In 2012 the International AIDS Society published seven priorities for HIV research. What has been the impact of this strategy?
We decided to launch the Towards an HIV Cure initiative to stimulate and coordinate international efforts, and also to advocate for more research in the area. Several consortiums in the United States have been established to develop a cure for HIV, with experts coming from fields such as immunology, genetics, virology and also the private sector. Our knowledge of HIV persistence under antiretroviral treatment has progressed in past years. Strategies being investigated include reactivating the latent virus to flush it out of the cells and then to kill the virus with immune agents or a vaccine. Gene therapy to make cells resistant to HIV infection is also being explored.

"If we do not treat the 35 million people who are already infected, the epidemic will continue."

For the first time, this year's Lindau meeting boasts more female young researchers than male. How can more women be encouraged to take scientific posts?
When I first started work in the 1970s at the Institut Pasteur in Paris, France, there were no more than five female professors; today, the same institution has close to 50% female professors, which is wonderful. One way forward is to better recognize the work of women, although I think that this is already progressing. Another issue is children. I made the choice not to have children because I thought it was too difficult at that time to have a career and a family — although it might not be the best solution and many other women scientists do choose to have a family. Certainly we can better organize research institutions to offer childcare, for instance. While we all can agree that equity is a good thing, women shouldn't be selected just because they are women. ■

Iria Gomez-Touriño completed her PhD in biology at the University of Santiago de Compostela, Spain, and is a Marie Curie postdoctoral fellow in the immunobiology department of King's College London, where she focuses on identifying the T-cell receptors of autoreactive T cells in type 1 diabetes.

CHRISTIAN FLEMMING/LINDAU NOBEL LAUREATE MEETINGS

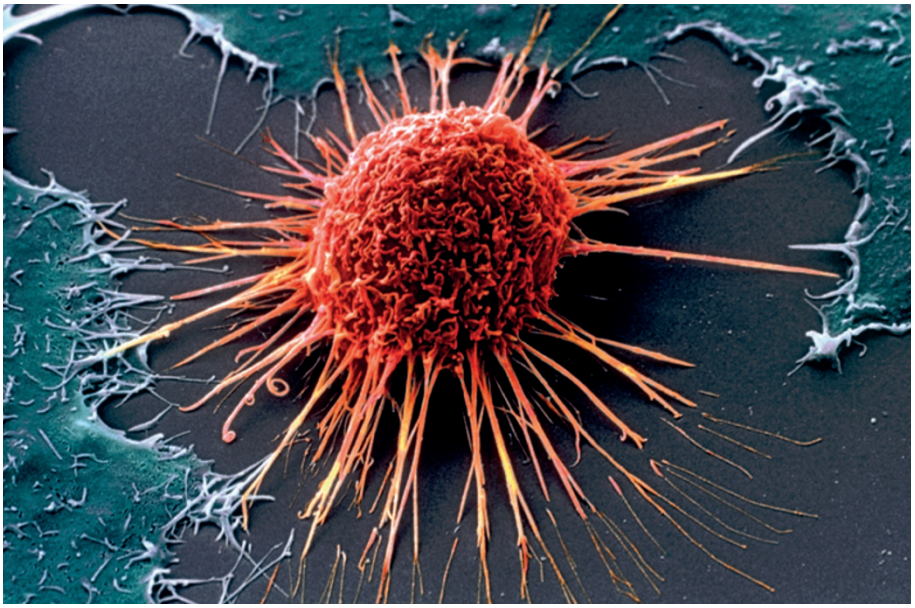
Q&A Michael Bishop
Free thinker

Michael Bishop and Harold Varmus proved that genetic changes could drive the formation of tumours. They were awarded the 1989 Nobel prize in Physiology or Medicine for discovering the origin of retroviral oncogenes. Bishop — now director of the GW Hooper Foundation at the University of California, San Francisco — tells Kipp Weiskopf about 40 years in cancer research.

What first drew you to science, and to biomedical research in particular?
My first scientific hero was Arrowsmith — the main character in the 1925 novel of the same name by Sinclair Lewis, which almost every medical student of my generation read. It is about an idealistic young man who starts out as a family physician but is not satisfied and wants to be a medical scientist who cures diseases. I identified with him because I grew up in rural Pennsylvania wanting to be a doctor but I was not very sophisticated. When I went to medical school at Harvard in Boston, Massachusetts, I had never seen the inside of a research laboratory, so I immediately took up with classmates who had undergraduate research experience and I credit them with my decision to try research.

What has been the most exciting stage of your career?
I had a great time working on polio in my early years in the lab. But I switched to retroviruses just before the discovery of reverse transcriptase, which was essential to the biotechnology revolution. We found ourselves at the cutting edge of an absolutely new field in which things were moving extremely rapidly. Every young scientist's objective should be to start something new because that's when things are really fun. If I were beginning my scientific career today I would study neuroscience, which has fascinated me ever since I encountered it during my first year at Harvard Medical School and which still has thrilling frontiers.

Has working in the San Francisco Bay Area been a particular influence?
When I arrived in 1968 it was in the middle of the Haight-Ashbury 'hippie heaven' era [named after a district in San Francisco], and a degree of openness also pervaded the academic community. I had other offers from institutes on the East Coast, but I disliked their academic pyramid structures. So I went to the University of California, San Francisco



STEVE GSCHMEISSNER/SPL

A cervical cancer cell — many cases of this form of the disease are caused by the human papillomavirus.

(UCSF), which at the time was of no consequence whatsoever. That did not bother me in the least because I was working on a very humble problem and having a wonderful time. There was an atmosphere that made it okay to explore any research direction. It was also a lively political environment. I flirted with the Peace and Freedom Party for a while, and it was the time of the Free Speech movement. There was an open spirit that I had never quite encountered before.

In more than 40 years of cancer research, what hits have we scored?

Two success stories are slam dunks. First, recognition of the fundamental role of the genome in cancer has completely transformed the way we think about every aspect of cancer. Consider the issue of what causes cancer. I view this as the most challenging unsolved problem in cancer research. Genome science may help solve this problem, because the nature of the damage in tumour DNA often represents the chemical signature of the causative agent. This is clearly seen in skin cancers caused by exposure to sunlight, and there are genomic clues for other cancers, such as breast cancer. Or consider early detection of cancer. It seems only a matter of time before either molecular cytology on excretions or circulating DNA help us to detect stealth tumours, such as pancreatic and ovarian cancer. And of course, the implications for therapy are profound.

"The fact that we have allowed the tobacco industry to continue to control the agenda is a public disgrace."

The second big hit has been in public health — specifically, the substantial drop in lung cancer in the United States that is attributable to the dramatic decline in smoking. Unfortunately, we are not doing as well in some other realms, such as obesity, or immunization against the papillomavirus, which causes cervical cancer.

Will we find a cure for cancer?

It seems unlikely to me that there will ever be a single cure for cancer. The disease is just too heterogeneous for that. Instead, I would like to emphasize that if we are ever going to conquer this disease, it will be by prevention. For example, we can prevent numerous diseases by vaccination against their causes. Examples include polio, measles, hepatitis B and cervical cancer. We need to know the causes of cancer in order to prevent the disease. The fact that we have not eradicated lung cancer caused by smoking and that we have allowed the tobacco industry to continue to control the agenda is a public disgrace — but the United States has blazed the path and in California we are doing better on this front than most other places.

Has a career spent working on cancer made you more or less fearful of the disease?

Some things haven't changed. My wife has colon cancer and the lead drug for that disease is the same one I was prescribing when I was a young physician 50 years ago, which is pretty sobering. So yes, it is a fearsome disease; even with therapy you may never have a truly comfortable day in your life again. By combining our eventual understanding about every lesion in the cancer genome with the emerging prospects of immunotherapy, though, I think the future is pretty bright.

Is the current relationship between academia and the pharmaceutical industry the best model for drug development?

It is a bit like what Winston Churchill said about democracy: it's a terrible system except for all of the others. We are in a market economy and we're going to stay that way because the development of drugs is very expensive. Some companies have shut down their research arms completely, relying on academia for new discoveries. The danger is that the money invested by pharmaceutical companies in academic research is very targeted, which could dilute the academic enterprise by crowding out fundamental research.

What do you see as the next frontiers in rational drug design?

Ultimately, it lies in understanding the signalling pathways so well that we can feed a computer all the DNA sequence data and have it tell us what are the likely targets for therapy, and what potential for drug resistance lurks in the tumour. The frontier is bioinformatics that uses genomic data to design a regimen that is free of pitfalls.

Twenty-five years after winning the Nobel prize, what inspired you to attend Lindau for the first time this year?

I have always had a major calendar conflict at this time of year, but having met students who have been here and also having my colleague Elizabeth Blackburn recommend the experience, I decided I would give it a try. It is more substantive than I had anticipated and my experience with the young researchers has been excellent.

How did winning the Nobel prize change your life?

The most important thing is that being awarded the Nobel prize has not changed the way I feel about myself. It also has not changed the way my colleagues think of me, and has not affected my bank account very much either! I do not see it as a burden, as some people have described it, because I do not take it too seriously. However, it was definitely an asset while I was chancellor at UCSF because, rightly or wrongly, it said something to the general community about the quality of the institution. Of course, it has also made it possible to come to a place like Lindau, which is a plus (except for the jetlag). ■

Kipp Weiskopf is an MD/PhD student at Stanford University in California and works on the interaction between the immune system and cancer. He has developed drugs that target CD47 and stimulate immune cells, particularly macrophages, to recognize cancer cells as foreign and attack them.