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## Reversing the 'brain drain': Is the answer in the network?

By SHLOMI DOLEV  
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It boggles the mind to imagine what could be achieved if Israel invested just a fraction of what less developed nations invest in high- and very-high-speed broadband infrastructures.

Despite our outstanding academic and scientific achievements, Israel consistently ranks embarrassingly below countries with lower GDP and less-developed technology sectors when it comes to the network infrastructure that fuels basic scientific research and in the quest for petaflop computational power. It is no wonder that the Taub Center for Social Policy Studies documents alarming facts in a recent update to its seminal findings from 2008: "Israel's academic brain drain to the United States is unparalleled, with 29 Israeli scholars in the US for every 100 remaining at home in 2008 (the most recent data available). This is several orders of magnitude more than the 1.1 Japanese or the 3.4 French scholars for each 100 remaining in their respective home countries."

Numerous reasons have been given for this disturbing trend, from salary disparities, a lack of tenure opportunities, academic boycotts and more. But perhaps we need to look more closely at the nuts and bolts of the issue, literally and figuratively, and explore the lack of infrastructure to get collaborative scientific research done – and get it done right. It is time for Israel to realize that smart investment in high-and very high-speed broadband infrastructures is crucial to creating jobs, boosting economic performance and reversing the alarming rate of "brain drain" among our finest minds seeking professional fulfillment abroad.

Against a backdrop of infinitesimal investment in broadband research infrastructure and computing power, we at Israel's Inter-University Computation Center (IUCC), the operator of Israel's National Research & Education Network (NREN) adopted an age-old adage: "If the mountain won't come to Mohammed, then Mohammed must go to the mountain."

In early 2013, Israel became one of the 25 countries who collaborate in PRACE, the Partnership for Advanced Computing in Europe, Europe's most advanced High Performance Computing (HPC) research infrastructure. This means that Israeli researchers in academia and industry can reach the summit of the "supercomputing mountain" with free access to this multi-million- euro resource. PRACE supercomputers are ranked among the fastest in the world, with several not only in the coveted Top 500 supercomputer sites, but in the Top 10.

The combined HPC resources of PRACE cost in excess of €400 million and are primarily funded by the European Union.

There has not been a local supercomputing resource in Israel in well over a decade. Yet HPC is perhaps one of the most important tools for innovative research. Researchers need HPC to run experiments and simulations at a rate of one or more petaflops (one quadrillion operations per second). This computing power is fundamental for research seeking to solve science's most difficult challenges – in astrophysics, engineering, energy, medicine, chemistry, materials and more.

Since IUCC joined the consortium as Israel's representative, a growing number of Israeli researchers have been allocated core hours on PRACE resources. To encourage more, IUCC is hosting the PRACE 2014

Winter School in Tel Aviv. Participants from all over Israel and Europe will receive world-class hands-on training, as well as a mini-workshop on "The Future of HPC: Israeli Innovation," where Israeli companies and researchers who are developing future HPC technologies will be showcased.

The decision to join PRACE is part of IUCC's commitment to keep pace with the needs of Israel's scientific and research communities, and an important step toward Israel obtaining its own supercomputer.

But it is not enough. To properly leverage these resources, investments in network infrastructure must meet these efforts – at least halfway. As of 2011, Israeli academia had purchased just 15 kilometers of dark fiber (unused optical fiber) to augment our National Research & Education Network (NREN). Shockingly, this was surpassed exponentially by European countries with much smaller economies.

Consider the fact that since 2002 no less than eight outstanding researchers trained and educated in Israeli universities using Israel's sorely lagging research network were awarded Nobel prizes in the sciences.

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The need for a policy overhaul to reverse the alarming "brain drain" is certainly not news. But making concerted and focused efforts, like investing in very high broadband network connectivity and high performance computing to overcome the challenge is. And nothing could be more closely aligned with our national mission to enable and empower Israel's talented researchers do what they do best – right here at home.

The author is the chairman of the IUCC Executive Committee and the Rita Altura Trust Chair in Computer Sciences, Ben-Gurion University of the Negev.



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