# Report on the

# ANGLO-JAPANESE HEALTHCARE CONFERENCE

# —THE FUTURE OF MEDICAL TECHNOLOGY: 2001-2010—

## March 29th-31st, 2001

## IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE, LONDON
## Lecture Theatre 342
## Mechanical Engineering Building

**Organising Committee:**

**Professor Richard Kitney,** *Department of Biological and Medical Systems, Imperial College*
**Professor Fumihiko Kajiya,** *Department of Cardiovascular Physiology and Medical Engineering, Okayama University Medical School and Kawasaki Medical School, and former President of the International Federation for Medical and Biological Engineering*
**Professor Motoaki Sugawara,** *Department of Cardiovascular Sciences, Tokyo Women's Medical University School of Medicine*
**Alexandra Wyke**, *Managing Director, PatientView, and former Head of the Healthcare Division, The Economist Intelligence Unit*

**Joint Auspices:**

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**Okayama International Medical Engineering Forum, Okayama, Japan**
**Suzuken Memorial Foundation, Nagoya, Japan**
**Department of Biological and Medical Systems and School of Management, Imperial College, London**
**Com.Medica**
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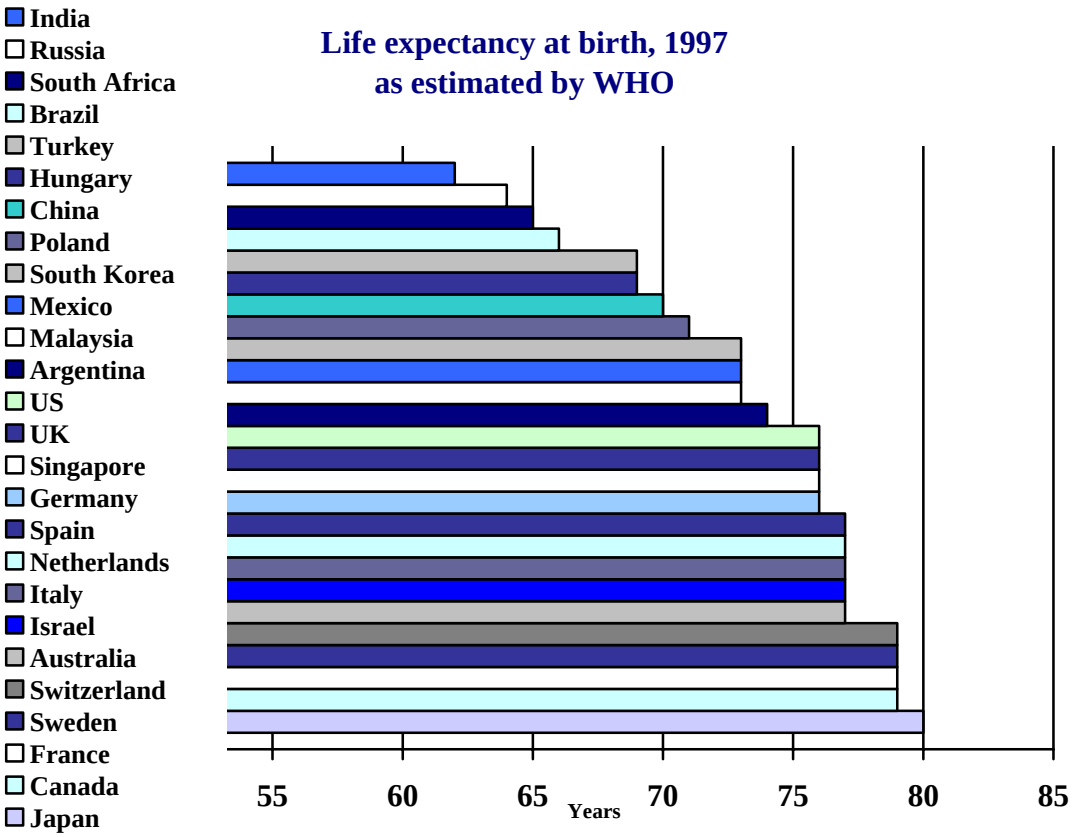
## Summary

Technology is paving the way for medical advances in very diverse arenas. The possibilities afforded by 21st century medical science are phenomenal. During the course of three days at "*The Anglo-Japanese Healthcare Conference on The Future of Medical Technology*", the technologies were identified and a number of scientific challenges were recognised. But all participants were convinced that medical advances are set to alter the face of healthcare radically. And that health of nations could consequently greatly improve. The biggest obstacles to progress seem to be the entrenched attitudes of government. Politicians, however, believe that the social and ethical implications of tomorrows medical advances are too huge for medical scientists to be granted a free rein.

## The challenges are numerous

Today healthcare is in a sorry state. Health inequities are growing. And as populations age the situation is bound to get worse. Globally governments are seeking to reform their healthcare systems. Yet diseases and the costs of treating them are on the increase. And all the while doctors' powers are eroding, as patients are becoming more disenfranchised and empowered.




The call is now for greater transparency and more visible standards for healthcare. It is against this background that innovation is gathering pace.

## Where medical technology is headed

In principle, technological innovation offers the greatest benefits to the largest number of people. At the heart of any project there is an understanding that the impact of any

innovation should be monitored within the relevant population to assess its impact of their well-being. For almost all of the last century, research projects centred upon the alleviation of disease. Great advances were made, ranging from the development of numerous pharmaceuticals to the deployment and refinement of x-ray technology. With the obvious exception of antibiotics and vaccinations, the approach resulted in palliative treatments. With this in mind, the 21st century is seeing a very significant shift in how scientists select their medical targets.

Today's key medical research includes, the miniaturisation of medical hardware, non-invasive medical interventions, gene profiling and new curative pharmaceuticals. Tissue engineering promises the creation of two-dimensional and three-dimensional tissue structures such as nerve tissue, tubular structures and even whole organs for transplantation. Modern technology is providing new methods of diagnosing, screening, and monitoring disease. For example, modern geneticists can profile those individuals with a predisposition to certain ailments. This panoply of medical advances is shifting healthcare from reactive to prophylactic; from palliative to curative.

Much still needs to be done. At a genetic level, the human genome may have been mapped recently, but technologists have yet to understand the precise link between genes or groups of genes and how illness manifests itself. Even if this achieved, it is possible that the gene pools will be too small to warrant the development of bespoke drugs. But despite these problems, geneticists are confident that their technologies will enable the eradication of whole tribes of diseases making 21st century medicine very different from that of the previous century.

**A global not a local healthcare universe**

The digital revolution be it the Internet, Intranets, or multimedia communication should enable the rapid and widespread transfer of medical knowledge across the globe, as well as new forms of medical experimentation. Research teams will increasingly rely upon experimentation in a virtual digital world. And they will compare their findings with colleagues in far-flung places. Developing countries will possess state-of-the-art medical knowledge. Students everywhere, will be educated by the very best of any medical field.

However, it is the consumers/patients that are to feel the greatest change. In time, humans should be able to plug into a virtual knowledge bank that runs their healthcare needs, and in doing so, improve care—and all in their own homes. There are numerous technologies currently under development within the field of telemedicine: biotelemetry, electronic medical records (EMRs), miniaturisation of medical hardware (such as ultrasound), and multimedia packaging. Currently hospital beds and GP surgeries are filled with patients, many of whom could be treated remotely. If complete medical information about their individual conditions were available online and monitoring technology were widely available, patients could be 'seen' remotely by healthcare professionals without the need to duplicate large-scale centralised healthcare environments. Telemedicine holds the key to lowering healthcare costs in the long term. It also provides a solution to the management of the aged and infirm.

Certain presumptions need to be made to assure the advent of a virtual healthcare world: that everyone is working to the same standards; and that the bandwidths and

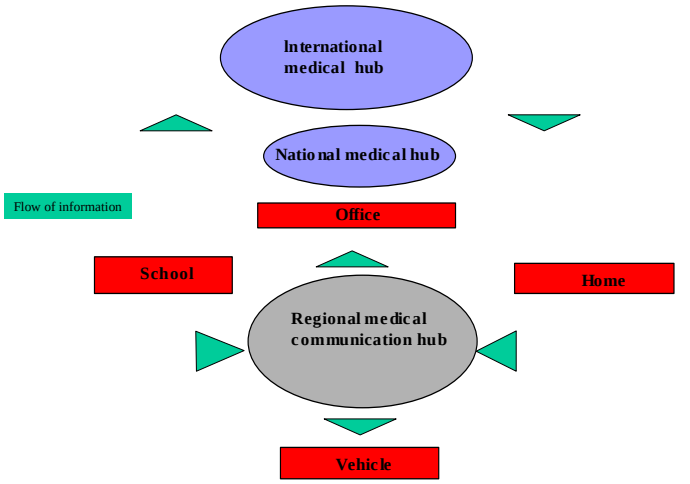
power are sufficient to support the infrastructure. Sending a scanned image of a high enough resolution 'down the wire' implies very robust computing, advanced image compression techniques and high-speed downloads. This is currently available, but at high cost. Medical technologists are therefore dependent on progress in the field of telecommunications. In addition, as learning by medical students become more individualised, new standards need to be applied across institutions with a common core curriculum and elective courses. The blueprint for such a national examination is being produced in Japan during 2001; and it is anticipated that there will be a nationwide qualification for testing by 2003.

The biggest hurdles, however, lie elsewhere. Medical data still has to be collected, gathered and disseminated. Legacy technologies need to be upgraded. Local, national and international electronic networks need to be laid down. Patients need to have greater access to the Internet. And all the technologies must be efficient and affordable.

### The 'empowered' consumer

But once these hurdles are surpassed, consumers/patients will become better informed as they have greater access to medical information online. As a result, they will be placed at the very centre of medical events. Local, national and international computer networks and services will link in to the consumer. And in time, technology could change the role of the doctor from omniscient health provider to healthcare adviser working alongside other professionals that aim to improve the well-being of the patient.

**A hierarchy of network medical links will service the healthcare consumer**




Source: Ken Kaplan, October 2000

## The socio-political background

Although technologists are convinced that they have the power to improve healthcare systems, governments are forced to take a more restrained view. For them, there are

two important issues related to medical research: cost; and the social implications of medical advance. Often the different perspectives of scientists and government can be unproductive.

**A question of money**

While the development pipeline is constantly producing new ideas and products, the cost of innovation continues to increase. The inequity of healthcare provision, even within the developed world, is a chief political concern. Given sufficient time, technology may provide answers to most medical problems. But the cost of development, be it genetic research, developing new bio-mechanical solutions or improving scanning technologies, may serve to hamper progress severely. This has to be considered against the background of rapidly ageing populations. One of the worthy goals for technologists is to improve the quality of life of those living to an advanced age. Yet as they achieve their aim older people will claim ever-greater amounts of disposable budgets unless current healthcare models are challenged.

As part of a new wave of health reforms, patients are being asked to take more responsibilities. They have to share the financial burden and interest in their own healthcare, when possible. Rationing is another financial mechanism by which governments seek to bring their healthcare costs under control. Already, politicians and medical professionals are forced to take tough decisions about which treatments to allow and disallow. They must decide where to allocate precious resources. Only cost-effective products receive government approbation. Governments, too, need to realise that not all medical solutions necessarily carry a high cost. Alternative and oriental medical techniques are increasingly being looked at in combination with more conventional western treatments, as these may offer lower-cost options. In tandem with the development of new drugs and treatments, new environments and monitoring systems are being investigated, that allow national healthcare systems better methods for assessing medical progress.

The shifts in political attitude toward medical R&D have forced technologists to review their agenda. Most now focus on developing products that keep people out of expensive hospital settings. Consortia and partnerships are the name of the day, not only to bring together disciplines to promote better research results, but to make R&D more affordable.

**A matter of ethics**

Aside from the question of money, the technologies themselves raise serious ethical and moral problems for politicians. In the past year the UK government has had to tackle sensitive medical issues such as waiting lists, organ removal, animal testing, battles over gene ownership, the genetic modification of food, animal and human cloning, euthanasia, BSE and the foot-and-mouth epidemics. In response governments have escalated the levels of political intervention, by implementing moratoria, through the creation of new regulatory bodies, by raising the profile of the public health and chief medical officers, through ever more watchdogs and through new national and intra-national legislation.

The issues for politicians, professionals and policymakers are likely to become more complex. The Internet raises new problems regarding personal privacy and freedom of information. There is a thin line to be drawn between self-determinism and social

responsibility. Academics seek greater freedoms, but the public demand that medical research be reined in.

## Will technology prevail?

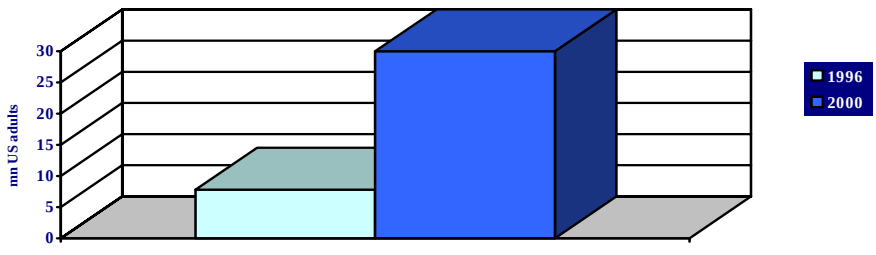
Following the three days of deliberation, the future for technology seemed assured, but with certain caveats:

- **Universal not local medicine.** Despite the diversity of societies, it was generally held that certain common problems should be tackled with common strategies. Thus within each nation there are policies that deserve greater attention, which could be universally applied. The notion of universality can be further broadened. In the future there may be such an entity as the universal doctor. From the beginning of the doctor's life, a globally standardised approach to medical learning, could turn internationalise the medical profession.

- **Technology offers both a societal and individual approach to treatment:** While genetic researchers and The Internet place a great emphasis on treating patients as individuals; government responsibility lies more with creating standards of health nationwide. The two approaches work well together. Patients may have to take increased responsibility for their own health. But at the same time patients can be secure in the knowledge that government and policymakers are protecting their interests through tough laws and regulations across the healthcare spectrum.

- **The need for more intelligent forms of medical education:** All participants in healthcare seek and need more education. Today, with greater self-determinism public education needs to go beyond government campaigning on single medical issues. At every stage in the development of a new technology, transparency will be the order of the day. In addition, both politicians and healthcare technologists need to be alert themselves to ethical and social implications of their actions in the field of medicine. For example, there is a need to overcome public and political suspicion of medical research, particularly where gene therapies are involved. There is also the matter of perceived 'loss of ownership' to be dealt with as medical professionals see information that was previously their exclusive domain becoming available to a wide range of consumers. Thus doctors and other healthcare intermediaries need to loosen their hold on medical data. At the same time as medical information spreads more widely, the public will yet again increasingly look to government and scientific accreditation bodies for guidance for reliable sources of medical facts and figures.

**Health and medical information retrievers online**
*Source: Cyberdialogue*



- **New role for politicians:** Tangible progress will only be a reality if the financial and social constraints placed upon technology are understood by those charged with its development. Ultimately, political pragmatism will determine the future, as only with political goodwill will projects be allowed to flourish and funds become available.

# Day One: Thursday March 29th, 2001

*On the challenges facing medical technologists, on how future medical information will be dispersed; on the need for reviewing methods and content of medical education; on tissue engineering and drug discovery, and on whether technology is good or bad for health.*

**Chairmen for the first day of the programme:**
**Professor Richard Kitney** *Department of Biological and Medical Systems, Imperial College*
**Professor Fumihiko Kajiya** *Department of Cardiovascular Physiology and Medical Engineering, Okayama University Medical School and Kawasaki Medical School, and former President of the International Federation for Medical and Biological Engineering*
**Professor David Norburn,** *Founding Director, The Management School, Imperial College*
**John Robinson,** *Chairman, George Wimpey plc, Low and Bonar plc, and RJB Mining plc. Chairman of the Healthcare Sector Group of the Overseas Projects Board (Department of Trade and Industry), and former Chairman, Smith & Nephew;*
**Dr Alexandra Wyke**, *Managing Director, PatientView*
**Professor Nicholas Bosanquet,** *Health Policy, Imperial College;*
**Professor Motoaki Sugawara,** *Department of Cardiovascular Sciences, Tokyo Women's Medical University School of Medicine*

**Welcoming address**: Sir Richard Needham *Chairman, Biocompatibles Ltd, Deputy Chairman of Dyson Ltd and Chairman of Gleneagles UK Ltd*

Sir Richard Needham, Chairman of Biocompatibles, looked at healthcare inequities and the lack of a standard model for dealing with the medical expenses of societies. In his speech he focused on the differences in the medical climate between Japan and the UK. A significantly higher percentage of the population lives longer in Japan than in the UK. As a result Japan is now tackling the problems of having to support an ever-growing elderly population. Both systems have their merits, cultural and commercial, but both must ask different questions of medical technologists. He concluded that there is a need for uniformity.

He proposed two solutions:

- **Similar access to new technologies**: "Approval of new technology and treatments is vital. But why, when there are fantastic advances in technology, is there no global approval system? The management of scientific advance is lamentable."
- **Better education of the public**. "The public are still unbelievably ignorant about themselves. One of the issues of greatest importance is how people are educated about their bodies. Education will certainly help in the management of medicine and of scientific advance."

**Keynote address, The Political and ethical agenda***:* The Rt Hon Virginia Bottomley, *JP, Member of Parliament for Surrey South West, and former Secretary of State for Health*

Mrs. Bottomley named the key challenges facing individuals, corporations and nations involved in the provision of healthcare:

- Growing inequities across the globe.
- Coping with the demographic 'time bomb'. The difficulty that many nations are beginning to encounter as people live longer and birth rates continue to fall.

**The changing percentage of the population over 65**

| | **1990** | **2015** |
|---|---|---|
| Japan | 12% | 23% |
| Europe | 14% | 18% |

Source: UN, 1990

- The problem of rationing. The political and social implications of deciding which diseases or infirmities will be reimbursed by the state, and which should be paid for by patients out of their own pockets.
- The erosion of the power of the medical professional. Doctors are seeing their powers "on the slide" as technology brings relevant medical information within the reach of greater numbers of patients.
- The greater transparency afforded by the Internet and other technologies.
- The need to keep up with the pace of change. The sheer volume of research projects carried out and the number of new developments and treatments brought to market means keeping up to date is an increasingly onerous task.

Thus medical technologists need to ensure that:

- Innovation should be available to the widest possible audience to effect 'transparency' and to ensure the confidence of the medical consumer in the process of which they are a part.
- Innovation must be 'patient friendly' – this will assist in making technological innovation more acceptable.
- Innovation should be affordable.

From her political perspective, Mrs Bottomley believed that central and local government will have to play an increasing part in the medical technological landscape, be it in the form of "watchdogs", moratoria, or legislation. However, such intervention should not be allowed to stand in the path of genuine progress.

**The impact of the ageing society: Kyoko Kitazawa**, *Deputy Editor, Nikkei Medical*

Ms Kitazawa, Deputy Editor, *Nikkei Medical*, gave an overview of the problems facing Japan's ageing society:

**Table: Average life expectancy in Japan and the UK**

| | **Japan** | | **UK** |
|---|---|---|---|
| | 1960 | 1997 | 1997 |
| Men | 63.3 | 77.2 | 74.06 |
| Women | 70.2 | 83.8 | 79.32 |

Source: OECD Health Data

People are living longer in Japan. As a result, there are concomitant numbers of people forced to tolerate varying amounts of disability and the chronic ill-health so frequently associated with advanced age. In addition, year-on-year increasing life expectancy rates in the country mean that ever-increasing numbers are being forced to live longer with such conditions.

In consequence, Ms Kitazawa said that the Japanese healthcare system is now "very tight" – although it has yet to buckle under the strain. Japanese national health expenditure in 1999 was 30 trillion yen (around £173bn) – substantial by any standard.

From the perspective of how much money should be apportioned to healthcare for the elderly, Ms Kitazawa commented there has to be recognition of the group's special needs. Interventions carrying the greatest benefit to the greatest number of old people should be a clearly identifiable goal, distinct from healthcare for society as a whole.

She added that technology on its own would not suffice in solving the problem. There has to be a greater appreciation of the social support structure that should form part of any healthcare environment for the elderly. Ultimately, technology in combination with increased access to long-term care should hold the key to reducing the financial burden represented by the elderly.

Looking ahead further, Ms. Kitazawa said there would also have to be more emphasis on prophylaxis to reduce levels of infirmity. But she noted that for Japan, adequate healthcare provision for the elderly would only be achieved if reform of the medical insurance system were tackled.

**Technology and care of the ageing in Japan:** *Mitch Green* **Mitch Green,** *General Manager, Development Division, Half Century More Co Ltd*

In Japan the elderly account for 17% of the population and around half of the national healthcare spend. These high costs are set to escalate. In Japan most of the elderly who stay at home do so with the support of their families. But economic considerations are forcing family helpers to go to work.

At the same time, there are too few hospital beds to accommodate the surplus elderly patients. Mr Green believes the answer lies in providing technological support to patients in the home. Mr Green noted that: "Japanese 'seniors' are demonstrating an increasing willingness to take responsibility for their own health and technology is assisting the transition."

Progress in remote monitoring, improved diagnostic techniques and in-home care should enable the elderly to stay in their homes and out of institutions for longer, according to Mr Green. Overall this should serve to lower the cost of caring for the elderly. Ageing consumers will challenge national healthcare agendas, requiring governments to focus more closely on patient management. Technology in the form of computer assisted monitoring and earlier and better diagnosis will serve to make this a reality.

**E-health education and the future medical student**: **Dr Rifat Atun,** *Director of the Health Management Programme and Senior Lecturer in Health Management, School of Management, Imperial College*

Rapid increases in the volume of available medical data and the move towards digitised information will require a complete overhaul of traditional medical systems, according to Dr Atun.

Today, many doctors begin to lose their skill base soon after they leave medical school – the sheer amount of new medical information makes the task of remaining current extremely challenging. In the future, it will become increasingly unreasonable to expect doctors to be the sole "receptacle of (medical) knowledge". Dr Atun predicts an on-line data-rich environment that would help ensure that doctors' knowledge remains current. An added bonus of working within such an environment would be that doctors would be able to take advantage of the pooled experience of their peers when making decisions.

The implications for medical students are profound. IT could assist remote learning, promoting better understanding of clinical outcomes in response to specific interventions. Students could gain an appreciation of the medical processes underpinning the healthcare infrastructure as well as the ethical implications of any decisions they might make. But before digitally enhanced medicine becomes a reality, several technical hurdles must be overcome:

- Bandwidth
- IT accessibility
- Electronic Health Records (An interactive document available online)
- Improved compression technology

Fortunately, none of these is insurmountable. Dr Atun pointed to the significant implications of digital medical support, particularly in the training of new doctors. There will be an inevitable move from "fragmented collective teaching events" to "self-directed learning." There is also the promise of internationally standardised medical instruction – a major step towards global medicine.

**Medical learning online: Martin Godfrey,** *Vice-President, Marketing, medschool.com*

Medschool.com aims to compress the whole of the undergraduate medical course into one online book, assisting students to becoming doctors. Dr Godfrey said that for students familiar with IT, learning is very much faster when it takes place online. Knowledge is absorbed up to four times more quickly than when using traditional methods. Learning and retention rates are also significantly improved with interactivity, compared to traditional medical instruction using books and a lecture theatre.

The Medschool.com programme also offers a "patient simulator"—
a tool giving the student a 'virtual patient' in need of medical treatment. Depending on the diagnosis that is made, the virtual patient will make progress or their condition

will be static or may even deteriorate. The method allows the student to progress through to a final diagnosis and to discover the optimal treatment for a problem. There is also an option to compare the diagnosis that has been made with those of others. Dr Godfrey said that peer-group comparison should form an important part of the learning process.

**The 'e-learning' market - US$bn per year**

| | |
|---|---|
| 1997 | 0.234 |
| 2003 | 11.3 |

*Source: medschool.com*

**Medical education, the Japanese experience: Professor Tadahiko Kozu,** *Department of Medical Education and Department of Gastroenterology, Tokyo Women's Medical University School of Medicine*

Professor Kozu felt that medical educational reform in Japan is inevitable. Pointing to the fact that the cost of educating medical students in Japan is very high and noting the country's ageing population, he said that there would be a pressing requirement for more doctors.

Under the current system, demand for doctors would certainly outstrip supply. Professor Kozu proposed a "paradigm shift" in medical education. In place of traditional group learning, future medical students would need to understand how to teach themselves. This can only be achieved through the increased use of online learning resources. It also means that the role of the tutor will move towards that of adviser and progress checker.

But a system of individual learning entails a recognised standard, capable of being applied across institutions with a common core curriculum and elective courses. The change is already under way. The blueprint for a national examination is being produced in Japan during 2001 and it is anticipated that there will be a nationwide qualification for testing by 2003.

**Tissue engineering and replacement**: Professor David Williams **Professor David Williams,** *Clinical Engineering, University of Liverpool, and Pro-Vice-Chancellor, University of Liverpool*

Professor Williams began by observing that the concept of tissue engineering does not necessarily mean making a device. It can also mean persuading the body to generate new tissue spontaneously. But there are currently limits to how far this can be taken and the body's ability to be cajoled into producing new tissue of its own accord declines with age.

During the 20th century one of the major limitations to any form of bodily prosthesis was the nature of the materials used. Professor Williams said: "We chose materials in the body because they were inert or because they were biodegradable and served a particular function. But it is still very difficult to take synthetic materials, place them in the body and expect them to perform over the long term."

He said that the next generation of biomechanical synthetic materials needs to convince the "body to heal itself through the delivery to an appropriate site of molecular signals, cells and supporting structures." Professor Williams believes that for this to become a reality, scientists would need to adopt a multidisciplinary approach.

The ability to deliver signals to tissue at molecular level is still some way off. "It's control engineering that's the issue. We have the perfect bio-factory (the body), but it's a question of controlling what the body does as far as tissue regeneration is concerned", he noted.

He added that in spite of the promise of the techniques that are being researched and developed, until there is a very clear commercial application, the question of who will pay the development costs remains unanswered. Funding for medical technology research is driven by clinical outcomes and should these not be apparent, the opportunity to make progress may be hampered.

**Cell sheet engineering for tissue reconstruction: Professor Teruo Okano,** *Institute of Biomedical Engineering, Tokyo Women's Medical University School of Medicine*

Professor Okano gave a presentation illustrating the progress that has been made in engineering tissues that are responsive to body signals. Under his direction, 'intelligent' cell sheets have been created that change their size, expanding or contracting, according to variations in temperature. This property is also capable of being 'switched' on or off as medical occasion dictates. This represents a very considerable advance on artificially created tissue sheets that respond solely to enzymes, which are too aggressive when in operation.

In addition Professor Okano's team have devised temperature-based techniques that enable different tissue surfaces to attach and detach from one another. Professor Okano likened the technique to a form of "scotch tape"; offering the surgical option of cultured cell sheets that will effectively "stick" different tissues together. Again, the technique involves fewer traumas for the patient.

Variations in the construction and shape of the cell sheets are possible according to the medical requirement.

**The goals of tissue and cellular engineering: Professor Carmelina Ruggiero,** *Bioengineering and Medical Informatics, University of Genoa, Italy*

Professor Ruggiero began by pointing out that tissue engineering started several decades ago. Outlining a number of cell adhesion, molecular structure and function studies that are already under way, she noted that the advent of 'in silico' (computer based as opposed to 'in-vitro' or 'in-vivo' testing – 'virtual' experiments) computer modelling and experimentation has led to rapid advances in the field.

Testing ideas with the aid of a computer also means a cost saving over more 'full-blown' initial trials—eliminating costly first stage research and avoiding going down 'blind alleys'. Professor Ruggiero said that as an emerging technology, tissue engineering has a very high market potential. The long-term goal of tissue and cellular

engineering is the ability to bring to market cheap and efficacious 'living' prostheses that can be easily used and with a clear benefit to patients.

**Drug Discovery - The multinational position: Dr Allan Baxter,** *Senior Vice-President , Drug Discovery, GlaxoSmithKline*

In the 1950s-1970s, drug discovery was largely a serendipitous affair Dr Baxter began by saying. But the progressively greater expense of developing new drugs and the pressures to realise a return on investment led to a change in direction. The research focus is no longer upon the alleviation of disease but on the potential cost benefits than can arise as a result of medical intervention. At a macro level the constant question is whether a treatment will keep patients out of hospital—the most expensive part of any medical treatment.

Despite these constraints, pharmaceutical innovation is in its 'third incarnation'. Dr Baxter commented: "It is fashionable to say that we are currently in the 'third generation' of pharmaceutical development" – a world in which combinatorial chemistry, ultra-high throughput, scaleable processes and genomics are becoming the norm. Essentially, the first two generations were reductive in approach – concentrating upon the isolation of single molecules, but "we are now moving into an era where many things are looked at once."

Dr Baxter said that the upshot of third generation research programmes is that all drug 'targets' will eventually become known: "The expectation will be that we will move away from the palliation of disease to prevention and, where we miss that, to cure." Current drug research endeavours all carry the possibility of individualised therapies and cheaper, safer medicines for all.

But costs will continue to be enormous. Dr Baxter observed that since 1980, the cost of R&D among the major pharmaceutical companies has increased fifteen-fold, but output at the end of the product pipeline has hardly increased at all. Even given the scale of multi-national pharmaceutical companies, "no one company will be able to encompass all the disciplines needed to bring new drugs cheaply and rapidly to market." Consolidation within the pharmaceutical industry looks set to continue, whether in the form of partnerships, consortia, mergers or acquisitions – in response to the range of skills and vast financial input needed.

## Is technology good or bad for health? Open forum

*Chair:* **Professor Nicholas Bosanquet,** *Health Policy, Imperial College;* **Professor Motoaki Sugawara,** *Department of Cardiovascular Sciences, Tokyo Women's Medical University School of Medicine*

The first day of the conference finished with a lively open forum on whether technology is good or bad for health, chaired by **Professor Nicholas Bosanquet** of Imperial College and **Professor Motoaki Sugawara** of the Tokyo Women's Medical University School of Medicine.

Four fundamental points emerged from the discussion:

- In principle, most new technologies offer a positive contribution to medicine. However, technologists should support rationing. The point was clearly made that while it may appear desirable, not every doctor needs a MRI scanner.
- In theory, technologists should take a neutral stand on ethical and social issues. However, technologists do need to participate in the public discussion of how their innovations should be used. The notion of ownership of a new technology needs to be established from the outset, in order that the greatest number can benefit from new developments.
- In practice, technology should be a way of increasing informed healthcare choice for the individual.
- Not every new technology has to be prohibitively expensive. As well as 'big ticket' technologies, it should not be forgotten that there are good "low cost accessories."

**Guest speaker: Professor Susan Greenfield,** Director, the Royal Institute of Great Britain

Professor Greenfield closed the day's considerations with a talk on how neuroscience seeks to understand an organ that controls every aspect of our lives, but which remains shrouded in mystery. She observed that if the brain is largely a mass of differentiated cells transmitting messages between each other electro-chemically, what gives rise to our sense of self?

Pointing out that while technology has advanced our ability to understand the physical manifestations of cerebral activity, we are no nearer to understanding why such expressions may constitute consciousness. Available scanning technologies permit the observation of areas of activity within the brain. But there is no straightforward correlation between seeing zones in the brain illuminated on a PET scan and proceeding to the conclusion that they are wholly responsible for specific types of behaviour. A parallel was drawn with populist notions of genetic theory.

Much play has been made of the idea that with the human genome now mapped, the next step will be the isolation of single genes that predispose us to particular ailments or behavioural traits. Professor Greenfield said this is not only a simplistic view, but ultimately reductive as it discounts the effect of other factors such as gene combination or external environment.

Similarly, the manner in which the brain functions is astonishingly complex and it is almost certainly the sophisticated neuronal links between groups of cells in different parts of the brain that account for its workings as much as the isolated neurones. However, with new scanning technologies in place to help us view 'grey matter' in action, Professor Greenfield posited a future in which we may approach an understanding of what gives rise to personal identity and an ability to treat brain disorders more readily.

# Day Two: Friday March 30th, 2001

*More on the technologies: informatics, telecommunications, imaging and visualisation, genomics, and pharmaceutical innovation. The financing of this medical technology revolution was also discussed. An open forum was held on the subject of the role of the doctor in the new technological world.*

**Chairmen for the second day of the programme:**
**Professor Chris Toumazou,** *Analog Electronics Group, Department of Electronic and Electrical Engineering, Imperial College*
**Professor Yohsuke Kinouchi,** *Faculty of Engineering, University of Tokushima*
**Professor Ken-ichi Yamakoshi,** *Department of Human and Mechanical Systems Engineering, Kanazawa University*
**Professor Tsuyoshi Shiina**, *Institute of Information Sciences and Electronics, University of Tsukuba*
**Dr Geoff Carr,** *Editor, Science and Technology, The Economist*
**Professor Shoichi Senda,** *Department of Integrated Medicine, Kagawa Medical University*
**Professor Katsuhiko Tsujioka,** *Department of Physiology, Kawasaki Medical School*
**Mark Simon,** *Chief Executive Officer, com.Medica*
**Professor Kenkichi Ohba,** *Department of Mechanical and Systems Engineering, Kansai University*
**Dr Tim Jones,** *Executive Director of Health for Europe, Middle East and Africa for the Oracle Corporation*
**Professor Motoaki Sugawara,** *Department of Cardiovascular Sciences, Tokyo Women's Medical University School of Medicine*

**Professor Chris Toumazou,** *Analog Electronics Group, Department of Electronic and Electrical Engineering, Imperial College*

Professor Chris Toumazou introduced the day by looking at the new high power devices, that can be embedded in the body. He said that the challenge was to build a bridge between digital information systems and body systems. But for this to be achieved there would have to be common interface standards – in effect, global standards to assist in the implementation and exchange of information.

**Medical Information and the Internet: Professor Richard Kitney,** *Department of Biological and Medical Systems, Imperial College*

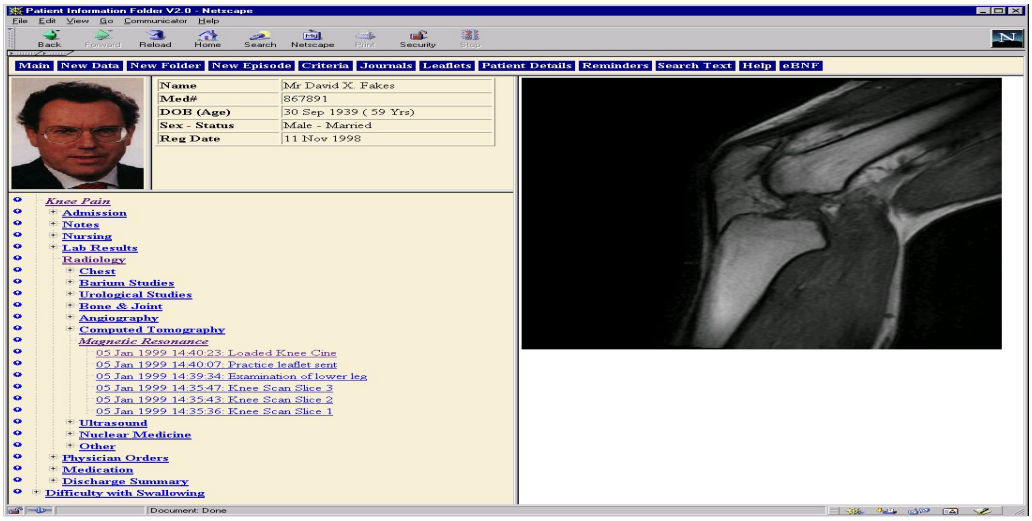
Professor Kitney started his presentation by saying that technology and market forces are shaping the future of healthcare with four trends already well established:

- The move from a data poor to a data rich environment
- The move from patient homogeneity to individual risk assessment
- The move from intervention to prevention (ie, gene therapy)
- The move from fragmented to integrated care networks

On the point of integrated care, he looked at imaging technologies used at St Mary's Hospital in London. Traditionally x-rays would have been used to assess the need for biopsy. With Magnetic Resonance Imaging (MRI), the image of the knee joint is far more sophisticated. With computer two-dimensional to three-dimensional modelling of the MRI image, it is possible to dissect the knee on screen, obviating the need for biopsy.

Professor Kitney said that developments of this kind are being facilitated by exponential leaps in computer memory and the ability of telecommunication channels to transfer complex pieces of data from one place to another. He considered rapid image transfer a vital weapon in the physician's armoury. An 80 "slice" MRI image of 63Mb can now be transferred from one location to another at very high speed (in seconds) so opening up the possibility of speedy second opinions from remote locations or of joint diagnoses.

In terms of memory capacity, computer industry products speak for themselves. Professor Kitney cited the fact that a 1994 Sega Saturn Game-maker ran on a higher performance processor than a Cray 1 supercomputer in 1976. Computer processing power will continue to open new possibilities for medical technologists and doctors.



The new scanning technologies and increases in computing power also have implications for storage. Professor Kitney noted that "30% of all chest x-rays are lost in the first six months" owing to the difficulties of storage.

But there now exists the capacity to create a 'windows' based EPRs (electronic patient record) holding the totality of a patient's medical history – available for a doctor to scrutinise at the press of a button. This would solve the problem of storage and enable the simultaneous distribution of perhaps a single x-ray to radiologist, consultant, GP and even the patient. Professor Kitney observed that while the future of healthcare is being shaped by market forces, "the agenda is being driven by the medical community", giving new technology projects direction and additional impetus.

**Tele-echo system: Internet and medical ultrasound: Professor Kunihiro Chihara,** Graduate School of Information Science, and Director, Research Centre of Advanced Science and Technology, Nara Institute of Science and Technology

Professor Chihara's vision is of a nomadic healthcare environment, one in which there are no geographical limitations. Even conventional hospital treatments can be carried out in the patients' home. His department has developed a product that accords with this promise: an Internet-friendly mobile ultrasonic device. The device is portable and can plug into the Internet, thanks to data compression technology.

Professor Chihara's mobile ultrasound scanner makes remote monitoring a reality. He foresees a future of what he labels "augmented reality". In this future, remotely obtained computer images support physical observations made by the patient to the specialist. Long-term, the prospect for this technology is self-scanning in the home, relieving hospitals of the requirement to summon patients for scanning checks and so freeing valuable resources.

**The medical applications of network technology: Dr John Baruch**, *Cybernetics and Medical Informatics, Bradford University*

Information technology has the capacity to change healthcare in all arenas: hospitals, healthcare centres and the community. But Dr Baruch says there are a number of limitations to this.

In the new world of healthcare, remote telemonitoring holds forth distinct promises:

- The ability to monitor the progress of a disease.
- The capacity to monitor the progress of drug delivery. This also means that GPs will be in a position to ensure that their patients are following a prescribed course of treatment.
- The possibility of identifying disease at an earlier stage and following this with preventive measures.

But the constraint to all of this is the degree to which individuals, patients and GPs alike, are educated and able to deal with IT.

In addition, "The challenge of writing software that can keep up with the pace of change (new innovations in hardware) is not a trivial matter." To date, the take-up and use of technology is still "very patchy". Technological advance, in the opinion of

Dr Baruch, is outstripping the capacity of the larger medical community to adopt and take advantage of it. Dr Baruch noted that the adoption of any new technology by GPs in the UK and Japan is "still a function of age" and while many GPs are using computers, they tend to use them for their practices rather than disease management. He concluded that GP and community education is at the heart of making the new systems functional. Dr Baruch considered this is a problem for national and local government, which remains to be dealt with.

**The new generation of imaging equipment: Professor Forbes Dewey,** *MIT, Boston, founder and co-director, with Professor Richard Kitney, of the International Consortium for Medical Imaging Technology*

Image analysis already produces complex data: micro intra-cellular images and stereo reconstructions of complex organs and body parts are now possible. For the future, the increased use of robotic techniques coupled with new imaging techniques means less-invasive surgery. One example is endoscopic coronary by-passes. Here, surgeons are able to perform the operation on a beating heart, which is effectively made still using processed images.

But despite all the excitement, the uptake of information technology within medical institutions is slow. In spite of the great variety of available imaging techniques, 70% of all US hospitals images are still done using x-rays and these "still almost all go straight to film", according to Professor Dewey. He gave a number of reasons for this:

- If images are digitised – there are severe initial expense implications.
- Practitioners have proved reluctant to change.
- The technology has been slow to develop.

"Many people are still shy of making the investment and there is a clear lack of an international standard." Professor Dewey said that there are also major educational barriers to be overcome, recounting the comment of a senior radiologist: "Putting images into a digital medical record will give access to persons who are not qualified to interpret them."

But the need for multi-media health records that include scans and images is evident. With a standardised format, doctors will have access to heterogeneous information that can be shared across different areas in a hospital. However, this does presuppose a more structured data environment, where different pieces of hardware can talk to one another and all using one digital language (such as DICOM-3).

**Echocardiography 2001: Impact on hospitals and medicine: Professor Kiyoshi Yoshida,** *Department of Cardiology, Kawasaki Medical School*

Professor Yoshida gave a presentation on the non-invasive imaging of coronary arteries using an echo-doppler hand-held device. This external appliance uses a transducer to obtain the image.

Charting the move from angiograms to echo-based images and from CT (computerised tomography) to MRT (magnetic resonance tomography), Professor

Yoshida predicted that by 2005, similar portable pocket-size echo scanners would be readily available on the market.

He also pointed out that with a portable scanner, 'real-time' Magnetic Resonance Imaging would become an everyday reality—leading to more rapid diagnosis.

**Imaging and visualisation over the Internet: Martin Hardens,** *formerly Vice-President, Corporate Development, PlanetMedica*

Dr Hardens considered the pressures that stand in the way of the widespread use of digital imaging:

- Rapidly evolving technologies – why pay now when a better system may be available soon?
- Regulatory compliance.
- A shortage in the market of appropriately skilled personnel.
- The inevitable pressure on costs and health spending generally.

Among these four points, he considered regulatory compliance as perhaps the toughest issue, as ultimately, people's lives depend upon the reliability of equipment and testing procedures.

For Internet imaging this means there must be full DICOM compatibility. In addition technologists have to ensure that equipment 'down-time' is less than 2 milliseconds per year—otherwise the used of Internet medicine could be potentially dangerous, particularly in the operating room.

He noted that there are number of companies which are developing programmes that will take a scanned image and process it to give a simply viewed 3-dimensional image. This new method also permits the quantification of the size of a lesion, allowing for more accurate analysis of the medical problem.

**Genomics, the human genome and gene therapy – the meaning for pharmaceutical innovation: Professor Kari Stefansson,** *Decode Genetics, Iceland*

According to Professor Stefansson there are two tangible benefits that come from sequencing the human genome:

- The ability to deal with particular genetic predispositions.
- The ability to develop genetic testing, which will indicate particular disease predispositions.

Decode Genetics is based in Iceland, where there is a nation-wide project to create a centralised genetic database. Iceland has a genetically highly heterogeneous population. The database should become an invaluable 'bio-informatics, data-mining tool'. Variations in the gene sequence can be skilfully and carefully browsed on computer chips.

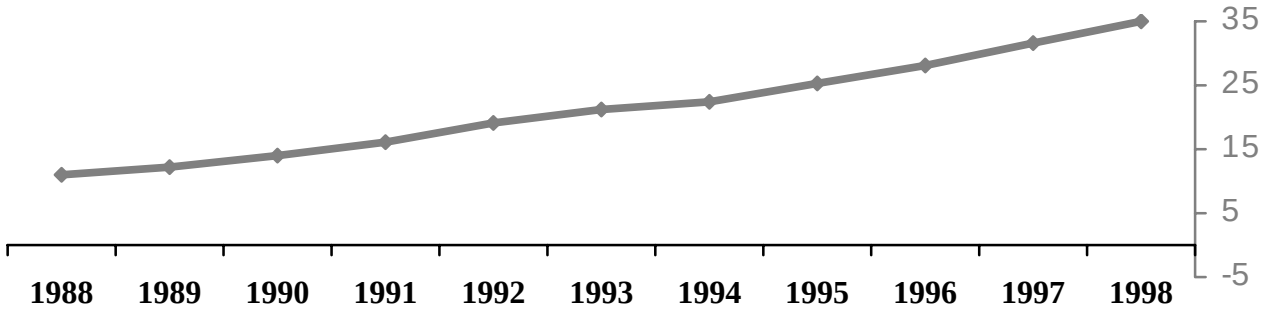
The creation of such genetic databases has been a contentious issue around the world. But in the case of Iceland, the government conducted a public referendum before the project was given the go-ahead. A 90% endorsement was received. Moreover,

Professor Stefansson's believes the database does not undermine any personal liberties, particularly if individuals are left to judge whether they should or should not have a genetic gene test. "When we look at the benefits of the new genetics, we have to weigh this against the dangers that some people might see," he said.

**A viewpoint from the pharmaceutical industry: Dr Robert Geursen,** *Head of Corporate Public Policy, Aventis Pharma*

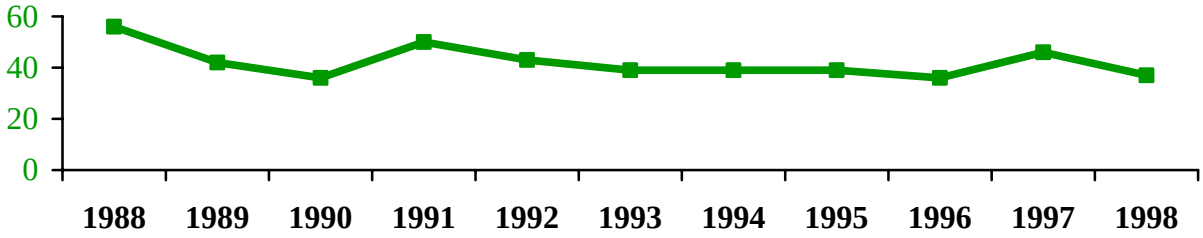
Between 15-20% of corporate costs now being spent on R&D in the pharmaceutical industry, the genome project would cause costs to rise further. Like Dr Baxter, Dr Geursen believes that the only way of sustaining this sort of expense will be partnerships, where researchers from different disciplines, in large and small companies, all work together. Genetics, should aid drug research to become more focused on specific diseases and disease-related genes. At the same time informatics and better knowledge management should help reduce the time its takes to get a drug from laboratory bench to larger-scale clinical trial. At present these lead times run from 10-15 years. The goal is to reduce them to six to nine years.

**Rising costs of global pharmaceutical R&D, $bn**




*Source: Datamonitor, 1999*

**Launches of new chemical entities, 1988-98**




*Source: Datamonitor, 1999*

**Dr John Lackie,** *Principal and Chief Executive Officer, Westlakes Research Institute (former Vice-President, R&D Strategy, Yamanouchi UK Ltd)*

Dr Lackie provided a second example of how genetic databases might work in action. He presented a new initiative from the UK known as the "The North Cumbria Community Genetics Project." This is in effect an epidemiological study of a

population in the vicinity of the British Nuclear Fuels plant at Sellafield. The study aims to link clinical and genetic databases of the population surveyed and to consider variations from the genetic norm.

Dr Lackie said that the recruitment of gene donors was on an 'opt-in' basis, with female volunteers providing the relevant bio-material in the form of umbilical cord, blood and plasma. Patients were promised complete anonymity and given a complete explanation of why the research was being carried out.

Since the project began in 1996, 5,460 bio-samples have been obtained from babies and 2,500 from mothers, nearly all from new-borns babies and new mothers. Dr Lackie said that with such a large body of data, there is a real danger of data-overload. He felt that the role of informatics would be crucial in bringing the project to a successful conclusion. For Dr Lackie, the challenge will be to "transform the data into information."

**Financing the medical revolution: Kazuo Ogino,** *President and Chief Executive Officer, Nihon Kohden Corporation*

Mr Ogino presented the commercial backdrop to funding medical technologies. Comparing levels of investment in medical technology research, the US emerges as the clear world leader.

**Investment in medical technology R&D in selected countries, 1999:**

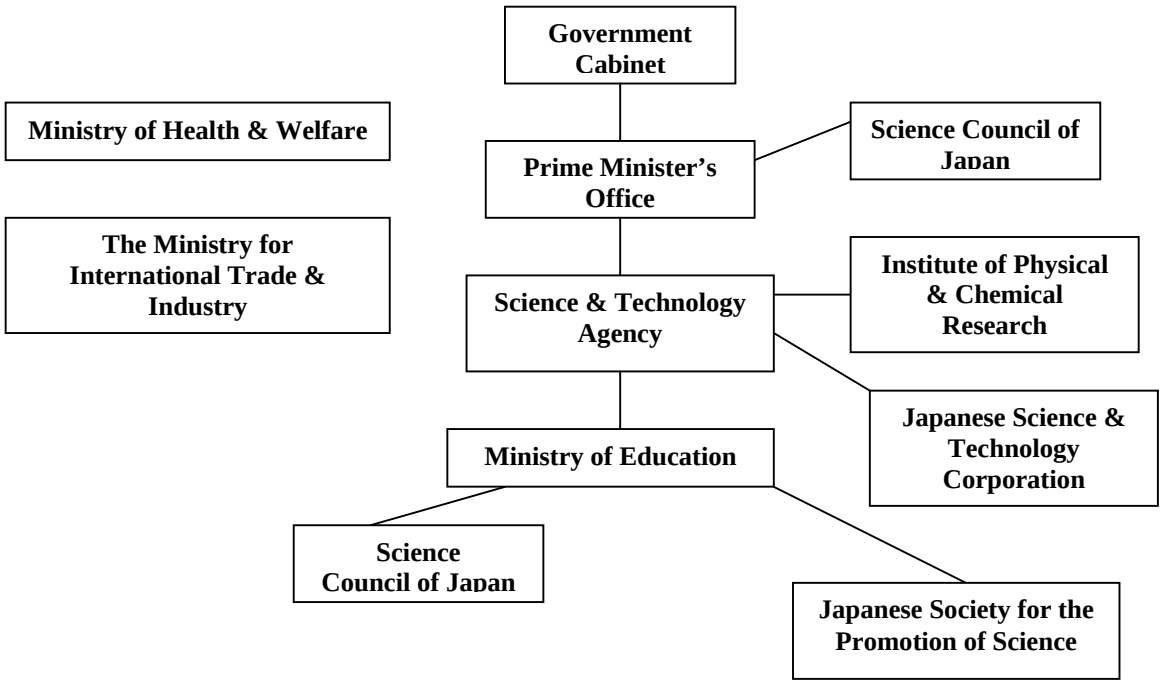
| | |
|---|---|
| United States | £226bn |
| European Union | £130bn |
| Japan | £92bn |
| Germany | £42bn |

But he pointed out that the source of funding for technology projects varies greatly by country. In the UK inward investment accounts for 17% of the money made available while in Japan, the figure is only around 4%. Another difference between the UK and Japan is that basic research is given a low priority. In Japan a greater emphasis is placed on applied research. He confirmed this by commenting that the output of basic research scientific papers in Japan is very considerably lower than in the UK in spite of a very high R&D expenditure. 'Blue sky' research – developing technologies with no immediate and obvious application is something that Mr. Ogino felt should be afforded greater importance in Japan.

However, unlike the UK, much of the funding for the development of medical technology in Japan comes from central government – around 52% according to Mr Ogino. This led to an examination of the different options that are open to medical technologists.

While the Japanese government provides very substantial support for R&D, Mr Ogino questioned the hierarchical and complex nature of the many different agencies from which budget may be forthcoming:

**Possible sources of government funding for medical technology R&D in Japan**




*Source: K .Ogino*

Whatever the source of funding, Mr Ogino proposed two strategies that technology enterprises should keep in mind in order to remain financially stable and commercially viable:

- Aim to become a 'total solution provider' – If your solution is pre-eminent in the market and you can prove that you will succeed in meeting all user needs, you will have a compelling proposition. To achieve this position, a strategy of corporate acquisition or consistent investment in new ventures is essential.

*Or alternatively:*

- Concentrate on a specific technology or new product that others will want. This enables an organisation to be the niche-leader in a global marketplace. Such an approach will probably prove attractive to venture capitalists.

Mr Ogino concluded with an examination of how a national 'mindset' can have an impact upon the progress of a technology enterprise and its possible funding. Quoting from a Japanese newspaper he said that nearly 70% of young people between 18-25 in the US and Korea were "potential entrepreneurs". However, for the UK and Japan this figure fell back drastically to less than 40%. He felt that medical technology project teams and companies required strong entrepreneurial skills as well as research expertise if they were to flourish.

**New Technologies, a commercial perspective**: **Anthony Knight**, *pharmaceutical consultant*

Mr Knight started by observing that in both the UK and Japan the cost of conducting research has increased massively, while output in the form of marketable drugs has largely stood still.

Profits have therefore been declining and as other speakers commented, he saw mergers, acquisitions and partnering as a way out of this conundrum. He joined Mr Ogino in stating that if technology is to flourish, the balance between public and private funding has to be a primary consideration – but added that there are no hard and fast absolutes. Mr Knight said that all medical technologists charged with attracting funding for their projects should be able to answer four simple questions:

- **What is the business model for the project you are embarking upon?** A "pure technology play" has no prospects if it fails to deliver a definable business need. Implicit within this is the question of where and when the final revenue stream will emerge.
- **How reproducible is the solution that you are researching?** This means looking at what intellectual property rights are likely to be involved and ensuring that the product is adequately protected. It also entails answering the question of how long a project is going to take and whether there are others working on similar or identical projects. – In short, will the research yield a commercial product with sufficient despatch to beat the competition and benefit from the patents and copyrights before their term of protection lapses?
- **What do I need the funding for?** A basic, but central question. Mr Knight said that if you are clear about why you need money, then seek funding. But he cautioned that any sum less than £2m would be of almost no interest to venture capitalists. Equally, financiers will look for a measure of corporate control as part of any agreement. In normal circumstances this would amount to around 25%.
- **Should more be done?** Mr Knight said that stronger links between industry and academia are essential in order to promote a culture more fiscally and politically supportive of technical innovation. It is the job of medical technology entrepreneurs to make this a reality.

## Open panel discussion: The role of the doctor in the new technological world

*Chair:* **Dr Tim Jones,** *Executive Director of Health for Europe, Middle East and Africa for the Oracle Corporation;* **Professor Motoaki Sugawara,** *Department of Cardiovascular Sciences, Tokyo Women's Medical University School of Medicine*

Among a number of points raised were:

- The doctor can no longer be viewed as a source of endless knowledge. This is largely because of the explosion of medical data and the wider available of that data on the Internet.
- The healthcare sector is highly fragmented, with payers, healthcare providers and patients sitting on the apexes of the same triangle. However, technology demands that all work together and that doctors become team players.
- The role of the doctor is now less influential. Informatics are increasingly delivering healthcare giving scientists, IT workers or nurses some of the responsibility previously owned by doctors.
- To date doctors have used the Internet on a limited basis, as a general resources for journals. However, the opportunities are clearly much larger, with electronic prescribing, remote diagnosis and remote monitoring of patients after they leave the surgery just three examples.
- The general practitioners' role will change with some taking on more specialist clinical tasks and others just deliverers of healthcare.

# Day Three: Saturday March 31th, 2001

*On the management of quality, the role of the consumer, and international partnerships.*

*Chairmen:*
**Dr Michael Coughlan,** *GP, Galway, Eire, and former chairman of the Irish College of General Practitioners;*
**Professor Kazuhiko Atsumi,** *Member, Science Council of Japan*
**Professor Richard Kitney,** *Department of Biological and Medical Systems, Imperial College;*
**Professor Fumihiko Kajiya,** *Department of Cardiovascular Physiology and Medical Engineering, Okayama University Medical School and Kawasaki Medical School*

**Dr Michael Coughlan,** *GP, Galway, Eire and former president of the Irish College of General Practitioners* and **Professor Kazuhiko Atsumi,** Member, Science Council of Japan chaired a session on **the management of quality** from a healthcare consumer perspective.

In a wide-ranging opening address to the final day's sessions Dr Couglan opened with an attempt at defining what is meant by quality in healthcare: "Quality is something that is difficult to define, but it is something that you will recognise when you see it". He said that the role of the doctor in the face of changing consumer demands could best be defined as "mission impossible". Nevertheless, a future in which humans would be offered the possibility of "plugging into a knowledge bank" could only result in a long-term improvement in healthcare. He added that in future, healthcare would focus upon the individual rather than the masses and that linked networks would have to be preceded by training and appropriate interfaces for the consumer.

**The global practice: Dr Catherina Maulbecker,** *Chief Executive Officer, GetWellness*

The new healthcare consumer is highly mobile, affluent and in search of choice. The Internet is promoting transparency in the medical world, just as it has in other sectors, such as retail or banking. As information becomes more freely available, however, better benchmarks and standards will have to be established. This is taking place as 'infomediaries' emerge to satisfy consumer choice. Dr Maulbecker's firm, GetWellness, is one such infomediary. The firm is literally "the doctor in the patient's pocket". It offers signed-up patients access to a suitable physician anywhere in the world. To make such a virtual GP workable, GetWellness has put in place a global network of doctors, who have an understanding as much of cultural sensitivities of their international patients and are to deploy the new electronic technologies. GetWellness demonstrates that technology is an enabler for the mobile healthcare consumer, with remote monitoring and real-time feedback opening up access to GP services worldwide.

**Healthcare Procurement –Dr Robert Hangartner,** *Brett Cook Consulting, formerly with the UK department of Health*

Dr Hangartner outlined what he believes what should be the four goals for a healthcare system:

- The delivery of good health
- Responsiveness
- The economic equity of a system
- The stewardship role of central government.

However, he observed that there are a number of interim "proxy" goals that should be attained: quality, affordability, sustainability and accessibility. To achieve these targets, the various parts of the healthcare service must be clearly defined and monitored.

What benchmarks are going to put in place to safeguard the system and which body will police it? In theory, technology enables healthcare systems to do different things at less cost and more accurately. But Dr Hangartner said that the real problem is convincing the doctor that is the case. With better benchmarking, doctors would be able to assess clinical performance and the value of a medical intervention. In the meantime, as more information enters the public domain, consumers will become more proactive. Frequently that means demanding greater access to technology. For this reason, the introduction of benchmarking should be considered a high priority.

**International healthcare issues: Dr Andrew Barrer,** *The Barrer Group Global Healthcare, former head of the US Healthcare Financing Administration, and former Chairman of the University of Wisconsin Health Care System*

There is a general move towards viewing and treating patients as consumers. Dr Barrer said that as this happens, it is implicit that patients will be afforded more choice. The more toward such consumer-driven healthcare is one of the major drivers of international health reforms, of cross-border partnerships and global standardisation of healthcare. Technology genuinely holds the promise of improving standards on a cross-border basis.

However, Dr Barrer said that unlike other sectors, healthcare still remains a remarkably local affair and that perhaps this is because it has to. Conditions and cultures vary hugely and international medical bodies constantly need to ask: “What works within the community of local healthcare workers and officials?”

Dr Barrer said that when enforcing any health reform plan, it is important to decide who the local administrator of the project should be. The best doctors tend to become head of hospitals and therefore they become responsible for business decisions. But these individuals need training if they are to fulfil this role. Education and an understanding of the essentially parochial nature of healthcare delivery ‘on the ground’ is essential if technology to be effective.

**Integrative Medicine: Professor Kazuhiko Atsumi**, *Member, Science Council of Japan*

Professor Atsumi is an enthusiastic supporter of CAM (Complementary Alternative Medicine). He started his presentation by saying that CAM is increasingly becoming an acceptable and indeed cost-effective alternative to western invasive technologies.

However, he conceded, even in Japan a paradigm shift is needed before CAM can gain any broader measure of acceptance. He said that there is a pressing need for more holistic treatment of patients in tandem with modern aggressive curative therapies. Pointing out that western and oriental medical techniques need not be mutually exclusive, he added that a combination of the two traditions could benefit the consumer physically, as well as producing savings on healthcare budgets.

Professor Atsumi concluded by saying that by 2005, 50% of Japan's healthcare budget would be earmarked for the elderly. If only a third of the aged were treated using complementary medical techniques, the overall cost could be reduced by as much as 86% in that year.

**The interface between public, private and voluntary sector service provision and the procurement of healthcare: Dr Robert Hangartner,** *Brett Cook Consulting, formerly with the UK department of Health*

Dr. Hangartner began his second address to the conference with a quote from the an OECD report published in June 1998 asking why the interface between public, private and the voluntary sector needs to change in relation to the procurement of healthcare. There is a requirement to strike "a balance between dignified self –reliance and social solidarity, and a redressing of roles and responsibilities."

To this end, the bodies involved need to examine what they do and what they *should* be doing.

**Central government's role** in healthcare procurement remains essentially one of stewardship.

- Leadership and co-ordination are clear elements of what Government should do. There is however, a danger that as technology advances (particularly IT), decision-makers are in danger of being gradually deskilled – putting greater pressure on fewer people.
- Government should remain responsible for setting targets and assessing priorities.
- Healthcare consumers are entitled to expect Government to organise and deliver a minimum package at all levels within a health service.
- Training and education, as always, are central tenets in the procurement of healthcare. This is a Government responsibility.
- Public accountability. A health service and its provision are generally the result of the actions or inactions of Government. There is therefore a continuing requirement for public accountability – but at entity rather than individual level – "unless there has been a clear failure of process".
- In fulfilling its part of the healthcare procurement contract, Government should also be the *primum mobile* of collaboration between the various bodies that collectively provide healthcare. It is vital that the tone should be set from the centre.

For **Non-Governmental bodies** (NGOs) a different set of objectives should apply:

- Within the voluntary sector, a priority is how to harness the efforts of the many disparate fund raising bodies.
- Equally, voluntary organisations are entitled to expect support and backing from both Government and the private sector when raising funds. There should be no sense that they are working in isolation. With £1.74bn of NHS funds coming from charitable funds, the effect of the voluntary sector should never be underestimated.

Referring to *The Ferguson Report* (www.fergusonreport.com), an online newsletter covering consumer healthcare informatics, Dr Hangartner said that there are two distinct categories of consumer interface with healthcare providers that technology enables:

- Online 'cyber-doctors' providing information only. These are healthcare information websites in which consumers can find answers to general questions they may have, but in which patient contact does not take place.
- The second type of 'cyber-doctor' is one that encompasses the elements of the first type and then provides a patient link between the real and virtual worlds. This will probably be in the form of

email or tele-responses to consumer queries. Long-term, it means that doctors must "redesign" their practices to reflect a new doctor-patient relationship. They will need to respond to the demands of cyber world as freely as they do those of the real world.

Dr Hangartner foresees a future in which increasing amounts of online information will force change as patient expectations and aspirations escalate - leading inexorably towards an international convergence of healthcare provision and medical training. In the future, consumers can look forward to a "single integrated global standard" of healthcare, enabled by standardised IT platforms and uniform approaches.

He concluded by considering some of the practical implications and difficulties of realising this in the UK.

- Higher rate taxpayers should be forced to have compulsory healthcare insurance. The current system is clearly unsustainable.
- One of the biggest challenges facing all bodies involved in healthcare provision is not really solvable by technology. – "It's a question of common sense and education."
- Within the private sector, healthcare companies should be allowed to benefit from the service they provide. Healthcare provision in the UK is tainted by the belief that is it is unethical to profit from medical care.

## Close of conference