ongoing and future projects clustered on the edges of each whiteboard, framing the overlapping half-erased scrawls in the centers that characterized Mike's thoughts of the previous month or so. Facing Mike's L-shaped desk was a ragged half-circle of well-used and constantly changing office chairs, which were more often than not occupied. Mike's door was almost always open, and anyone could (and often did) come in, mixing with undergraduate and graduate students and Mike's parade of visitors from other universities.

We had more or less weekly meetings one-and-one with Mike, almost always in the morning, to discuss what we we were working on, be it thesis project or a related paper. When we had little to show for the last week, Mike eagerly launched into an energetic explanation of whatever he was working on, with invitations to contribute and be part of the fun. These sessions frequently evolved into impromptu group meetings, sucking in whoever was walking by in the corridor outside. Given Mike's enthusiasm, one-on-one meetings could run long and get a bit intense. If this was a possibility, MikeD, MikeF, Patricia and myself had an agreement that, about 30 or so minutes into the meeting, (1) one of us would walk by Mike's office to see how things were going and, if necessary, (2) distract Mike long enough to give the one in the meeting a chance to either gather their

thoughts or escape. This agreement was infrequently invoked, but did highlight one of the unofficial advantages of large theory groups.

I loved watching Mike teach, and took whatever graduate courses that I could from him. When he intimately knew the topic, as in the Computational Complexity course, it was invariably enthralling. As he was often running a bit behind and had not fully prepared his notes, he would spend the first 10 minutes sketching a story point by point in a stream-of-consciousness soliloquy on the left-hand side of the board, and then (with periodic consultations) give several hours of beautifully-constructed and delivered lecture. I still remember his 2 1/2-hour explanation (if not the details) of the complex chain of parameterized reductions underlying the W[2]-hardness of the Dominating Set problem. When he didn't quite know what he was talking about, as in the Computational Biology course, it was just as fascinating — the unexpected ways he would jumble together those concepts he knew well with those that he didn't, if not always viable, was invariably both entertaining and intriguing, and gave me insight into how truly new and innovative ideas emerge. When you walked into a lecture Mike gave, as with Forest Gump's box of chocolates, you never knew what you were gonna get, but you knew it would be good.

I also spent a lot of time in the UVic grad bar with Mike, both after class and work. These get-togethers had anywhere between three and nine people, but were always intimate. The back-and-forth of ideas was even more varied and playful then in the office meetings and courses, fueled in part by generous plates of nachos and jugs of Rickard's Red (which Mike insisted on paying for, saying it was his duty as a supervisor). Many of these ideas died (a much-loved proof of the collapse of the W-hierarchy to W[2] lasted only 24 hours), but many also survived to appear later in print. Interspersed through it all was our realization that we were in the middle of something new and beautiful, and we wondered aloud (especially as the level of beer in the jugs lowered) when the rest of the world would see the parameterized light as we already had.

After all this time together, I got to know, appreciate, and occasionally puzzle over some of Mike's other interests outside of research. His passion for CS and Mathematics education was awe-inspiring. I spent many evenings helping out with this, both putting materials together beforehand (to this day I cannot look at rolls of hockey tape without remembering the hours we spent in the living room of Mike's house putting together neon-bright executable illustrations of sorting networks and graph problems on room-sized blue tarpaulins) and running the associated activities in school auditoriums in and around Victoria. I still have pictures of Mike encouraging children and their parents as they worked through these activities and discovered (without proof, but feeling their rightness) classical CS algorithms and complexity-theoretic distinctions. I heard of, but never experienced first-hand, his love of surfing, as he could never find a wet-suit big enough to fit me. This was perhaps fortunate. MikeH (who was wet-suitable) later told me about Mike's habit of, just as a wave you were trying to catch was getting interesting and hence potentially dangerous, starting distracting discussions on mathematical proofs.

If you hung around long enough, you got to glimpse Mike's loopier aspects. Sometimes they clung tenuously to the side of valid academia. I once narrowly talked Mike out of his brilliant idea of having me illustrate the finer points of parameterized analysis at an annual student-industry get-together in Vancouver by standing on a multicolored Rock of Complexity while wearing a clown suit. There were his surreal Passion Plays, written to bring home the beauty of various lesser-known branches of mathematics to the general public. Other times these aspects were part of his decidedly unconventional life. One day he brought in videotapes in which, over two sessions and about 7 1/2 hours, he told part of the story of how he volunteered for, went AWOL (several times) from, was imprisoned by, and was finally discharged (first dishonorably and then honorably) from the US Air Force during the Vietnam War. They were filmed by a cousin of his as working notes for a movie screenplay. They were amazing. Perhaps inevitably, they vanished from circulation after copies were given to several local schools. I wish I had kept one.

There were darker aspects as well. Mike can be both laid back and intense, personable and dispassionate. I think this is all part of what makes him an excellent and innovative mathematician. However, when unexpectedly combined, these aspects can be disconcerting. I remember a lunch-time meeting in which Mike evaluated an outline of one of my thesis chapters. He became more and uncomfortable trying to be nice about it until I gave him permission to stop being diplomatic, at which point he sighed, relaxed, and happily tore what I had written to shreds. There was a picture of Mike at that time in front of the CS General Office at UVic in which he looked directly at the camera with his usual smile and half his face was in perfect shadow. I felt then (and still feel) that there is truth in that picture.

Ultimately, though, it was good being around him. I was deeply impressed by Mike's generosity with ideas and his willingness to share authorship. As his students, we were always given the opportunity to become part of whatever papers Mike was working on. Perhaps even better was his not requiring that he be author on what we ourselves produced unless he contributed — if what we wrote got accepted, he would gladly pay to send us to meetings with single-author papers. I did not realize until years later just how special and unusual that was, and it is these things, among others above, that I carry forward.

Eventually, it came to an end. By the time my thesis was submitted, Mike was traveling a lot, on the verge of leaving Victoria for good, and I had taken a postdoc in Ontario. With the additional complication of an external examiner from South Africa, it was hard to arrange a defense date; at one point, we joked that it could only be held in a to-be-specified airport boarding lounge. However, it all came together in April 1999, 6 1/2 years after I first talked to Mike.

I'm faculty now, and it is the job of my dreams. I teach and have my own students, and enjoy both very much. Courtesy of my being one of Mike's early

graduate students, I've had the privilege of attending several of the parameterized complexity workshops at Dagstuhl. I see Mike at these workshops and he is as amazing and full of neat ideas and energetic as ever.

Looking back, Mike is the most fascinating person I have ever met and one of the greatest influences on my academic life. Being around him changed and gave form to my research, and his theories underlie much of my own work and intellectual outlook. Almost all of my research collaborators are people I have met either through Mike or by association with parameterized complexity. In my dealings with graduate students, I aim for his generosity and openness. In my teaching, to the best I can, I try to be passionate and convey to students the excitement in every subject that Mike does whenever he talks.

All told, pretty good results for one e-mail.

Happy birthday, Mike, and thank you. Please keep on thinking and doing beautiful things.