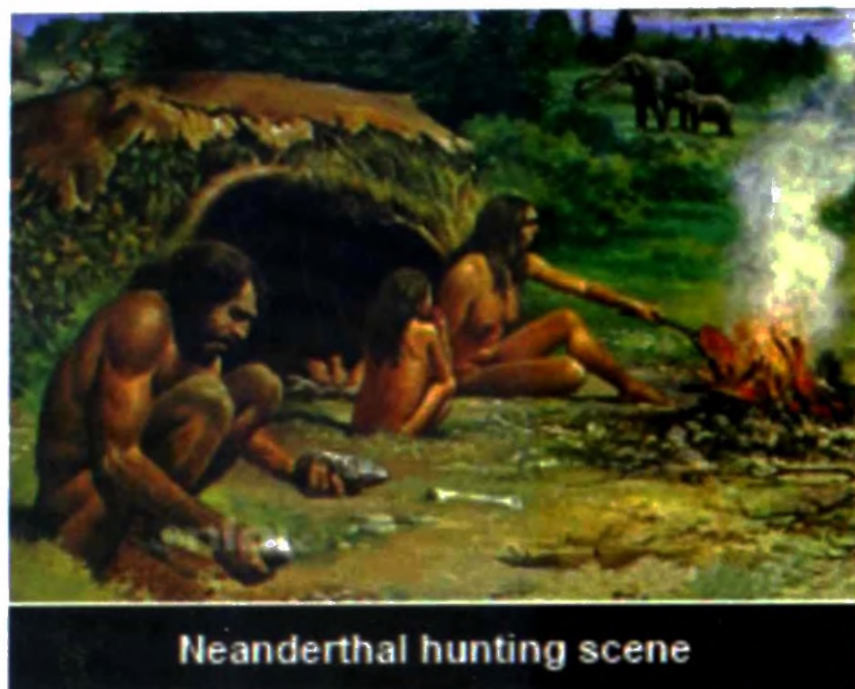


# ROLE OF THE MATERIA MEDICA – RETROSPECT AND PROSPECT

By R.O.B. Wijesekera



Neanderthal hunting scene



One had always imagined that the association between medicines and plants began with our own civilization. However, recent paleontological research reveals that even Neanderthal man employed plants for his health care. So it would seem that 60,000 years or more ago Neanderthal man was aware of the medicinal value of plants. However, our own story commences a very long time later. Over the ensuing multi millennia, humankind has made ample use of the enormous array of plants on earth in order to overcome diseases and ailments.

First, during the zenith of Arabian culture, then on to the

Greco-Roman age, spanning the Indo-Aryan periods and the Chinese dynasties, medicinal plants that is: the *Materia medica*, formed the basis of therapy for all human diseases and conditions, and this was spread throughout so many varied geographic regions.

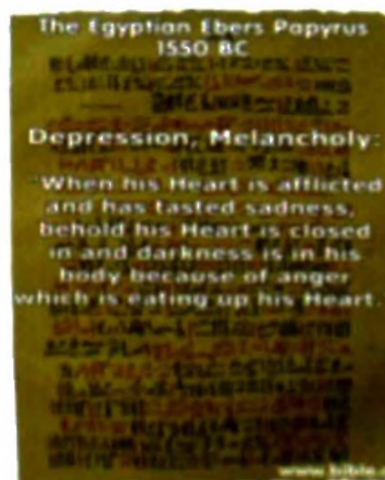
Traditional medicine, therefore, as we identify it now, follows three major patterns:

- that which emerged from the Arab-Greek- Roman origins and became the Euro-centric model.
- that which developed in the Indo- sub continental region and identifies itself as the Indo-centric model.
- Traditional Chinese and Tibetan systems identified as the Sino-centric model.

All of these had accumulated an invaluable *corpus* of knowledge and wisdom regarding human illnesses, the power of plants to heal, and the methodologies of diagnosis and practice of healing.

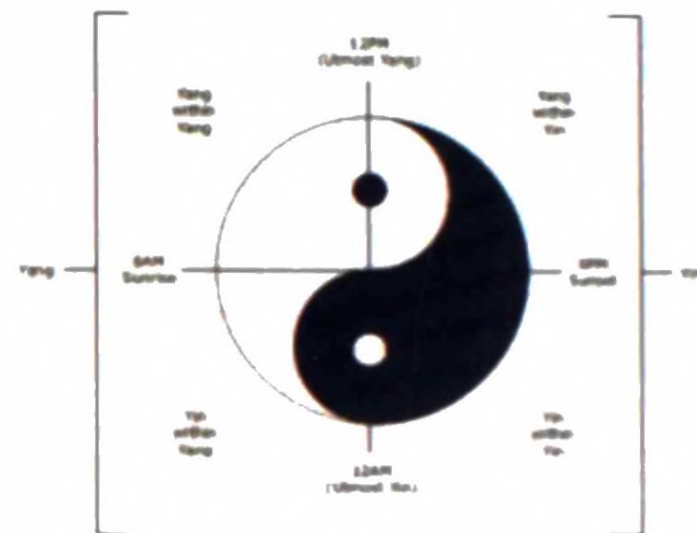
Despite the destruction of records due to the ravages of time, and human conflicts through the ages, there still remains for us some documentary evidence of these great medical systems, in theses such as:

- the Ebers Papyrus of Egypt, (ca 1550 BC),
- the *Corpus Hippocraticum* of Greece.ca 460 BC,
- the *Charaka Samhita* (ca 600 BC)
- the *Susruta Samhita* (ca 600 BC),
- the Chinese text: Wu Shi Bing Fang (ca 350 BC), Shen Nang Ben Cao Jing(Han Dynasty 25-220 AD), and later Li Shi-Zhen's celebrated Compendium of Medicinal Materials.( 1587 AD).
- Dioscorides: Die *Materia medica* 50 AD.
- Galen: *Materia medica*, 130 AD.

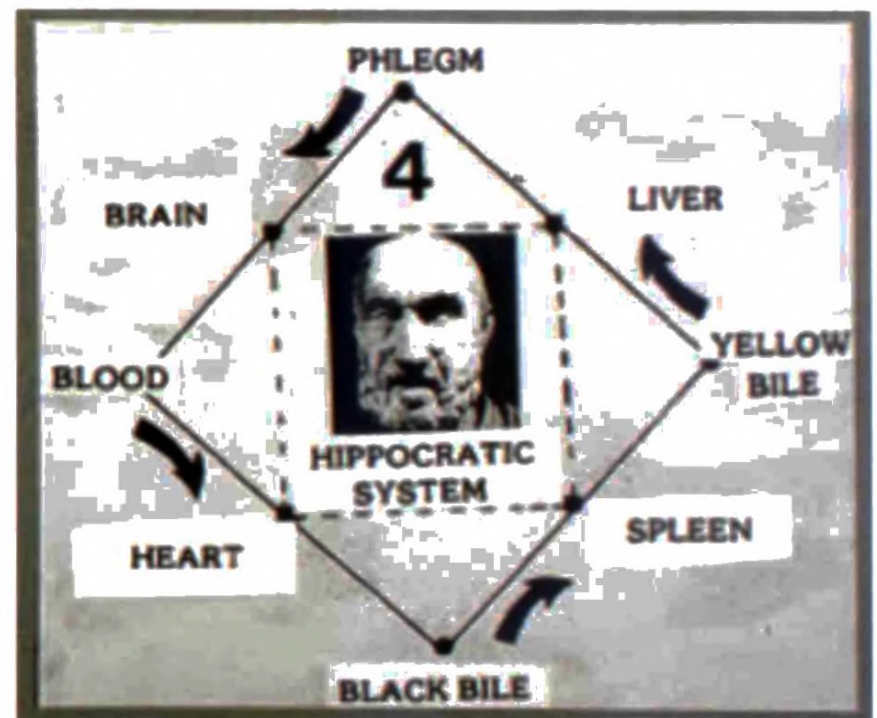


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These major systems developed largely independently of each other, although there had been some interaction between the Arabian-Greek-Roman systems and the Indo systems. There had been some interaction too, between the Indo-centric model and the Sino-centric model caused, perhaps mainly by the spread of Buddhism throughout the South and South Asian region. Accordingly, striking similarities, between them were evident. The use of plants and plant derived therapies was the dominant common factor. The other major feature was the concept that illnesses were caused by a disturbance of an otherwise existing inherent balance of factors within the body, and therapies were aimed to redress the imbalance. This was manifest in the System of four humors of the Greco-Roman system, formalized as the Hippocrates system, the "Tri dosha" system - *Vata*, *Pitta*, and *Kapha* - of Ayurveda, and the "Ying-Yang" concept of the Traditional Chinese system. So, to strengthen the body's ability to counter the imbalance was indeed, the basic underlying theoretical objective of medical therapy in all of the three systems.

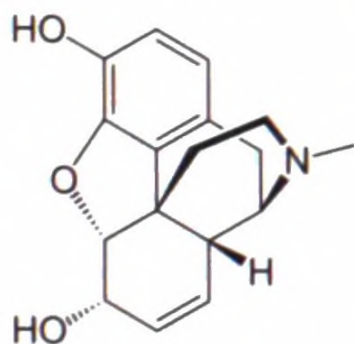


If interpreted in terms of recent concepts,- concepts that have entered modern systems undoubtedly derived from the older systems,- this would translate in modern terminology, into: the "strengthening of the body's immune system". The similarities in terms of diagnostic methodology and therapy too were indeed most significant. For example, it is recorded that Hippocrates used the plant *Veratrum album*, as an anti-tussive, while at the same time the Chinese were using the plant *Veratrum nigrum*, for the same purpose. There were many such similarities in the use of plants of related genera for similar purposes.

Permit a digression here to illustrate such instances with some personal experience. During the author's tenure as the Manager of the WHO Task force for Research on Plants for Fertility Regulation, Geneva, 1978-80, the Task Force noted that the plant genus *Aristolochia*, was used by several different cultures in different geographical locations and different regions of the world as an agent of fertility regulation. As a result it was rated a priority candidate for the Task Force investigation and endeavour to find a plant-derived fertility regulating agent. It was further found that although the member plants of this genus contained Aristolochic acid, a strongly toxic secondary metabolite, the extracts were innocuous in the dosages administered. This feature was researched and published by the members of the task force, but this is a feature that is now well established, namely, that although a plant may yield toxic constituents, the total extract may be harmless or even as the case may be, more effective than an isolated pure chemical the presumed "pure active constituent". The existence in the plant itself of the secondary metabolites in a form linked with sugar residues and not as the toxic aglycones may be a ready explanation. In the sugar linked form the substances being soluble can be easily eliminated from the body before the toxicity can manifest itself.

The global trend remains today, as humans worldwide, sophisticated or otherwise, depend on the use of medicinal plants as the main source of therapeutic agents to combat disease, as it has remained for many millennia since those ancient times; and continued till the time when modern organic chemistry, focused now as "Phytochemistry" or the Chemistry of Natural Products, became a dominant force. One could say, that the modern phase of therapy, based on single chemical substances as the active agent, commenced with the rise of organic chemistry itself, - which later came to be identified as the specialty, Natural Product Chemistry or in Europe as Phytochemistry.

About the beginning of the nineteenth century the German organic chemist F.W.Sertuner isolated Morphine, from the opium poppy exudate, and thence began the use of pure chemicals. Morphine was commercialized in 1826 by Merck, to begin what came to be identified as the Pharmaceutical Industry.



Morphine



Frederich Sertuner

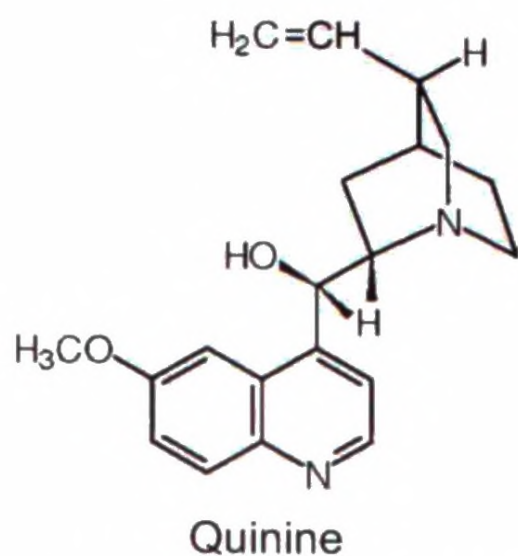
The industry depended on a sequence of research which investigated plants with established bioactivity, with a view to isolating and identifying the chemical entity which was supposed to be the agent responsible for the activity. From then onwards there was the White Willow plant or *Salix alba*, from which came the drug Aspirin, commercialized by Bayer, *Cephalis ipecacuanha*, from which came emetine, and followed by others such as quinine and reserpine which were epoch making stories in themselves. May one recall some of these stories, as they are a significant part of medicine's history? Malaria was a scourge then too as it has been since. Jesuit priests working in the jungles of Peru in the mid nineteenth century came across the natives using the extract of a bark of a rain forest tree, (*Cinchona ledgeriana*), and successfully curing a fever that was killing many of the colonists; they brought it to the notice of the Spanish viceroy, whose wife, at the time, was also seriously ill with the disease. When administering the extract of the bark successfully cured her, the viceroy sent it to Europe and chemists Joseph Caventou and Pelletier in Europe isolated from it the historical substance Quinine. From then onwards it was the endeavor of all chemists, for the ensuing half a century, to try to imitate nature by isolating from medicinal plants the perceived active principle; and following it up by attempting to synthesize the desired individual chemical.



Caventou & Pelletier



Sir Robert Robinson

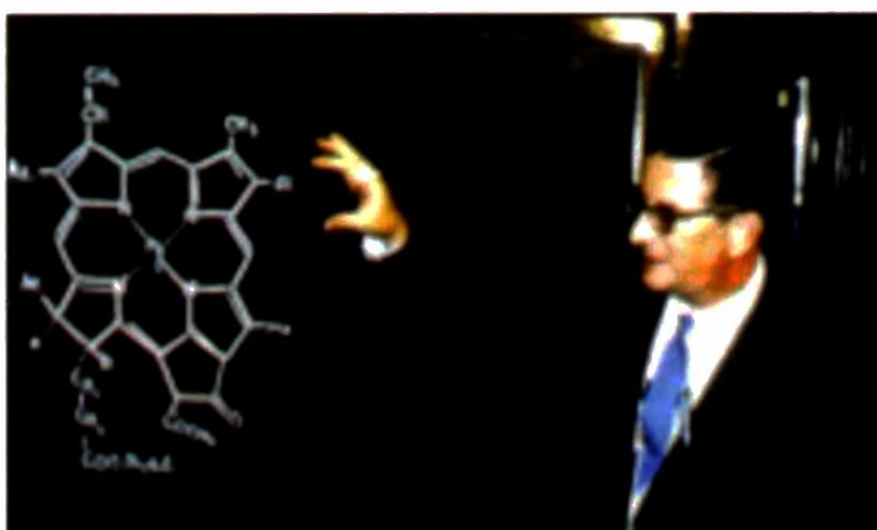


The great Nobel Prize winning organic chemist of Oxford University, Sir Robert Robinson OM, FRS,, spent decades in unravelling the complex structure of Quinine but, earlier, his mentor, William Perkin, in attempting a quick- strike synthesis ended up with not quinine, but the dye Mauve, thus beginning the commercial synthetic dye industry.

The synthetic trail of drug discovery was set in rapid motion during the period of the World War II when natural quinine became unavailable due to the Japanese occupation of the south Asian region where cinchona had been cultivated by colonial powers notably the French, the Dutch and the British. With this as the desperate driver, the synthetic chemical industry speeded ahead, and the vast array of synthetically produced pharmaceuticals was to follow. Great Nobel Prize winning Chemists like: Leopold Ruzicka, Robert B. Woodward, Carl Djerassi, and Gilbert Stork, among a generation of others, were engaged in these synthetic efforts.



*Rauwolfia serpentina*



Prof. Robert Woodward

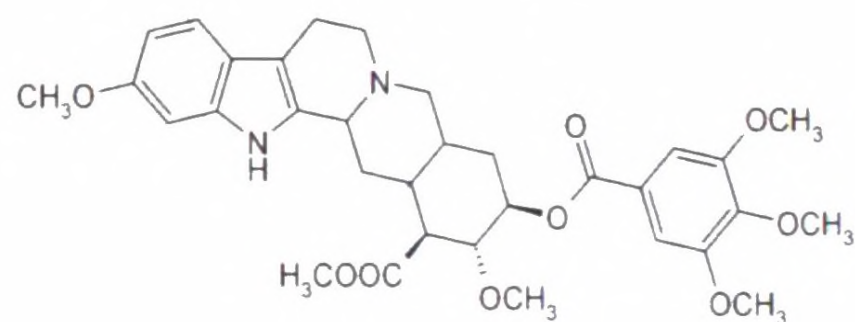


Prof. Gilbert Stork

The story of Reserpine, now the subject of a book, was a similar epic. Up until the period of the mid twentieth century there was no cure for hypertension and the condition was confused with insanity, and treated as such.



Prof S. Siddiqui

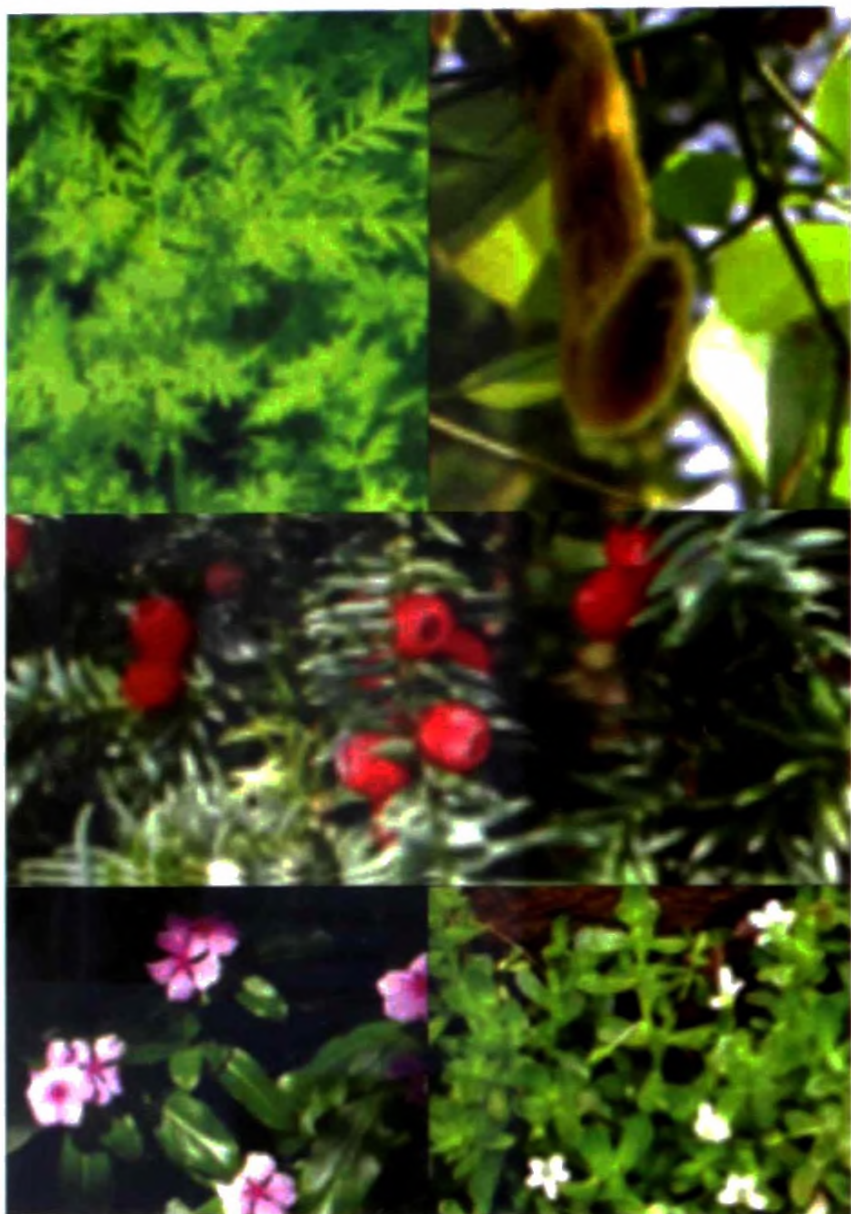


Reserpine

The Pakistani chemist Salimuzzaman Siddiqui, working in pre-divided India, noted that the plant *Rauwolfia serpentina* was used by Ayurvedic physicians to cure symptoms of insanity. He isolated the alkaloid Reserpine from it, and sent the total plant extract to Ciba in Switzerland whose chemists led by Emil Schlittler were able to isolate several alkaloids from it. Ciba marketed reserpine, which for several decades after the 1950's, remained the standard treatment for hypertension. Synthetic variants have now taken its place, although it is contended that the total extract, referred to in Ayurveda as: *Sarpaganda gnanavati*, still has merits as well, in terms of efficacy and safety, and lack of untoward side effects.

A few recent landmark examples of natural products, which similarly led the way towards new drug developments are:

- Artemisinin from *Artimesia annua* the Chinese plant known as quinghasu, the present gold standard for treatment of malignant Falcifarum malaria, and the ethers derived from artemisininine.



- L Dopa from *Mucuna pruriens*, in the treatment of Parkinson syndrome,
- Taxol from *Taxus brevifolia*, as an anti cancer agent.
- Vincristine, and Vinblastine from *Catharanthus roseus*, in the treatment of cancers.
- Bacosides A & B from *Bacopa moniera* for memory enhancement and Alzheimer syndrome

There are a host of others, which have now entered the modern armory of medicine, and still more in the final stages of doing so.

The need for new and inexpensive therapies for chronic illnesses cannot be over emphasized. In addressing this need some facts of relevance may be stated:

- According to the National Institute of Health of the US 50% of the bestselling pharmaceuticals of today are derived from natural products.

- 70-80% of the Global population is dependent for their therapeutic requirements on natural products mainly used as aqueous extracts, according to the WHO..
- 60% of the anti-cancer drugs and 75% of the anti-infective drugs approved by the FDA during the period 1981-2002 are traceable to natural product origins.
- 50% of all drugs approved since 1994 by the FDA are derived from natural products.
- 80% of the molecules used in all pharmaceutical drugs sold worldwide, are derived from natural products.
- At the present time over 100 new natural product-derived drugs are in clinical research and development.
- Despite the chemical synthetic industry, 25% of prescribed drugs are still those of vegetable origin (WHO).

Thus natural products remain a matchless source of novel drug agents, Nature gives the leads and chemists imitate them. This brings us to another monumental issue which is the wanton destruction in the name of development of the natural rain forests of the world the treasure trove of potential drugs of the future. This according to the International Union for the Conservation of Nature is one of the major global issues. Besides, the volume of wisdom and knowledge accumulated in the traditional systems of medicine, mostly lodged with the rural societies, it is now realized, should not be missed in the new approaches to health care and therapy. This also emphasizes the crucial role that modern Phytotherapy can play in health care. Sadly it is a less appreciated factor in the Anglophone countries of the world, although a mandatory requirement in the Eurozone.

A paradigm change now being recommended by the new generation of pharmacologists and clinicians, in the development of new drugs is:

- To jettison the present dogma of a single chemical approach to the treatment of disease..
- To recognize multi-drug therapy, & a multi-target approach
- And to take cognizance of the synergistic factor in respect of interaction between the chemical entities.

Traditional therapy as well as modern Phytotherapy, has long followed similar strategies using mono-extracts or poly-extracts, in the belief, that a complex patho-physiological process can be influenced more effectively and with lesser if any side effects, by a combination of several low dosage compounds ( eg.in extracts), than by a single chemical compound at high dosage level. To facilitate this new paradigm a deep study of the therapeutic methods of the traditional systems would be a distinct guide. In the formulation of drugs, modern high-tech analytical

methodology such as three dimensional HPLC enables even complex extracts to be standardized accurately, and hence the extracts of yore may be a facile means for the future therapy enabling cost-effective therapies in the developing regions of the globe.



*Professor Hildeberte Wagner*

It would be pertinent to end by quoting Professor Hildeberte Wagner, of the Centre of Pharma Research in Munich, Germany, who puts it thus: "The main aim is to find a scientific rationale for the therapeutic superiority of many herbal drug extracts derived from Traditional Medicine, as compared with single constituents. The efficacy of these extracts used for centuries was verified in many cases by clinical studies."

It is anticipated that there will be a smooth transition to a new kind of multidrug therapy, incorporating the benefits arising from deep studies of the traditional systems, for the enhancement of the health of all mankind.

*N.B. Adapted, updated, & extended from a lecture delivered to the Ceylon Medical Association 126th Anniversary Scientific Congress: Symposium on Herbal Medicine, by the Author, on 12th July 2013*

### Passion in Success

What is the secret to success in science or anything else? Hard work alone is not enough. It is being passionate about something, enough to make a wholehearted commitment of creativity, rigour and determination.

*Alice S. Huang, California Institute of Technology, President AAS 2011.*

### Peripatetic Nobel Prize Winner - Baruch Blumberg.

Baruch Blumberg, popularly known as Barry, won the Nobel Prize for Physiology in 1976, for his discovery of the Hepatitis B virus, and his inventing a vaccine against it. Characteristically when eventually he died at the age of 85, he was many miles away from his home base of Philadelphia, attending a NASA Conference in California. He spent many years working with and leading NASA's astro-biological research program, and in research on Cancer at Philadelphia. Blumberg was constantly on the move and he was reputed to be one of the researchers who had one of the most massive collections of samples of blood. He guessed that he had amassed over 450,000 blood samples during his career. To acquire this collection he had travelled to West Africa, the Arctic, Rumania, Italy, Taiwan, the Pacific islands and more. His geographical reach was so great that his face appeared on stamps in the Maldives and Angola. "I carried a Lab around the world," he was to say.

NASA has now announced the creation of a Blumberg Chair in Astro-biology to honour the pioneer in the subject.

*Science* 332, (2011), 289; *Science*: (2010), 135 .7  
*Science* (2011), 334.p 1328.

### The formidable issue – Vaccine for TB?

When the celebrated tuberculosis researcher and Harvard University immunologist Barry Bloom wishes to illustrate how difficult is the scientific research to reach this objective, he displays a slide of a man holding a small saw alongside a massive redwood tree. The slide draws a laugh from the audience but it indicates the magnitude of a public health challenge that is far from funny.



*Barry Bloom*