

EDITORIAL

BIOINFORMATIC DREAMS AND VILLAGE REALITIES

An international conference, Bioinformatics 2002, held in Bangkok in February 6-8, 2002 highlighted the great expectations stemming from recent activity in genomics and proteomics. This outpouring of information is changing science almost daily and leading to need for careful planning to order this information flow so that optimal translation can occur into practical activity of consequence. We have entered an era that brings high anticipation to fields such as agriculture and health as well as to basic science itself.

It is also a time for questioning potential and purpose. The technology is elegant and powerful, so much so that it has generated a whole new culture, which is willingly taken up by hordes of young enthusiasts, along with its universal language, its jargon, its arrogance towards the uninitiated: "have gene sequence, what have you got to offer?"

Nursed by the Internet the information flows remorselessly to the global tune. This is the key: potentially the fast-flowing databases are accessible to all to play with, to twist and turn, to translate, to mutate, to modulate, to admire, to build and to dismantle. This is in a time frame so fast that there is enough information to occupy all those who would participate, as long as their concentration lasts.

Bioinformatics is not just born, it is well along the childhood path into adolescence. The mathematicians have found a new grip on computational biology, as disciplines merge and grow up together. Networking has come of age, locally, nationally, regionally, globally, conceptually. The science has already generated endless dreams: of fame, of fortune, of intellectual excitement. Funds are flowing, in the expectation that the downward path of tech stocks will turn sharply upwards as glistening new products hit the market place. In part that

is the problem as well as the hope: are expectations too high?

In a keynote lecture to the Bangkok conference, Carlos Morel, Director of TDR (UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases) observed that "bioinformatics by its nature and requirements provides a uniform opportunity for both developing and developed countries to contribute and take advantage of the new knowledge and data to overcome the division created by the capital and technology needs of genome sequencing projects. International efforts are needed to strengthen the capability of disease endemic countries to explore the potential of genomics to develop new drugs, vaccines and diagnostics for tropical diseases that impose a heavy toll in poor and marginalized populations." (Morel, 2002).

Certainly this is a hope that springs eternal. This hope also springs, however, from an academic and industrial culture of win at all costs. This culture is firmly embedded in competition and profit. Profit in turn, of course, can contribute to research opportunity and the potential to use this activity to further economic advantage. Funds from public and private sectors fuel the use of bioinformatics for scientific advance and hence fuel the cycle of greater and greater dominance in the market place of new ideas and new products. Thus, even though the availability of this wave of technology is potentially equal to rich and poor nations alike, in reality the rich still will grow richer as a result of their larger base and thus their greater ability to exploit it quickly: in some respects capital may even be more important than ideas.

What does change perhaps is the lag time for all to catch up, not to be left quite so far behind so far in the race to knowledge. Those

from less rich countries who choose to return home to teach after postdoctoral stints in the rich laboratory world can at least sit at their computer keyboards meaningfully as participants in theory development rather than fret away the hours thinking what might have been had they stayed in New York or Paris. Elation or greater frustration?

At the same time, from keyboard to drawing board is now not quite so far and, given networking options, at least there is now greater opportunity to participate actively in more equitable collective enterprise. The challenge is still there, as ever, to compel the genesis of greater equity in which there is less exploitation of endemic country resources, armed now with direct access to the fundamental information rather than handouts from would-be exploiters. Participation can now be more immediate, ongoing and interactive. But patent wars (Shiva, 1993; Dawkins, 1997) will persist, may even hot up as information flows faster and the reality of greater potential equity in discovery grows. This throws greater responsibility on scientists as managers of data flow and protectors of home turf from the vandals: nothing ever is really free, but now in Bangkok, Beijing or Beirut there is a remote chance to be at or near the active front, at least in a network of more equal opportunity.

It is however unclear just how equitable such networks are or can be. Funds emanate predominantly from rich country sources and even where generosity enters into the equation, most often fund access requires co-investigators from the donor country in the expectation that they will give direction and judgement, so that driving is still a rare privilege. It takes more than ordinary ability on the part of the recipient to take charge of the reins, but this is gradually occurring.

So much for opportunity. But what about the directions of ambition? What about the bioinformatic dreams? Health sector output from the Human Genome Project so far has tended to place undue emphasis on unraveling genetic diseases and indeed we see a steady stream

of reports of relevant gene sequences and interactive arrays, so that the diagnostic potential thereof is entering medical compendia and leading to claims of potential genetically engineered cures. The sequences so determined are accessible on the web, so they are available for all to think about. That is the cheap part. The virtually impossible barrier is the cost of subsequent action upon these databases. Here the multinational pharmaceutical conglomerates still tend to rule the roost, either by direct involvement in development, or by purchase of start-up companies that own the patents.

Another dimension, in some ways more exciting, is represented by the output of non-human genome projects. Here many of the targets are causative organisms of infectious diseases prominent in poor countries. Optimism ebbs and flows of visions vaccines for an ever-lengthening shopping list. In this context the drivers are mostly still rich world scientists. Here colonialism is reborn in new clothes. Materials are taken from the endemic country to laboratories in large Western institutions, sometimes with courteous acknowledgement, occasionally with minor co-authorship on subsequent publications, more often with the unacknowledged grasping hand of the thief. To the granting agencies are spun yarns about saving the world's poor as a prelude to expanding markets. The products occasionally sell at affordable prices in the countries from which the materials were taken, more often the real justification is seen as protecting travelers from the exploitative country to the exploited. The picture is not universally as pessimistic as this but sadly it is often so.

There is thus a long journey to be traversed from the ease of access to scientific information on the Internet to equity in participation by investigators in poorer countries in the exciting pathway of new knowledge from the database to the market. The rapidly increasing availability of key journals on the web does however bear witness to serious, generous attempts to reduce the inequities of access to and utilization of knowledge. WHO's recent attempt to make such journals available

freely on the Internet to health personnel in poorer countries is a step in the appropriate direction. But even this advance leaves most initiatives in rich hands, so that selection of problems to tackle applying the tools of bioinformatics is likely to result in bias towards their perceptions of priority. Even the admirable TDR-like optimism will take a long while to fully generate equity in disease prioritization appropriate to global needs and even longer to witness equal driving of the requisite high tech research programs funded dispassionately by international finance.

The conceptual grandeur of the bioinformatics revolution has to be seen in the context of village realities. The revolution promises change implemented according to ambition and perspective of the privileged drivers. The same funds or perhaps just a fraction thereof applied to health system strengthening could conceivably reduce the burden of disease in a more immediate fashion if the element of sustainability can be achieved. This requirement cannot be achieved by paternalistic goodwill either with pre-existing technology or per newer molecular medicine. Thus grand schemes for development of long lists of new vaccines in Western laboratories without equitable endemic country participation seem likely to fail in many respects. Funding here today, uncertain tomorrow builds false hopes and expectations. The village – in the rural countryside or in the urban shanty town - is used to failed promises.

These are inherent in the paternalistic juggernauts that flow from high tech dreams. Will bioinformatics be just one more chapter of unfulfilled promise or will it deliver in terms that the village can understand and benefit?

That is the real challenge to the dreams. Equitable leadership is one ingredient in the equation. Cost-effectiveness in the village marketplace is another. No brilliance of technical innovation alone can solve this dilemma, the jigsaw requires so many hands to work together (Kaplan, 2000).

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