In memory of Roger Fletcher and Michael Powell

compilation of notes from former students and colleagues

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During the conference, I first gave a memorial address during the opening session, in presence of the Omani government delegates, the Faculty Dean, the SQU professors and all scientific delegates. This address was triggered by the disappearance of two major figures in the world community of optimization researchers: Michael J.D. Powell and Roger Fletcher both left us during the years 2015 and 2016, respectively.

Mike Powell was my supervisor during my stay in Cambridge in 1977 for the preparation of my Ph.D. thesis, and a friend and colleague for many years after. His short illness and death were a real shock for me (and many colleagues), since I knew him so well and respected his work so much. He was indeed one of the very early pioneers of numerical optimization in the United Kingdom, and his work laid the foundations of several subjects which are today of continued importance, such as quasi-Newton methods, sequential quadratic programming, augmented Lagrangians, trust-regions and interpolation-based derivative-free algorithms. His approach of science and mathematics was at the highest possible standard, always leading to both deep and far-reaching analysis and also to truly practical methods and associated software, ready to be used in many real-world applications (he was especially proud of the fact that his methods were instrumental in the design of the first manned mission to the moon). His support, encouragements and criticisms were crucial in the development of my own vision of optimization and also in the unfolding of my career.

Although I knew Roger Fletcher also since the late 1970's, I only came to closely collaborate with him much later. Together with Powell, he was one of the leading figures in the then nascent field of numerical nonlinear optimization, and his contributions also clearly rank amongst the most influential. His originality and depth, combined with his attention to young students like me, made his presence and suggestions most useful. Several years later, I had a chance to invite him to Belgium for a conference I was organizing at the time he had started, with S. Leyffer, to work on the idea of filter methods. The discussions we had then on the theoretical underpinning of this very successful approach led to an excellent collaboration of several years and a handful of papers, creating the basis of the now well-known filter convergence theory.

Both Powell and Fletcher were very keen hikers, an activity which I like practicing myself. During my memorial address, I thus had the opportunity to recall some souvenirs of hikes with both of them (together and separately) in the Scottish and Welsh mountains. These were somewhat of an initiation rite for a young researcher and, later, great opportunities to share a common appreciation and nature and landscapes with true friends. I did my best to show that sharing these memories and others was, for me, an important duty of true personal appreciation over many years.

Andrew R. Conn
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Michael influenced me a great deal professionally but here is a non-mathematical influence that (my wife) Barbara thought was more important.

When we stayed with Mike and Catherine, he would bring us up tea to our bedroom every morning and Barbara enjoyed it so much that she coerced me to continue the practise at home.

David M. Gay
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In 1977 I was privileged to spend a few weeks visiting the (now defunct) A.E.R.E. Harwell in England. Mike was still there, but was soon to move to Cambridge. In the course of trying to construct an example of Broyden's method never completely converging on a linear problem, in hopes of including such an example in a paper that Bobby Schnabel and I were writing, I was surprised to end up constructing a proof that Broyden's method converges in at most 2n steps on linear problems. This happened a few weeks before I arrived at Harwell. When I told Mike about the result, he did a double take. I have always treasured this memory.

P.S. John Dennis suggested that this result might mean Broyden's method is locally 2n-step Q-quadratically convergent on nonlinear problems, which I was then able to prove.

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Roger Fletcher was among the pioneers of numerical optimization. Since he was my PhD supervisor, it is expected that I was influenced by his way of thinking. Indeed, his help and discussions were useful as he accepted a new research idea only if supported with either proof or motivation. In particular, when I told him after the usual Tuesday afternoon coffee-break that “I proved the descent property of the Fletcher-Reeves method when inexact line search is used,” he replied “it is interesting.” Later on the same day, he found my proof is correct and told me to write up this result immediately (which implies to stop writing my PhD thesis). Then, Roger also expected a proof of the global convergence of the method by extending that of Powell, which he received recently. After checking the paper, he returned the last version to me by adding “by Mehiddin Al-Baali,” next to the title of the

paper, although he knew it is very interesting result as being “the first practical convergence result” and honestly, it would be my honour to have him as a joint author. He felt I deserve that result alone and he helped me as being my supervisor.

I used to have useful discussions with Mike Powell whenever I meet him at conferences, including the Dundee meetings. I used to listen to him carefully and learned about his way of analyzing mathematical problems, as he was quite accurate with certain expected results. For example, in the Dundee 1987 meeting, he said to me “the self-scaling technique for the quasi-Newton methods is sometimes useful,” although this technique was unattractive to many researchers. After a few years, I converted his word “sometimes” to practice by considering scaling only when the value of the scaling parameter is smaller than one. In this way, I was able to show the useful theoretical and numerical features of the self-scaling technique.

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