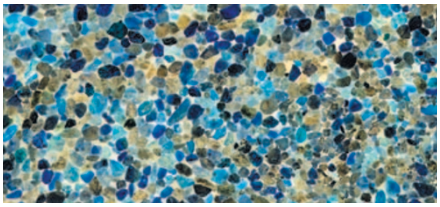
Regenerative medicine

Harnessing the potential of stem cells to provide therapies for diseases such as diabetes and neurodegenerative disorders is one of the hottest and most challenging fields in biomedical research. This month, our two interviewees describe how they have come to focus on the science and business aspects of this field, respectively.



Stephen Minger, Director of the Stem Cell Biology Laboratory, Wolfson Centre for Age-Related Disease, King's College, London, UK

Location, location, location. A cliché, but one that those involved with regenerative medicine are well aware of given the current variations in restrictions on stem-cell research worldwide. "I am glad to work in a country with such a pragmatic approach to the use of stem cells," says Stephen Minger, who moved his stem-cell research programme from the US to the UK 10 years ago. "I think the UK has created a tight regulatory environment, but one that is still amenable to progressing science."

Minger's interest in stem-cell research began 15 years ago, when it became clear that although the use of human foetal tissue had promising potential for Parkinson's disease treatment, the number of embryos that would be needed was much too large. So, in postdoctoral research with Fred Gage at the University of California San Diego, Minger and others established some of the first neural stem-cell populations that might be expanded to the numbers required for therapeutic applications. After leaving the Gage laboratory, Minger became an assistant professor in this field at the University of Kentucky Medical School in 1995. He then took the chance to return to Europe, where he had spent much of his childhood, coming to Kings College in 1996, and was appointed as a lecturer there in 1998.

As for many young scientists, getting funded initially was a challenge, made harder by the uncertainties related to the ethical and regulatory issues surrounding stem-cell research. "Those of us working with human embryos for research purposes recognize how important it is to have very coherent, transparent and pragmatic regulations in place that the public can feel confident in. The situation in Korea over the last year or so illustrates clearly how awry it can go when you don't have this kind of regulatory system," Minger emphasizes.

However, after some initial success with mouse embryonic stem cells, particularly related to the generation of neural, pancreatic and retinal lineages, Minger was well placed to make the most of the opportunities offered by changes in the laws regulating human embryonic stem cell research in the UK in 2001–2002. Together with Susan Pickering and Peter Braude at King's College, he was awarded one of the initial licenses from the UK Human Fertilisation and Embryology Authority for the derivation of human embryonic stem cells, and his group subsequently generated the first human embryonic stem-cell line in the UK.

"To be in a field that is new and to be successful is very exciting," says Minger. "But even with hard work and perseverance, not everything you do will succeed — sometimes, you will need to say 'Right, next' and have another option to move on to." The right environment is also something that he emphasizes the value of. "I've always liked working with and mentoring young researchers, and have tried to create a fun atmosphere in which to work. For me, being a scientist is not so much a job as a vocation, and so if you're not doing something you're enjoying, it's not worth doing".

Joydeep Goswami, Vice President, Stem Cells & Regenerative Medicine, Invitrogen Corporation, Carlsbad, California, USA

With the passing of Proposition 71, a US$3-billion state-led initiative to support stem-cell research, California is aiming to be a world-leading centre in the field, despite the current lack of federal support. Joydeep Goswami, who recently moved to head up the stem-cell business for Invitrogen, is among those in the state keen to be involved. "Given the nascent nature of the field, I was attracted by the opportunity to participate in shaping it by creating the tools and technology platforms that enable research and therapy using stem cells," he says.

The development and application of novel technologies has long held an interest for Goswami — he trained as a chemical engineer at the Massachusetts Institute of Technology, gaining his Ph.D. on the control of death in mammalian cell culture. Simultaneously, in order to get a better understanding of developing technology strategies, evaluating and managing technological risks and technology commercialization, Goswami pursued an M.B.A. course at the MIT Sloan School of Management.

A 5-year period with the consultants McKinsey then followed, during which time Goswami worked with clients in healthcare- and technology-related industries worldwide on strategic and operational issues in R&D, and market and licensing strategies. "This gave me an understanding of the pharma industry, especially in terms of the inefficiencies that drive up the costs of drugs and the opportunities to address this," says Goswami. "What attracted me to then move to Invitrogen was the dynamic nature of the team there and their vision to put together the right set of technology platforms to enable scientists in the pharma industry to find cheaper and safer therapies faster."

At Invitrogen, Goswami led the Global Technology In-Licensing Group for one and a half years, which involved identifying, evaluating and licensing in technologies for Invitrogen to commercialize. "I enjoyed getting involved in negotiations with licensors and gaining a much more thorough understanding of legal contracts and intellectual property strategies," recalls Goswami. So, when the chance to lead Invitrogen's stem-cell business came up, Goswami was motivated by the idea of transferring these skills to this emerging field. "The challenge of creating business models that could succeed in this field given the complicated and international nature of intellectual property, funding and acceptance of such research was a major incentive in moving position," Goswami says. "One way we are aiming to do this is by focusing more on the use of stem cells as research tools in drug discovery, rather than stem cell therapies. For example, being able to provide a reliable and consistent supply of human stem cells pre-engineered with the desired assay/reporter systems could revolutionize drug discovery assays".

A strong internal team, together with external collaborations, will be crucial to success, believes Goswami. "Already, having a great team of researchers has allowed us to create technologies around which we have built productive external relationships," he says. "We're now working with research labs in several ways — providing support for stem-cell training courses, creating enhanced tools and involving opinion leaders in the testing of new technologies."