Peter Goodfellow on how automation can aid innovation in the pharma industry

Interview by Joanna Owens

Peter Goodfellow, Senior Vice President, Discovery Research, GlaxoSmithKline

Peter Goodfellow is currently Senior Vice President, Discovery Research at GlaxoSmithKline (GSK). His career as an eminent molecular geneticist and industry leader began in academia, during which he had a brief flirtation with biotech before he 'fell in love with making drugs' at GSK.

In 1979, following a postdoctoral position at Stanford University, Peter moved to London and joined the Imperial Cancer Research Fund (ICRF; now Cancer Research UK), where his research focused on new methods of genome mapping and the genetics of human sex chromosomes. Perhaps his most famous work was the cloning of SRY, the male sex-determining gene, as part of a collaborative study with a group led by Robin Lovell-Badge.

Peter was promoted to the tenured staff at ICRF in 1983 and to professorial level in 1986. He was elected to the Balfour Chair of Genetics at Cambridge University and to the Fellowship of the Royal Society in 1992. He has also been elected to the European Molecular Biology Organisation and the Academy of Medical Sciences. During this time he developed links with several biotech companies, and set up Hexagen plc, since acquired by Incyte Pharmaceuticals.

In July 1996, Peter decided he wanted to gain managerial experience in industry and joined SmithKline Beecham to lead the department of Biopharmaceutical R&D. In 1998 he was promoted to head of Worldwide Discovery, and when SB merged with GlaxoWellcome in 2000 to form GSK, he took on the role of Senior Vice President, Discovery Research.

Do you miss the academic environment?

There are many things I miss about academia. I miss working with young people. When you're running a lab, each year you take on new graduate students and new postdocs, and so every three or four years the lab personnel turns over. I miss that creative ignorance of the young; the enthusiasm that isn't bound by what the rest of us call common sense or our inherent prejudices. They are prepared to take on problems that the previous generation has given up on. In a large company such as GSK, the workforce is much more stable and people stay for much longer periods. That brings a professionalism that is absent in academia, but it needs to be balanced by the enthusiasm and creativity of the young.

Could you ever envisage moving from pharma back to biotech?

I really enjoy my job and I certainly don't have any plans to leave. But I guess I could imagine a future back in academia or biotech some day.

'I miss that creative ignorance of the young [in academia]'

What does your day-to-day job involve?

Mostly interacting with people. Approximately 30% of my time is peer reviewing the science of our portfolio, another 30% of my time is management and administration of the organisation that I'm directly responsible for, and a third 30% of the time is contributing to the management of R&D and GSK as a whole. The remaining 10% of the time is spent reading journals, thinking about science and contributing to the science base.

What has been the highlight of your career at GSK so far?

Starting a project and being able to create new science. I hope to see new drugs emerge from projects that I helped to start. I also hope to see fruits of an analysis that we did to find and address the bottlenecks in drug discovery. That analysis led us to the construction of new facilities designed for automation, thereby freeing scientists to think and leaving machines to add things together in test tubes. We started with the facility in Tres Cantos, Spain, which focuses on HTS, followed by a facility in Harlow, UK, which opened in October 2003 and is dedicated to HT chemistry. In early 2004 we open a facility in Philadelphia, which will have space for both HTS and HT chemistry. By using this type of integrated approach to automation, we are trying to bring more activities under the same umbrella. So, for example, we are now looking at incorporating all of our structure–activity relationship work in a single environment.

Do you think that by industrialising drug discovery, it's becoming less innovative and creative?

Do you think that by sequencing the human genome, we've become less innovative and less creative? If the answer to that is yes, then I plead guilty. What we're trying to do with 'industrialisation' is provide tools for people to do more things. Unfortunately, the word 'industrialisation' has all sorts of negative connotations, as has the word factory, and we've been very careful internally at GSK to use the word 'facility' because, quite rightly, scientists who are very highly trained don't want to feel that they can't contribute. The reality is that it is the machine that enables you to contribute much more. We don't decrease the amount of thought that goes into an experiment, you increase the amount of thought that you need to ensure that you do the right experiments.

'I think we're on the edge of being able to make drugs more easily'

In addition to HTS and HT chemistry, what other technologies in drug discovery do you think are exciting at the moment?

We're beginning to see the real impact of structure-based design with the sort of automated approaches that we're using. By generating large datasets that include structural information, I think we're on the edge of being able to make drugs more easily. It will take us a couple of years to be certain that is the case, but I'm very optimistic.

1359-6446/03/$ – see front matter PII: S1359-6446(03)02899-X

You're a molecular geneticist by background; what new advances or techniques in that field have impressed you?
The sequencing of the human genome has to be one of the central parts of the world going forward. But there's also whole-genome based technologies, which are rooted in genome sequencing, such as transcription microarrays. These approaches change the way that we think about experiments. The analogy I use is that ten years ago there was a rough equation that went: one graduate student = one gene = one clone per three years. Now, the whole process of gene cloning has been obviated because you have all of the genes available to you. The idea of collecting data on all genes is equally powerful.

Do you think that the human genome sequence will impact drug discovery and healthcare as much as expected, and if so when?
I've said before that we have to be much more careful about how we, the biomedical community – and by that I mean both academia and industry – sell ourselves, and as a former academic I think I'm as guilty as everybody else of saying: 'Give us money for basic research and we will give you cures for disease'. But when the drug discovery and development cycle is 15 years, then clearly today's latest 'breakthrough' is not going to translate into a drug to treat your disease tomorrow, it's going to be several tomorrows away. The same thing is true of sequencing the human genome – it wasn't an instant transformation that resulted in many new treatments, but I think it has created an environment in which the production of new treatments becomes much easier. How long will it take? Well, if you're an optimist, 5–10 years, a cycle of the drug discovery process, and if you're slightly pessimistic then it might take two cycles of the drug discovery process.

The biggest problem in the whole drug discovery business is that when you change something, you don't know whether that change is going to make you more successful or not until you've been through a cycle of drug discovery.

Why do you think R&D is becoming so expensive?
I'm not sure R&D is becoming so expensive. It's clear that there is enormous opportunity, and with that opportunity you need to make investments. Is US$30 billion a year spent by the NIH very expensive? It is clear that making safe, effective drugs using logical approaches is going to take considerable resources, and that's what we're seeing today. Whether making new medicines compares with the expense of making new cars or making new weapons is a social issue.

'Society needs to understand the [drug discovery] process'

How can the industry make the public realise how long it takes to discover a drug and the amount of investment required?
Society needs to understand the process so that they can understand why, for example, new medicines are so expensive. I think there does need to be a transparency. I also think that it's not just the pharmaceutical industry, it's the whole biomedical field, because I don't see industry as separate from society, I see us as a part of society.

How do you think consolidation affects R&D?
The increase in the size of a company as a result of consolidation gives you the opportunity to take an integrated approach to the whole process rather than the biotech approach of pinning everything on one hope or opportunity and waiting to see whether it's either wildly successful or a failure. Although we all know many successful biotech companies, the vast majority of companies fail.

'I see [the pharma industry] as part of society'

What in your view is the main thing needed to increase productivity and reduce attrition?
Anyone running an R&D organisation has probably done the same analysis as we did at GSK, which was to establish what the main problem areas are in the drug discovery process and invest in those areas. Once we've invested in that area, it takes a long time to know whether it was a wise investment or not. However, in the meantime, we're thinking about the next investment. So if you allow me the luxury of saying that our investments in HTS and HT chemistry have been successful, then the area where we really need to focus is connecting the clinic to animal models, if that's possible. We're trying to do that by using whole-genome approaches – transcriptomics, proteomics, and so on – to see whether the responses of animal models to a particular drug are the same as for humans. If it turns out that the animal models and humans are very different, then I think we're going to have to focus even more on extracting information directly from patients and normal volunteers, to tell us whether we're on the right pathway for therapeutic intervention or not. GSK is beginning to focus more on how we can extract information from the clinic. For example, we have an ErbB1/ErbB2 small-molecule inhibitor in the clinic that I'm very excited about. What we're trying to do is not only understand the tumour response to the drug but also understand those tumours that don't respond even though we might predict that they should, so we do that by looking at whether the inhibitor is blocking the different mitogenic signal pathways that are activated in the tumour cells. I think this type of approach, where you get information back from an individual patient, will become very important for helping us understand what the drugs are doing, and could form an important part of individualised or personalised medicine.

GSK have received a great deal of bad press about the price of drugs in developing countries, particularly drugs for HIV. Do you think the pharma industry is doing everything it can to help treat people in developing countries?
This is a social problem, a social issue. Do we point the finger at the automobile industry and say they're not doing their part because they're not providing the transport that is needed to move the drugs around Africa? I think we in the West need to make a decision about what our collective responsibility is, all of the parties involved. It was very depressing to see the bad press that the pharma industry got over this issue, because we were portrayed as being the barrier to HIV treatment in Sub-Saharan Africa, when actually we were, and still are, trying very hard to find a way of helping to solve the problems and deal with the difficulties of these issues – through preferential pricing programmes, R&D, education and donations. What is true, however, is that we cannot be the sole solution.

What strategies would you take to circumvent the issue of patent expiry of GSKs major drugs?
Make new drugs! My personal view is that patent law is an appropriate way for society to award innovators while at the same time preventing innovators from holding society to ransom. I think the system works well, as long as there is clarity about the rules. Patent expiry should be a major incentive to us to make new drugs, in addition to the incentive of trying to find new treatments for patients.

If you weren't a scientist in the pharma industry, what career do you think you would be doing?
We had one of those executive games where the top 400 executives in GSK was asked what they would have liked to have done if they hadn't been in the pharma industry. The majority of the male British-based executives said they would have wanted to play professional football! I am no different, I would have liked to have played football for England and been a poet.

You are cited by the FT as one of the ten most influential people in British science. In which area of science do you think you have been most influential?
I am flattered if anyone thinks I'm influential. I have worked in several areas where molecular approaches have transformed biological science, and was involved, with many others, in bringing molecular biology to human genetics. In my opinion, that marriage really unlocked our knowledge of medicine and clearly this continues today with the human genome sequencing and whole-genome approaches. If I could claim anything it would be that I have been a proponent of this type of molecular analysis combined with classical approaches.

'Science is an intellectual exercise and not a handicraft'

Who or what has been the greatest influence in your career?
There have been several people who have had an enormous influence. I often tell the story about the chemistry teacher who, when I was starting A levels, said that: '50% of what I'm going to teach you is true and 50% is untrue, and the problem is that neither I nor anyone else knows which is which'. I found this liberating: I realised that there was a lot out there still to be explored. I had a similar experience from the other side of the desk, when giving a seminar to a group of students about what could be done with the human genome sequence. At the end someone put their hand up and said, 'But what are we going to do, there's nothing left for us to do?' As an undergraduate, I had a lecturer called TGB Howe, who has a first degree in Classics and teaches microbiology as if it is an intellectual exercise. I was encouraged to think about science, and my PhD supervisor Walter Bodmer, a mathematician, continued in that tradition. Science is an intellectual exercise and not a handicraft – the emphasis should be on the thinking rather than the 'doing' with your hands. I still believe this today – I am trying to provide tools to allow scientists to think about science rather than to have to worry about physically doing the experiments.

What would you like to have achieved by the end of your career?
I would like it if there were several drugs on the market because of a contribution that I made to their progress through the portfolio. There are many projects where you make the decision to stop or argue that they should progress forwards, and perhaps this decision only contributes 0.0001%, but that contribution, when translated into the treatment of patients, could be enormous. I think that anybody who works in the pharma industry would like to see some of the drugs that they care about get through and actually make a difference. I believe that we can use knowledge to make the drug discovery and development process much more efficient, much quicker. I'd like to see that happen.

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