



Global health perspectives

Fellows of the Academy talk with Dr Geoff Watts FMedSci about their experiences of working in global health

The Academy of Medical Sciences

The Academy of Medical Sciences promotes advances in medical science and campaigns to ensure these are converted into healthcare benefits for society. Our Fellows are the UK's leading medical scientists from hospitals and general practice, academia, industry and the public service. The Academy seeks to play a pivotal role in determining the future of medical science in the UK, and the benefits that society will enjoy in years to come. We champion the UK's strengths in medical science, promote careers and capacity building, encourage the implementation of new ideas and solutions – often through novel partnerships – and help to remove barriers to progress.

Dr Geoff Watts FMedSci

Geoff Watts graduated in zoology and spent five years in medical research before deciding to abandon the laboratory in favour of the pen and the microphone. He was deputy editor of the magazine 'World Medicine', and presented the BBC Radio 4 programme 'Medicine Now' throughout its 17 year existence. As a freelance journalist he has presented numerous programmes on science and medicine for Radio 3 and Radio 4 and the BBC World Service. He spent six years as a member of the Human Genetics Commission, and was elected a Fellow of the Academy of Medical Sciences in 2003.

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Foreword

by Professor Robert Souhami CBE FMedSci, Foreign Secretary of the Academy of Medical Sciences

The Fellowship of the Academy of Medical Sciences includes many investigators who conduct biomedical and health research with partners located across the globe. Many of the Academy's Fellows are based in low-income countries in Africa and South-East Asia, while many of our UK-based Fellows focus on research into diseases that are endemic in poorer countries. As part of the Academy's developing portfolio of international work, we invited Dr Geoff Watts FMedSci to interview a selection of Fellows who work on biomedical and health research challenges in resource-poor settings. Included here are some extracts from those interviews, which highlight the opportunities and challenges facing biomedical and health research, and the provision of health care in poorer countries. These challenges include the delivery of evidence-based health interventions to people who are in urgent need of them, and ensuring that research efforts do not neglect diseases that sometimes escape international attention and funding.

Our Fellows' knowledge, enthusiasm and dedication to medical research internationally provide an exceptional resource for the improvement of global health - a resource that we aim to harness through the Academy's first International Strategy. I would like to thank Dr Geoff Watts for conducting the interviews, and Professors Nick Day, Kevin Marsh, Anne Mills, Vikram Patel, Robert Snow, Sarah Rowland-Jones and Malcolm Molyneux for their enthusiastic participation. I hope this booklet helps to communicate the strength of the contribution that UK science and scholarship can make to medical research in resource-poor settings.



Nick Day



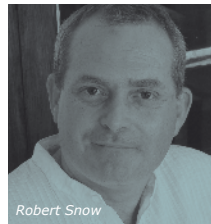
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Anne Mills



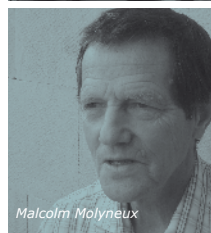
Vikram Patel



Robert Snow



Sarah Rowland-Jones



Malcolm Molyneux



Visions of global health

by Dr Geoff Watts FMedSci

Thirty years ago, asking a group of doctors and scientists familiar with the problems of developing countries how their standard of health was to be improved would almost certainly have generated agreement on one point in particular. The goal was not going to be achieved simply by trying to import unreconstructed systems of health care modelled directly on those designed to function in rich, developed countries. A watershed in thinking about the future of healthcare came in 1978 with the Alma-Ata declaration: the product of a World Health Organisation (WHO) international conference on primary health care. Its message was universal, but of particular relevance to lower income countries.

The declaration emphasised the central importance of primary health care. This, it said, 'reflects and evolves from the economic conditions and sociocultural and political characteristics of the country and its communities and is based on the application of the relevant results

'The story of public health has always been that developmental changes in society have been more important than specific interventions. But specific interventions can be important. Without them change takes longer.'

of social, biomedical and health services research and public health experience.' Hardly the most elegant of prose; but its message was clear enough. Attaining good health 'requires the action of many other social and economic sectors in addition to the health sector.'

While the particular opinions on the future development of global health expressed by the Fellows featured in this booklet were many and various, all fitted comfortably within this broad view. Professor Molyneux, for example, sees the future of global health as part of a bigger question of international equity and development. 'Every time we try to make any progress in research or clinical services we come up against the general economic strength of the society, and the general level of education.' Health care simply can't be divorced from other aspects of development. 'Africa is littered with well-intentioned donations of buildings and equipment that actually can't be operated or maintained.'

Priorities are also of concern to Professor Bob Snow. Some things, he says, have been prioritised because they are politically sexy. The eradication of malaria, for example, may not be scientifically realistic in the foreseeable future, but the idea excites people. 'Not nearly as high on the agenda is pneumococcal disease. It probably kills as many people, but hasn't grabbed international attention. Yet we know what to do, and there is an effective vaccine. But it's not being delivered. Pneumococcal disease isn't as exciting as malaria. Maternal and child health is another topic that keeps disappearing off the agenda. The issue here is slightly more complicated because we don't know quite what package of interventions works best to reduce the horrendous burden of maternal mortality and early neonatal death.'

To Professor Anne Mills, what's most important is to see middle and lower income countries building up their capacity to do research on their own health systems. But much of this effort relies on international funding - and donors, who are often quite influential when it comes to disease priorities and the development of health systems, may have their own ideas of what's needed. Money and influence from outside may not be best serving the interests of the recipient country.

Professor Kevin Marsh agrees. 'The fundamental requirement – and in a way this is a fundamental requirement for all development – is that countries have to take ownership of their problems. Part of that requirement is having a scientifically literate group of local people who can be involved in forming policy.' Professor Marsh also has another general point to make: 'The story of public health has always been that developmental changes in society have been more important than specific interventions. But specific interventions can be important. Without them change takes longer.'

In summary: the improvement of global health is inextricably linked to global development; basic primary care is *sine qua non*; research priorities must reflect local needs; policies should be informed by the understanding of scientifically literate local experts; and health care systems must be designed to meet local requirements rather than satisfy the prejudices of outside donors. The vision in a sentence...





A mixed bag of projects

Professor Nick Day FMedSci is director of the Wellcome Trust South-East Asia Programme based in Bangkok

Nick Day's first full time job overseas took him to Vietnam. He was working in a hospital in Saigon that admitted patients with a variety of tropical infections from all over the Southern part of the country. 'But it's diphtheria that sticks in my mind,' he says. 'The majority of doctors in the UK have never seen a case. It's a devastating, horrible disease that can kill kids in a number of different ways over a period of several months. And yet in the West, because of vaccination, our cultural memory is gone.' The depth of the impression it made on him is evident; talking of diphtheria he uses the word 'horrible' at least three times. And without actually saying as much, he's clearly disturbed by the West's loss of a widespread memory of the consequences of uncontrolled childhood disease. 'You have pressure groups of middle class parents saying that vaccination is a huge medical conspiracy. They just need to see a few of these cases.'

That Professor Day should have spent the greater part of his working life in South-East Asia is no mere matter of chance. 'I'd always wanted to do tropical medicine, partly because I grew up in the tropics, in Singapore and Uganda.' He studied medicine at Oxford, *en route* acquiring a degree in anthropology. Why that subject? 'Because I was fascinated by evolution, and remain so.' He'd toyed with a couple of alternatives, including genetics. 'But this was mainly working with fruit flies, and I decided that human evolution was more interesting.'

'You have pressure groups of middle class parents saying that vaccination is a huge medical conspiracy.

They just need to see a few of these cases.'

The Vietnam job came in 1991. 'I was lucky enough to be able to join Nick White's team in South-East Asia. He was then doing the job I'm doing now, director of the Wellcome Trust South-East Asia Programme based in Bangkok. He was in the process of spawning a daughter unit in Vietnam.' Day went there to take charge of it, working with local doctors studying malaria. During that time he carried out and co-ordinated research on the pathophysiology and treatment of severe malaria, tetanus, dengue haemorrhagic fever, typhoid, central nervous system infections and, of course, diphtheria.

He returned to Oxford in 1997 as a Wellcome Trust Career Development Fellow studying *Staphylococcus aureus* infections. The move wasn't one he would necessarily have chosen had there not been changes in the rules governing the training of junior doctors in the UK. The arrangements, in his view, have become too inflexible. When he left for Vietnam in 1991 there was no real system. It changed while he was gone. So, to acquire the Certificate of Completion of Specialist Training (CCST) necessary for a consultant post in the UK, he felt he had to return. In the long run it has made no great difference to the course and direction of his career; but the rigidity of the training system, he believes, is now an inhibition for junior doctors eager to work abroad.

When he returned to Asia it was to Thailand: to the mother unit of his previous base in Vietnam. The Wellcome Trust South-East Asia Programme has about 400 staff. The main laboratories and offices are in

the Faculty of Tropical Medicine of Bangkok's Mahidol University; there are research sites elsewhere in the country and also in Laos.

The programme includes research on malaria, melioidosis, rickettsial infections, dengue, and leptospirosis. This is quite a mixed bag - something which occasionally draws criticism when the unit has external reviews. Nick Day is unapologetic. Indeed, it reflects their philosophy, he says. 'In a rich Western setting where you're studying diseases relevant to the developed world, you do need to be very focussed to get to the forefront because there will be a large number of other researchers studying the same thing. It's very competitive. In our setting, which is rural areas of relative poverty, there is very little research going on. So the best use you can make of a sum of money may be to study a number of diseases. In our experience, being 'unfocussed' is actually the best path to follow - in a controlled way, of course.'

In the circumstances under which he works, and with the implicit hope of benefiting the local community, he's not happy about the idea of heading off into the countryside in search of evidence to back a pre-conceived idea. He feels it's important to go into an area and investigate before deciding what research to do. It's the local disease burden that should be, as Professor Day puts it, 'asking the questions'. More in-depth studies will come later.

What he describes as his personal research highlights include the largest ever clinical trial in severe malaria. This multi-centre study comparing intravenous artesunate with quinine demonstrated that the former yielded a 35 per cent lower mortality. The work led to an immediate change in the recommended treatment.

Every year Nick Day spends a month back in the UK. He visits scientific collaborators and meets up with colleagues in the University of Oxford's Centre for Tropical Medicine - which in 2006 awarded him a chair in the discipline. Unusually, he spends most of his UK time doing clinical work at the John Radcliffe Hospital. This is not at the behest of the University



or any one other body. He does it because it helps him keep in touch with the way the NHS is working, and with what's happening in the West more generally. This, he believes, is good for him - and good for his practice back in Thailand.

Global health challenges

Nick Day's current concern is over the flow of staff coming out from the UK to work with him. 'For the sake of the future of UK academic tropical medicine we need to have a stream of British junior doctors coming to do some research for three or four years. Sometimes they'll do that and get a PhD and go back into medicine in Britain; and sometimes they'll stay, like I did. But at the moment we have junior doctors who are interested, but too scared to leave the UK system. It's so rigid.' At one time the bright ones who really wanted to work abroad would be prepared to risk it. At interview they could make it clear that they had less formal but nonetheless highly relevant experience. 'Nowadays there's no way on a job application form that you can express the value of, say, having done clinical research on the Thai-Burmese border. In the past it was seen as something positive; now it's a negative thing. And at interview the candidates are all supposed to be asked exactly the same questions. I hear tales of frustration from junior doctors who would like to spend some time in the developing world but feel it's too risky.'



Questions from the field

Professor Kevin Marsh FMedSci runs the KEMRI-Wellcome Trust Research Programme at the Kenya Medical Research Institute

Kevin Marsh is professor of tropical medicine at Oxford University, and has been since 1997. He is also director of the KEMRI-Wellcome Trust Research Programme at the Kenya Medical Research Institute (KEMRI), and spends most of his time in that country. This geographical division of loyalty might seem a tad inconvenient. In reality it reflects the University's recognition of how and where his expertise (and that of certain other Oxford staff) is best deployed. It also fits with Marsh's own belief that research in tropical medicine should be driven by questions arising in the field and also, as far as is practicable, located where its findings will eventually be deployed.

Although he had a pre-existing interest in international development, Marsh's initial career decisions were determined as much by what he didn't want to do as by what he did. The former category included living

and practising medicine in the UK. Working in the developing world, he hoped, would be more exciting. Only when he'd actually begun in tropical medicine did he realise that this was what he really wanted to do.

'We want to avoid any suggestion that this is all just Oxford in Kenya. The vast majority of our researchers are after all Kenyans.'

A Medical Research Council (MRC) training fellowship took him to the Gambia where he embarked on clinical work together with research on malaria. 'It was a mixture of field-based epidemiology and laboratory-based work on immunity. The idea was to look at why pregnant women appeared to lose immunity to malaria. When I arrived I realised that we didn't really understand how anybody acquired immunity, so it was going to be hard to find out how you lost it. Now, 25 years later, I'm still trying to understand how children develop immunity.'

In 1985 Marsh returned to Oxford for a few years. He had been intending, eventually, to go back to the Gambia; but while at a meeting in Kenya he decided that this might be a good alternative. The outcome was a new research programme based on a tripartite arrangement between Oxford University, the Wellcome Trust, and KEMRI. The programme, which began in 1989 and of which Marsh is still director, started in a small way with a dozen staff. Now, including field workers, it numbers some 700. They began, not surprisingly, with malaria – which remains an important feature of the programme, albeit nowadays with more focus on the sick individual. This reflects an appreciation of the need to consider the disease in its context: the nutritional state of the population, their other infections, and so on. As a consequence the work has expanded to take on all the major causes of morbidity and mortality, particularly in childhood. Studies range from epidemiology to clinical trials to basic science.

While pleased with the way the programme has evolved and grown, Marsh wouldn't claim that it was solely the result of inspired foresight and careful planning. Chance, circumstance and serendipity have all played their part. But he likes to think that his basic tenet – research being driven by questions raised in the field – has continued to play its part in shaping the growth.

'My main scientific concern is still in how individuals become immune to malaria,' he says. 'Within that I have a more specialist interest to do with antigenic variation and changes in the molecular configuration at the infected red cell surface.' But research is only part of the job; most of his own time is now spent in developing and strengthening the programme.

Besides his directorship of the KEMRI Wellcome Trust Research Programme, Marsh is also professor of tropical medicine at Oxford. As he says, it is on the face of it an odd appointment; he spends only a limited amount of time in Oxford, and this is given over mostly to administrative matters, recruitment, linking up with colleagues, and the like. But the arrangement is beneficial to both parties. In fact Oxford has a number of people who spend their careers embedded in institutions in Africa and South-East Asia: in the areas where the diseases they work on are endemic. Many of these individuals are anyway paid not from university funds, but by organisations like the Wellcome Trust. As far as Oxford is concerned, the connection boosts its international credentials, and also contributes to its research assessment score. At the Kenyan end the link provides many logistical benefits, and strong international collaboration – although this last point is not something they overemphasise, says Marsh. 'We want to avoid any suggestion that this is all just Oxford in Kenya. The vast majority of our researchers are after all Kenyans.'

This, in itself, represents a marked change. It's one that delights him.





A shocking introduction

Anne Mills CBE FMedSci is professor of health economics and policy at the London School of Hygiene and Tropical Medicine

Anne Mills' entry to the real world of health economics, policy and planning was sudden if not brutal. On finishing a degree in economics and history at Oxford University she applied for a fellowship with the Overseas Development Institute (ODI). She was successful. At the age of 22 she found herself working as an economist in the Malawian Government's Ministry of Health in Blantyre. 'You had to come to terms rather rapidly with the Government bureaucracy and the political hierarchy, and learn how to influence what was going on,' she recalls. The job carried a considerable degree of responsibility. 'Nowadays you'd have at least a masters if not a PhD to get that job. In those days they recruited direct from university.'

Of the work itself, one component was analytical: looking at issues such as resource allocation, including the way that money was distributed

across the country. In her other main role she had to help plan the health components of integrated rural development projects. She points out that ODI took care in its selection process to pick only those individuals reckoned to be able to cope with this kind of sudden exposure. Even so the experience came as a shock to the system.

'Nowadays you'd have at least a masters if not a PhD to get that job. In those days they recruited direct from university.'

Happily it was not only formative but positive. 'It was a fantastic time. When you're in that setting, when you see the enormous deficiencies in health care, you can feel you're doing a valuable job. There were very few trained Malawian economists then.' She stayed in health economics. When she left Malawi it was to do a postgraduate diploma in health services administration at Leeds University. Or as she herself puts it: 'To learn the sort of things I ought to have learned beforehand.'

Mills spent the next three years looking at the NHS in England. But when an opportunity came to move back into low income country work, she seized it. This was in 1979 with the creation of the London School of Hygiene and Tropical Medicine's Evaluation and Planning Centre, a group comprising public health specialists, economists and anthropologists. She became professor of health economics and policy at the School in 1995, and head of the Department of Public Health and Policy in 2006.

Two research topics have played a dominant role in her career. One is malaria. This began, by chance, with a request to look at economic aspects of the disease in Nepal, including the cost-effectiveness of different interventions, and whether control was paying off. She returned to malaria in the mid to late 1990s when there was a global re-emergence of interest in it. There are now some six to eight economists working on malaria at the School – the largest group of its kind in the world. 'We undertook the cost-effectiveness analysis that provided part of the justification for the creation of Roll Back Malaria,' says Mills. 'More recently we helped to justify the global subsidy for artemisinin combination therapy.'

Her other main area of interest has been the financing and organisation of health systems, whether by community-based insurance, social

health insurance, contracting out government health services to Non-Governmental Organisations (NGOs) or the private sector, or any other of the various schemes found in low and middle income countries around the world.

There is, in her view, no single ideal solution to financing health care, no universal blueprint. 'This means that one can do a lot of useful work by looking at how different arrangements function in different settings.' In the late 1990s she ran a programme of research to evaluate systems of contracting out health care in different countries. The aim was to try drawing some general conclusions about this approach. 'One of the findings that emerged was the critical importance of the capacity of the local ministry of health to manage the contracting. The argument for contracting was often on the grounds that health ministries weren't capable of administering services themselves. We pointed out that ministries which couldn't do service delivery very well couldn't do purchasing very well either. In fact in some ways the arm's length relationship involved in contracting out was actually more difficult for them.' The aim, she firmly believes, must be to match the models available to the particular strengths and weaknesses of individual countries.

Since her early stint in Malawi, family and work responsibilities in London would have made it difficult to spend a further period working abroad. But she says she could now just about envisage another overseas position. One thing is clear: the Anne Mills who set off for another couple of years in Africa or elsewhere would be better prepared than the younger self who landed up in Malawi in 1973.



Global health challenges

Speaking of one of her main interests, malaria, Anne Mills declares herself optimistic. But she does have reservations about the thrust of research in the area. 'Clearly new research is important, particularly given the continuing spread of resistance. But, as with other areas of health, the main challenges are in the delivery systems.' What worries her most is the very fragmented system of external support for them. 'While there is definitely more funding available for malaria, there also needs to be greater help for countries to formulate their own strategies, and implement their own plans.' The support, she says, needs to be longer term, and more stable.

She makes a distinction between research into the technologies of biomedicine, and research into implementing them. 'We know that insecticide-treated bed nets are effective. We still don't have clear recommendations on how best to get them to people. Is it selling them? Is it giving them out? If you give them out, how do ensure that in four or five years time they're replaced?' Similar questions bedevil the distribution of anti-malarial drugs. The funds so far made available for implementation research have been too small. And there's also the question of legitimacy. 'A lot of my work at the School of Hygiene has been focussed on demonstrating that you can do rigorous research in this area - as rigorous as in biomedical science. But it's harder to raise money for work of this kind.'



Globally minded

Vikram Patel FMedSci, professor of international mental health at the London School of Hygiene and Tropical Medicine, is a psychiatrist based at the Sangath Centre in Goa, India

'South Asia has more than a billion people and about 3,000 psychiatrists.' says Vikram Patel, speaking from Goa where he spends the greater part of his time. 'If we tried to follow the kind of models (of mental health treatment) popular in Britain or the US that are dependant on specialist manpower, it would not be feasible or affordable.' He goes on to point out that even rich societies are starting to make more use of non-specialist health workers in tackling mental health problems. How much greater, then, is the importance of taking this approach in less developed countries? The more so given that Patel's ambition is not only to improve access and the cost of care, but also to boost its quality.

He finds it difficult to generalise about the state of mental health services in lower income countries. Some have policies, others do not. 'But

even in countries where there is a policy there are few resources to put these into action.' In one respect at least there would seem to be little difference between the rich world and the poor. Mental health is seldom near the top of anyone's priority list.

'South Asia has more than a billion people and about 3,000 psychiatrists'

Patel did his initial training in Bombay, deciding towards the end of it that what most interested him was mental health. He moved to the UK for specialist training in Oxford and at the Maudsley Hospital in London. Within the next few years he also worked in two other very different countries; first Australia, and then Zimbabwe where he spent two years at the medical school in Harare. What prompted the moves? 'At the time it was a desire to experience working in different places,' he says, 'but in hindsight it was also wonderful in terms of my understanding of mental health in different economic and cultural contexts.'

He returned to India in 1996, becoming a cofounder of Sangath in Goa. This community-based and non-profit organisation is funded through grants from bodies such as the Wellcome Trust; employs about 100 clinical, research and administrative staff; and focuses its efforts on child development, adolescent health, and adult mental health. The themes that underpin its work are also those on which Patel himself has concentrated for the past decade. 'The first is about the social and cultural determinants of mental illness. The second is how mental illness relates to other important health priorities such as HIV or child development. The third is how one can deliver treatment for people with mental illness without using specialist resources, because these are scarce and expensive.'

Treatment programmes at Sangath are based, as far as possible, on rigorous evidence. In their work on any particular condition Sangath staff devise a systematic programme of study. 'In depression, for example, we began by describing the local understanding of the illness, then finding out how common it is, and identifying the characteristics of the people who develop it. We then went on to develop treatments that are culturally acceptable and affordable, and finally evaluate them at large scale trial level. It's a logical process that can take up to 10 or 12 years.'

Another of Patel's enthusiasms is the Movement for Global Mental Health. This campaign grew out a series of articles on mental health that were published by the Lancet in 2007, and of which Patel was the lead editor. The series proved highly influential. 'It formed the basis of mental health Gap Action Programme (mhGAP), the new flagship program of WHO. Its success took us all by surprise. I think the reason for this impact was that over the years an increasing number of people had come to recognise the unmet need in mental illness in the global health context. By synthesising evidence and developing a specific call to action, the series of articles galvanised action. It was the right set of articles at the right time.'

The Movement for Global Mental Health itself is based on the Lancet series' call to action. Its aim is to improve services for people with mental health problems worldwide, and to do so following the best scientific evidence and with respect for the human rights of people living with mental health problems. That mental illness is not taken as seriously as it should be, Patel believes, is because many of the advocacy messages in the past have been fractured or contradictory. 'One reason why the Lancet series was so successful was that we were able to generate a simple, clear and actionable message.'

When asked which of his own research projects he regards as most important or satisfying, Patel picks two in particular. One is a study of the impact of depression in mothers on the growth and development of their children. 'This was the first such demonstration in a developing country. It's since been replicated around the world, and has led to trials to see whether interventions for maternal depression can improve child growth and development.' His second choice is the use of community health workers to improve the care of people with mental disorders. The trial he's currently finishing, on depression in primary care settings, is the largest for any mental illness carried out in any developing country.

Vikram Patel returns twice a year to the London School of Hygiene and Tropical Medicine, and reckons he teaches as much as he would were he living full time in the UK. The internet allows him to mark exam papers



and supervise PhD students without being physically in London all the time. The desire to travel that fuelled his earlier career moves has now abated, though he still sees himself as belonging to two societies. Not just to his native India, but also to Britain.

Global health challenges

Vikram Patel has his reservations about the way in which research money is spent. Pointing to huge gaps in health outcomes between rich and poor countries, Patel says that in most branches of medicine the discovery of new things is currently, for him, a lesser priority. 'Much of what we already know, and many very successful and often cheap interventions for health, are simply not being implemented in developing countries. So one of the research priorities for those countries should be to understand how to put the things we know work into practice.' This doesn't, he adds, apply to quite the same extent in his own discipline, mental illness, where there is still a need for more basic research that might yield new and more potent interventions. The benefits of remedying this particular shortfall, he adds, would not be confined to poorer countries. 'There is a huge scope for global mental health research to contribute to a better understanding of how to treat mental illness not only in the developing world, but globally.'



My successors must come from Kenya

Robert Snow FMedSci of the KEMRI-Wellcome Trust Research Programme in Nairobi is professor of tropical public health at the University of Oxford

It is now 25 years since epidemiologist Professor Bob Snow made a career choice he's never yet had reason to regret. He left the UK and went to live in Africa. 'I can't imagine doing anything other than what I do now - the science, working with the Kenyan Government, trying to shape policy. It covers all the bases for me.'

The bases he speaks of were not those he might have imagined wanting to cover when he embarked on his first degree, which was in human biology. The course was not chosen with any thought of epidemiology. Indeed it wasn't until his last year when one of the subjects was disease ecology that the topic caught his imagination. Instead of setting out to earn his fortune in the City, he enrolled in a masters degree course at the London School of Hygiene and Tropical Medicine. He'd pretty soon decided that he wanted to work on tropical disease ecology, in Africa.

In 1984 the MRCs Gambia Laboratories needed an epidemiologist to work 200km up-country in the field station at Farafenni. Snow got the job, and during the next three and a half years he ran a demographic surveillance system looking at the effects of various malaria interventions. He also learned about malaria epidemiology and entomology from Professors Brian Greenwood and Chris Curtis respectively. The trials in which he took part included the first in Africa on the value of insecticide-treated bed nets. 'The results were pretty dramatic. We showed a two thirds reduction in the clinical incidence of malaria if you treated the net with insecticide.'

'I can't imagine doing anything other than what I do now - the science, working with the Kenyan Government, trying to shape policy. It covers all the bases for me.'

Snow's next move was a temporary one, back to the UK. The six months he was in the country were spent at Oxford University's Centre for Tropical Medicine preparing for his next African base, the KEMRI site at Kilifi. Oxford already had links with KEMRI, but only for short-term projects. Along with Kevin Marsh, an ex-Gambia colleague, Snow helped to set up a deeper and more structured relationship between the two institutions. The research he embarked on was a large study of the host, parasite and environmental risks associated with potentially fatal falciparum malaria. 'This was the foundation for a lot of other interesting stuff that I went on to do in other sites of Africa, looking at the relationship between malaria transmission and disease outcome.'

After eight years at Kilifi he moved to Nairobi, to the KEMRI Wellcome Trust laboratories to work on the epidemiology of malaria in Africa more generally. He also started advising the Kenyan Ministry of Health on policy issues, and in particular on a national malaria strategy. After a year or so of doing this he felt he needed a more international perspective, so spent 12 months in Harvard at the Centre for International Development.

To the outsider it might seem that once you have devised a good strategy for dealing with malaria in place A, you can apply it just as well in places B, C and D. Not so, according to Snow. 'Of course there are some common features of malaria that transcend where you are. But

each area also has its unique characteristics. The commonly held view is that all you need to do is distribute insecticide-treated bed nets and offer people artemisinin-based combination therapy and you'll do the job everywhere in the world. This is possibly true for large parts of middle Africa. But outside Africa things are more complicated. To assume those two interventions alone will work will just lead to failure.'

Over many years of working in Kenya and elsewhere, Snow had built up considerable experience of mapping African populations according to the intensity of malaria transmission with which they were burdened. This led him to suggest a global equivalent. The Malaria Atlas Project (MAP) - which began in 2005 and of which Snow is director - combines medical information together with climate data from satellites to create a more detailed picture of the spatial distribution of malaria around the world. MAP has already published a world map of *Plasmodium falciparum* malaria, and is now repeating the exercise for the relatively neglected *P. vivax*.

On the future likelihood of our being able to deal satisfactorily with malaria, Snow is ambivalent. He sees a lack of financial commitment on the part of the international community and of national governments. 'The good thing about malaria is that we know what works. That's a big step in the right direction. But there are other things beyond the medical and research community's control. We need approximately \$4 per person at risk per year to do the basics of providing nets, a bit of spraying, some education about malaria, and the right medicines.'

'That doesn't sound a lot, but it's quite a big resource for an impoverished country. And whether the international community's going to stump up now in a time of financial meltdown I don't know. There's the human resource side as well. Many parts of Africa don't have enough doctors. And they have rundown clinics that can't be reached by roads to deliver goods and services. So there's a lot of infrastructure to be developed in the next ten years for us to do a really good job on malaria.'



With his personal chair in public tropical health at Oxford, awarded in 2000, his links with the University remain important. 'Oxford is a fantastic resource. Lots of people across the University you can draw on for expertise in economics and politics and social sciences. The Centre for Tropical disease provides a conduit for that.'

His ambition is not exactly to put himself out of a job, but he does hope he'll reach a position in which whoever eventually takes over from him doesn't have to be another expatriate Brit. It's a question of continuing to build research capacity. 'My successors,' he says, 'have got to come from Kenya.'

Global health challenges

Bob Snow is concerned about programmes for dealing with malaria. 'It's different from other diseases like HIV and TB that we're trying tackle as part of the Millennium Development Goals. With malaria we've done a lot of research, and we know what works. The only problem at the moment is being able to deliver the bed nets and the drugs. There isn't enough money, governments aren't adequately resourced to deliver to their populations, and nobody seems to be held accountable. There are a lot of good news stories out there at the moment promoted by Roll Back Malaria and other organisations, but they're only small snippets of what's going on across the continent.'



Immunology and Africa

Sarah Rowland-Jones FMedSci is professor of immunology in the Weatherall Institute of Molecular Medicine at the University of Oxford

Sarah Rowland-Jones' decisions to specialise in infectious disease, to do research, and to follow an academic career were all powerfully influenced by one of her teachers, the eminent microbiologist Harold Lambert, professor of infectious diseases at St George's Hospital, London. It was there, while working as a Senior House Officer, that Rowland-Jones first encountered him. 'He was close to retirement. But he was still enjoying his work, whereas one tended to see people in other specialities looking forward to stopping.' This, she decided – or perhaps it just came to her – was the specialty to go for.

It was around this time that the first patients with HIV started being admitted to hospitals in Britain. Rowland-Jones found herself caring for some of them. This fostered an interest in the disease and the body's immune response to it that has stayed with her ever since. Looking back

she feels the nature of her interest was slightly unusual. 'Most people at that time were keen to do laboratory work on the patients' cells, whereas I was more interested in the patients themselves.'

'Most people at that time were keen to do laboratory work on the patients' cells, whereas I was more interested in the patients themselves.'

At an equally early stage in her career she found herself liaising with clinicians in Africa about some of her patients. This foreshadowed an eventual shift into tropical medicine: a change that eventually happened following her move to Oxford, where she began working with Professor Andrew McMichael on the role of cytotoxic T-cells in HIV and other viral infections. She became professor of immunology in 2000; 12 months later she began a three year stint as director of the University's Centre for Tropical Medicine.

'This was an honorary post, so I was still doing a lot of research and clinical medicine,' she says. 'But it involved dealing with the overseas units, trying to attract bright young clinicians to go and work in them.' The job demanded a good deal of travel. The idea began to take root in her mind - and in that of her geneticist husband - that it might be interesting to work abroad for a period. In the course of providing logistical support for the overseas units she'd been learning a lot about what they were doing. So when the research directorship of the MRC Laboratories in the Gambia fell vacant in 2004, she applied. She was appointed, and the family moved to Africa for the next four years.

This, as it turned out, was not the easiest of times at which to take charge. A previous director had left after problems with the Unit's quinquennial grant submission, and during the turbulence of an interim leadership there had been a number of other resignations. Rowland-Jones had already been collaborating with staff working in the Gambia, exploring among other things the immunological basis of resistance to HIV infection. 'I'd done a study looking at whether sex workers who'd been exposed to HIV but not infected might have some kind of T-cell immunity to HIV infections.' The paper reporting the work had attracted much attention, and had launched a continuing collaboration with the Gambia. 'So the place wasn't unfamiliar - although it's very different

living and working somewhere compared with visiting it, even if you go for prolonged periods.'

The apparent immunity of the women in that study remains something of a mystery, the resolution of which would surely cast light on so far unsuccessful attempts to develop a vaccine against HIV. 'As with malaria', says Rowland-Jones, the organism changes constantly, and such immunity as people do develop is partial and not long lived. The difficulties presented by the two diseases are not identical, but have certain features in common. And just as a malaria vaccine is increasingly seen as likely to offer partial rather than total protection, this may also be true for HIV.

She enjoyed her four years in the Gambia, but describes it as an uphill task. 'We had to arrange a complete research programme within a year of my arrival. We had to recruit an entirely new malaria team because most of the previous people had left. Our new recruits were arriving as the proposal was being written, which was hard work for everybody.' But she adds that she wouldn't necessarily refuse a further period overseas at some point in the future.

Back in Oxford she continues with the work on HIV, now in the MRC Human Immunology Unit based at the Weatherall Institute of Molecular Medicine. With her colleague Tao Dong and their research group she also takes an interest in immunity to influenza, and the immunological basis of differences in the severity of the illness. In particular they've been monitoring functional changes in T-cell memory over time, trying to find out if the quality of the dominant T-cell responses has an impact on clinical outcome. The hope is that a better understanding will contribute to improved vaccine development. Insights from work on 'flu may contribute to an understanding of HIV, and vice versa.



Global health challenges

There are still many diseases that don't attract sufficient attention, according to Sarah Rowland-Jones. 'People working outside the big three - TB, HIV and malaria - find it more difficult to get funding for their particular interest. An example in the Gambia is hepatitis B infection where there's been a very successful campaign over 20 years to vaccinate the population. But people over the age of 20 are still dying of liver cancer related to earlier hepatitis B infection.' Because hepatitis is so common in Africa it can't be described as a neglected disease - for which there have been all sorts of initiatives. 'If you're neither neglected nor a major priority then you don't attract attention.'



Attentive to the clues

Malcolm Molyneux OBE FMedSci is professor of medicine at the College of Medicine in Blantyre, Malawi

Born in what is now the Democratic Republic of Congo, Malcolm Molyneux lived in the country till he was 13, and was educated at a boarding school in Northern Zambia. 'It's not a backdrop you can easily forget,' he says. Indeed, following a medical degree at Cambridge and junior doctor posts at Northwick Park Hospital, the Royal Free and elsewhere, the early 70s found him back in Africa, this time in Malawi. Given his African childhood this was more a case of returning home than of venturing into the unknown. Going back, he reflects, seemed a perfectly natural thing to do.

With his wife Elizabeth, also a doctor, he joined a mission hospital in Southern Malawi, and spent a year practising general medicine. When the Government health service needed a physician with a qualification

in internal medicine, he was the only eligible person in the country. He joined the service, and stayed with it for the next nine years.

'We wouldn't have returned to Malawi simply to continue the sort of work we had been doing. We went back because of the new opportunities that had opened up.'

In 1984 he returned to the UK as a senior lecturer at the School of Tropical Medicine in Liverpool. Why the move? 'I felt the need to get a broader perspective. I felt I had done what I could, and was rather marking time in Malawi. It remained interesting and challenging, but there wasn't at that stage a medical school, and there was no sense of moving forward.' On a personal level he also wanted his children to start their secondary schooling in the UK.

He stayed in Liverpool until 1995, becoming professor of tropical medicine in 1993. His return to Africa was prompted by the creation of the Malawi-Liverpool-Wellcome Trust (MLW) clinical research programme, of which he became director and remained so until 2007. 'We wouldn't have returned to Malawi simply to continue the sort of work we had been doing. We went back because of the new opportunities that had opened up.'

Most important of these was that Malawi had now set up its own medical school, in Blantyre. Molyneux foresaw that a direct link between this and the school in Liverpool could be mutually beneficial, and so it proved.

Besides tackling research on tropical diseases in the place where they actually occur, the MLW programme aims to provide training in research skills for clinical and lab scientists from Malawi and elsewhere, and to generally strengthen the medical school's capacity to study locally important health problems.

The research programme follows a broad definition: less 'tropical medicine' than 'medicine in the tropics', says Molyneux. The research portfolio has included Salmonella, TB, pneumococcal and other infections common in that part of the world. HIV, of course, constitutes an ever-present background to work on all these conditions, increasing people's susceptibility to them. Severe malaria is another preoccupation: a topic on which Molyneux began working while he was still based in Liverpool.

He's also been involved in data, safety and other monitoring activities in a number of malaria vaccine trials including the much publicised South American SPf66, an agent that sadly failed to live up to the initially high hopes of its efficacy. 'It had a twinkling of promise in East Africa, but then none at all in West Africa or Thailand. It was a tremendous disappointment, but also an incentive to develop new ways of testing vaccines. We learned a lot about the measurement of malaria outcomes and endpoints, and the way to run such trials.' He's also studied the interaction of malaria and HIV in both ward and field studies.

In spite of the setbacks, Molyneux remains optimistic about the prospects of a vaccine within the next ten years. 'I don't think we'll have a smallpox or a polio type vaccine that more or less banishes the problem. I see it as being an adjunct, an additional bulwark against infection, maybe to the tune of 30 to 50 per cent, making malaria more susceptible to other methods of preventing its transmission.' These other methods, of course, include prompt efficacious treatment, insecticide treated bed nets and indoor residual spraying.

In reviewing the health of the Malawian people and the medical services available to them over the time for which he's known the country, Molyneux's message is not one of unconstrained advance. 'There have been big improvements,' he says, 'especially in terms of the number of people trained and the number of local people in positions of leadership.'

But the onset of the HIV epidemic has put the brakes on that advance. 'From 1984 to the present it has steadily ravaged the country. So you've got progress in various areas against a huge increase in the challenge from this epidemic. This has been coupled with a considerable increase in the population with no increase in land area.'

On the frustrations of working in a resource-poor country Molyneux is philosophical. 'There are two ways of thinking about it that help. One is that wherever you work there are limitations of some sort; they're just different here.' Moreover, he insists, there's still a surprising amount that can be done. Choosing his words carefully, he continues: 'Some



of what's done now in the West - more, probably, in the States than in Britain - exceeds a sensible approach to disease. There you have to do everything possible, just in case. And this can be quite debilitating. Here we're thrown back on paying more attention to what the patient has to say, and making a careful study of physical signs. Listening, looking and being attentive to the clues.'



Building research capacity

'When I first went to Africa I started to wonder why so many expatriates were doing this research, and so few Africans,' Professor Marsh recalls. Now he knows. 'When you look at the amounts of money which have gone into research capacity building over the years they're tiny by comparison with what you'd need to spend if you were serious about it.'

Professor Day agrees. 'It's difficult for young doctors and scientists in the developing world to get trained and able to do clinical and scientific research in their own countries. It's difficult for them to get training overseas. And then it's difficult for them to get funding when they return.'

Several things, says Professor Marsh, are required to create a thriving research environment. You must have a critical mass in terms of people, intellect and resources; a satisfactory career structure; and someone to take a strategic view of the enterprise. Too many attempts at capacity building have just drizzled a few millions of pounds over peoples'

enthusiasms at a particular time. 'There's too rarely been an attempt to step back and ask what actually has to be done if we want to achieve this or that goal.' When you do this you usually find that what's required is a substantial amount of money. 'More like billions than millions – but that's hardly unreasonable when you think of the investment that's gone into science in the West.'

'I feel we need a greater partnership between research funders and development funders so that the two can proceed in parallel.'

Professor Molyneux offers a further caveat. 'I do feel that boosting research capacity by itself isn't going to make too much sense. We need it to be in the context of a broader increased capacity. For example, we need to strengthen good science teaching in the schools, and to do that we need to strengthen teacher training colleges.' Additional effort lower down the pyramid, in other words. Neither, he adds, can we improve clinical research significantly without attention to clinical services, particularly if these are weak. 'We've tried to pursue this line here (in Malawi) in that every research person has a clinical role and a teaching role. But that's not always how funding is organised.' Satisfying the needs of the researchers while also meeting the needs of patients can be tricky. 'I feel we need a greater partnership between research funders and development funders so that the two can proceed in parallel.'

Professor Snow has another suggestion. 'One thing we've invested in that's paid dividends is building a research cadre of epidemiologists, critical thinkers in science.' It's important, he thinks, to promote the value of investing in tropical medicine in the tropics. This can have a big development impact. 'We started in Kilifi 20 years ago with just a handful of people. We now have 700 working in the programme, and 100 Kenyan scientists developing research ideas and moving things forward. We work with the Kenyan Government in trying to translate some of that research into policy. And you can only do that from here. You can't do that from Oxford.'

Professor Rowland-Jones also has a point to make on the type of research capacity that needs to be created. 'There's a tendency for people to feel that research in developing countries should be limited to public health type efforts. The contact I've had with African scientists,

and with scientists from other developing countries, suggests that they want an academic career in the same way as scientists in the developed world. They don't want to be told they can only work in public health.' The West, she says, can be seen as patronising if it tells people what they must focus on. 'One of the things we were glad about in the Gambia was that we were able to recruit a lot of scientists from across Africa to posts in which people could envisage an international career structure, but based in a developing country.'

Some might say it's all a question of limited funds. Professor Rowland-Jones disagrees. 'Doing molecular biology does require more capital investment than public health research. But in spite of unreliable electricity and water systems, the Gambia labs ran a large molecular biology programme and had their own sequencing facilities on site.'

Science in the developed world is an international activity. Research institutes in the developing world should be as international as their developed world counterparts. Until this is the case, says Professor Day, we should remain mindful of the history of this branch of medicine. He is fearful of research in tropical medicine being seen as replicating an old colonial model in which researchers from the rich developed world with its resources and centres of excellence travel to acquire new knowledge and dispense pearls of clinical wisdom. Although it's no longer like this, he insists, it can still be perceived in this way. The movement of medical scientists between countries, whether in the developed or developing world, is wholly desirable – but it should be a choice born of intellectual cross-fertilisation rather than a necessity resulting from the lack of training and research facilities at home.

One feature of research that Professor Molyneux would be sad to see lost is the sense of excitement, challenge and even adventure that should be part of doing it. 'It's got to be a thrilling option for the people with energy and the best minds to want to get into.'





The role of the Academy

All the Fellows who spoke to the Academy during the preparation of this review were delighted that it was not only taking an interest in global health, but intent on doing more in the future. As Professor Mills pointed out, links with many developing countries that go back to colonial times have given the UK a vigorous and still thriving research base in this field. The Academy, she added, is a body well-placed to ensure that this tradition is maintained and enhanced and given added prominence. Professor Snow agrees. 'In the UK the Academy can lobby effectively through the Department for International Development. It can make a strong case to the UK Government on what it should and shouldn't be investing in.'

Professor Molyneux would be keen to see the Academy promoting and enabling more connections of the Malawi–Liverpool–Wellcome Trust kind in which he himself is involved. While links between individuals in different countries can be valuable, as can inter-governmental tie-ups, it's the inter-institutional links of the kind that exist between the School

of Tropical Medicine in Liverpool and the Medical School in Blantyre that he thinks are most valuable. Institutions are big enough to have the resources to get things done, but small enough to allow for feelings of personal commitment and identity. 'Liverpool and Malawi have both found the link stimulating and beneficial and it's had various spin-offs. It would be an achievable goal to try identifying more such connections.' There might also be a case for creating links at school level, he suggests.

What most impresses Professor Rowland-Jones is the Academy's mentoring scheme. 'It would be nice to see that sort of thing extended both to UK trainees working overseas, and also to trainees based in developing countries. It's extremely difficult to be successful in funding grant proposals from a developing country, and to have a mentor who could provide guidance would be very useful. This could make a big difference to people trying to establish themselves as independent researchers.' At any one time, she says, two thirds of the people in her group are from developing countries and will eventually go back to them. Like other Fellows in her position, she provides informal mentoring - but thinks it's something the Academy could arrange more formally.

As Professor Marsh points out, the Academy has a membership with a vast fund of experience to draw upon in producing high quality reports that bear on global health. But it may not have occurred to all Fellows that their knowledge and experience can be relevant in a global as well as in a national context. The Academy can remind them of this. As he says, some Fellows are themselves located in the developing world, and happy to help. 'Feel free to exploit us!'



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