

The serious challenge of medical research

Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution. It is, strictly speaking, a real factor in scientific research.

Albert Einstein

Two emails that landed on my computer screen recently gave clues to the amazing pace and reach of medical research. Both advertised conferences: one planned for Boston in July, and the other in San Diego in March this year.

The Boston meeting, entitled the Organ-on-a-Chip World Congress, is rather breathlessly described as concerning “assemblies of cell clusters using microfluidics that mimic *in vivo* organ structure”. Technology options to be reviewed at the congress resemble a fast-food menu — Lung-on-a-Chip, Brain-on-a-Chip and Gut-on-a-Chip.

The San Diego conference, Biomarker Summit 2015, will consider “all aspects of the biomarker and diagnostic development process from discovery to translation to commercialization”, with topics covering “big data analytics and management, regulatory and reimbursement trends, companion diagnostics development, and much more”.

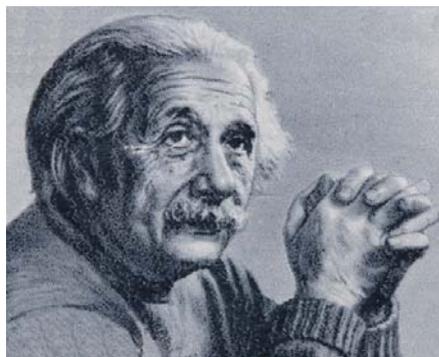
In contemplating the future of medical research in Australia, the international context, typified by what lies behind these two meetings, is critical. Two features stand out.

Biology — make way for IT

First, wherever you look, the massive contributions to medical research by non-biological sciences are paramount. Craig Venter, a gene scientist who sequenced the human genome, states in his book *Life at the speed of light* that genetic research and information science are so interwoven as to be inseparable. His book takes its title from his suggestion that if a sophisticated probe found life in deep water below the surface of Mars, an on-board sequencer could decipher and digitise its genome and radio the code at the speed of light to a laboratory on earth (presumably his), to be reconstituted to build a Martian organism.

In neuroscience also, technology not thought of as medical is now thoroughly integrated with biology. Workers studying changes in brain function as they relate to behaviour depend heavily on such technology. Denis Le Bihan, a French neuroscientist and major inventor of imaging techniques, extols the contribution of magnetic resonance imaging to our understanding of brain function in his new book *Looking inside the brain*.

Neuroscience leapt forward in the 1970s when computerised neuroimaging became available to the research and clinical communities. Physics underpinned the development of the electroencephalograph. New levels of neurological and psychiatric understanding are leading to new therapies, such as deep brain stimulation. Depression, Bihan suggests, may soon be seen as a feature of many abnormalities, just as the once-solid disease called “fever” broke apart when its multiple causes



were found. In all these discoveries, engineering, information science and mathematics are deeply embedded.

Medical research is good economics

Second, we need to see research much more clearly, as others

are doing, as a major economic opportunity for government and the private sector alike. The two conferences I mentioned are almost entirely private sector-sponsored. Medical research is an intellectual industry. Smart, future-oriented economic thinking would be seeking ways to position Australia at the head of the pack. Pedalling happily in the Alpine sunshine at the back of the peloton is just plain dumb economics. The oft-repeated (appalling) mantra that we are “punching above our weight”, based on publications, seriously mistakes past achievement for future opportunity. Research is a fierce competition. Winners do well. They need expensive support teams.

How is it that our major project grants scheme — the National Health and Medical Research Council — supports fewer than one in five applicants? If one in five *missed out*, the arrangements would be credible.

It is among the project grants that bright, risky and imaginative ideas are often found. Imaginative questions are the essence of research: yes, it does require high-tech and massive investment to prosper, but if the intellectual electricity is missing, the wheels do not turn. Were the Medicare levy raised by 0.5%, the \$3 billion raised each year could be applied to medical research — an amount much larger, and more equitably procured, than was to be raised through the proposed copayment for Medicare services. There would be no sitting and waiting for a future fund to bear fruit.

A big increase in our *present* fund also makes investment sense, so that we can more appropriately match the achievements of our economic peers and grow the world’s best research community, fit for future purpose, from our large talent pool. Channelling Henry Ford, we may say that what’s good for research is good for Australia.

While no one should promise that medical research will find a cure for cancer or Alzheimer’s disease, at least not in the next few years, it is certain that we will *not* find a cure any other way. Fortunately we live in a gilded age of science, and *all* of it — not just the disciplines classically seen as medical — has a contribution to make to medical achievement. It requires political and private enterprise and vision to enable it, through generous, imaginative funding.

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