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EDITORIAL

Resilience and Imagination

Producing a fortnightly editorial column is a task that can be both liberating and stifling. It is liberating when the author can freely express an opinion, without fear of objections from referees and editors. It is stifling when tight deadlines cast iron constraints on word limits and inviolable production schedules sharply define the time available to draft an essay. Critics abound, who are quick to spot repetition, pounce on factual errors and gleefully highlight mistakes of every kind. The task is uplifting when one encounters the sympathetic reader, who draws attention to related writings. The most formidable part of this task is to decide on a subject to write about. Columns must be relevant and topical, informative and useful, criteria that cannot always be met. Once printed, even the most hastily written composition is exposed to analysis and scrutiny. In searching for subjects, help often arrives from readers who are kind enough to send material that appears interesting. Almost always, these are topics that might otherwise have escaped attention. In struggling to decide on a topic for this column, help arrived unexpectedly. Two colleagues, independently, sent me (electronically, of course) the text of J. K. Rowling's Commencement Address at Harvard, delivered a few weeks ago. The title was compelling: 'The Fringe Benefits of Failure, and the Importance of Imagination'. The speaker appeared to have been placed in an interesting setting; the creator of Harry Potter asked to provide sage counsel to the graduating class of, arguably, the world's most prestigious university. If the past is any guide, one might conclude that many members of Harvard's graduating class would in future influence their surroundings in a very significant way. My interest was piqued by the fact that decades ago I had unsuccessfully attempted to enter Harvard for a doctoral program. I did however, stand on the fringes of a Harvard Commencement, as an onlooker thirty five years ago, listening to an address that I have now forgotten. The Commencement Address is what we term as a Convocation Address; an occasion for a well-known speaker to reflect on an important subject. Harvard's most famous and influential Commencement speech is undoubtedly the one delivered by George Marshall in 1947, when he announced the Plan, that now bears his name, for the reconstruction of the economy of post-War Europe. Marshall's speech in 1947 begins with

words that must have found some resonance in India in that remarkable year: '... I need not tell you that the world situation is very serious... I think one difficulty is that the problem is one of such enormous complexity that the very mass of facts presented to the public by the press and the radio make it exceedingly difficult for the man on the street to reach a clear appraisal of the situation'.

Heads of state and government, Nobel laureates and some of the world's best known names in the corporate world have addressed the Harvard gatherings. A cursory search on the Internet produced addresses by figures as diverse as Bill Gates and Alexander Solzhenitsyn. Rowling seemed an unusual choice, but on reflection, an extraordinarily imaginative one. Children, who have experienced the Potter magic would surely endorse the choice, many of them on the verge of entering college and some probably present in the audience that heard Rowling. The Potter series has captivated an entire generation of young readers, although I must confess that as an unimaginative adult I have never really read a Rowling book in its entirety. The Rowling story is now the stuff of legend. The rise of a poor, single mother in her thirties to the position of the most successful author of her time, in the short span of a few years is an inspirational story. When Rowling reflects on her experiences, before a Harvard audience, she eloquently touches on issues that must strike a chord in most of us: 'Half a lifetime ago, I was striking an uneasy balance between the ambition I had for myself and what those closest to me expected of me'. She notes that her parents hoped she would study for a 'vocational degree'. Instead she 'scuttled off down the Classics corridor'. Her parents, Rowling reflects, 'would have been hard put to name' a subject 'less useful than Greek mythology when it came to securing the keys to an executive bathroom'. Rowling's parents wished for her a future that millions upon millions of poor parents across the world wish for their children, a lifetime free of poverty. In Rowling's words: 'They had been poor themselves, and I have since been poor and I quite agree with them that it is not an ennobling experience. Poverty entails fear, and stress, and sometimes depression... poverty itself is romanticised only by fools'. But, in an intriguing insight that seemed especially appropriate for the elite graduating class, Rowling notes that what she feared most

'was not poverty but failure'. Rowling is at her most eloquent when she says that 'talent and intelligence never yet inoculated anyone against the caprice of the Fates', reminding her Harvard audience that they might well 'be driven by a fear of failure quite as much as a desire for success'. She turns to her main theme in declaring that 'failure gave me an inner security that I had never attained by passing examinations. Failure taught me things about myself that I could have learned no other way'. Many successful individuals would echo Rowling when she says: 'The knowledge that you have emerged wiser and stronger from setbacks means that you are, ever after, secure in your ability to survive'. Rowling is more qualified than most to extol the virtues of imagination: 'Imagination is not only the uniquely human capacity to envision that which is not, and therefore the fount of all invention and innovation. In its arguably most transformative and revelatory capacity, it is the power that enables us to empathise with humans whose experiences we have never shared'. Rowling describes her period of work at an Amnesty International office as 'one of the greatest transformative experiences'. In reading Rowling, I was struck by her characterization of imagination as the bedrock upon which all of invention and innovation rest. In discussions of science, technology and economic development, the two words most often used are 'invention' and 'innovation'. It may be useful to reflect on the importance of 'imagination'. The Rowling story of a rise from rags to riches and fame is likely to be retold many times in future. What is the quality that really makes such transformations possible? Undoubtedly, it is an inner toughness, a unique resilience that learns quickly from failure, turning defeat into victory. Failure is a common phenomenon in research, but this is a condition that is generally not recognized. In refusing to acknowledge failure we do not learn from it; borrowing Rowling's phrase, we do not reap the 'fringe benefits of failure'.

In advancing 'resilience' as a key element of success in difficult environments, the story of Mario Capecchi merits retelling. Capecchi shared the 2007 Nobel Prize in Physiology or Medicine for his work on gene targeting, which has paved the way for disrupting genes in animals, resulting in the powerful technology of 'knockouts', that permits biologists to probe gene function in living organisms. Indeed the field has advanced to a stage where 'approximately a half of all genes in the mouse genome (about 22,400 genes)' have been mutated (Deng, C. D., *Int. J. Biol. Sci.*, 2007, 3, 417). Capecchi's scientific achievement has been formidable; the impact of his work is now felt across a broad front in biology and biomedical research. But for the general reader, Capecchi's early life vividly demonstrates the role of resilience in shaping futures. In a lecture delivered in 1996, while accepting the

Kyoto Prize, Capecchi details his turbulent early years. The title of his lecture 'The Making of a Scientist' (available on the Howard Hughes Medical Institute's website) should attract scientists, young and old, aspiring and established. In a language that appears, at first glance, completely different, Capecchi conveys a message that finds its echoes in Rowling's Harvard address: 'I have no formula for generating creative scientists. To the contrary, my thesis will be that such a formula may not exist. My skepticism comes from a deep-rooted prejudice that creativity in science, or in any other discipline, may require the abrasive juxtaposition of unique sets of life experiences that are too complex to preorchestrate. It is in this spirit that I will share with you my own experiences as a tribute to such stochastic, chaotic influences. The only general interest of this story is that it exemplifies the antithesis of a nurturing environment, which all of us deeply want to believe is a conducive prerequisite for fostering thoughtful, creative human beings'. Capecchi's narrative is compelling. Born in 1937 in Italy, at a time when Fascism and Communism were beginning to be dominant, to parents as diverse as can be, he was soon (like Rowling) the child of a single mother. She was a poet working, with a group opposed to the Nazis, resulting in her arrest and internment in Dachau in early 1941. For a while the child was looked after by a peasant family who were given the proceeds of the sale of Capecchi's mother's meagre possessions. But by 1942 when the 'money ran out' Capecchi, as a child of 4½, set off on his own: 'I headed south, sometimes living in the streets, sometimes joining gangs of other homeless children, sometimes living in orphanages and most of the time being hungry. My recollections of those four years are vivid but not continuous, rather like a series of snapshots. Some of them are brutal beyond description, others more palatable'. The Capecchi story has a happy ending, with his mother surviving until the liberation of Dachau in 1945 and miraculously finding him on his ninth birthday. Emigration to America was the turning point. In Capecchi's words: 'I was expecting to see roads paved with gold in America. I found much more: an opportunity'. In looking back at his early years Capecchi says: 'I marvel at the resilience of the child'. He concludes that the 'genetic and environmental factors that contribute to such talents as creativity are too complex for us to predict. In the absence of such wisdom, our only course is to provide all of our children with ample opportunity to pursue their passions and their dreams'.

The Rowling and Capecchi stories are inspirational. They emphasise the importance of concentration and determination; resilience and imagination.

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