

Two takes on Iran sanctions

I am not sure why the Issues and Events section of PHYSICS TODAY should include opinion pieces like the item titled "Sanctions on Iran Slow Science, Slam a Scientist," by Toni Feder (August 2010, page 22). With such claims as "sanctions complicate international collaborations and breed aggression toward the West" and the rather histrionic ending quotation, "Is it a crime to show young people that science is a tool to support the development of our country?" the item reads like promotional material for the Iranian government. Absent are considerations of the importance of sanctions in stopping the Iranian regime from its stated goal of annihilating Israel, with the nuclear program as its weapon of choice. Nor is there any mention of the thousands of American deaths for which Iran is directly responsible. Instead, the article suggests it is the fault of the West that sanctions are in place. Feder notes that damage has fallen on one particular scientist, Javad Rahighi. Regardless of Rahighi's exact plight, it should go without saying that when rogue regimes such as Iran threaten nuclear war there will be an international response, and the scientific community will not be immune to the consequences.

The article seems to safely conclude that Rahighi is not involved in the Iranian nuclear weapons program. Perhaps one should consider that in speaking to Western reporters, Iranian scientists may not exactly be in a position to be forthright. And why are sanctions against Iran viewed as a greater prob-

lem than, say, the evil of the Iranian regime itself, in terms of the persecution and murder of scientists?

The Iranian government clamors for war, and many people are caught in the middle. PHYSICS TODAY should not be a forum for naive Western science writers to play Middle East politics.

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Feder replies: William Katz's concerns and criticisms go far beyond the scope of my news story, which looked specifically at the effects that sanctions against Iran have on science and scientists in that country. He is right that especially with stories like this one, it can be difficult to know who to believe. To get the best sense of the situation, in researching the story I spoke with many more people than are quoted. Just as with the Soviet Union and the West during the cold war, keeping channels open between scientists in Iran and those in other countries could be helpful in moving toward peace.

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One nice thing about doing scientific work in academia is that competition is generally mature and cooperative; it serves to advance and expand the body of knowledge, which will eventually benefit everyone. Such an environment is less likely to be present in business, for example, where the tendency is to try to eliminate competitors and monopolize the market.

Like it or not, politics influences science in almost every country, under any political system, in developed and less-developed countries alike. An unpleasant reality is that scientists have to learn the art of maneuvering through local, national, and international regulations to get to do the science and yet maintain ethics and integrity. Scientists must not only navigate through the restrictions but move the science forward.

As a physicist from a less-developed country and a graduate of McGill Uni-

versity in Canada, I've witnessed the politics of science from vantage points in both countries. Working now in Iran, I find my personal challenge is to keep the slope of my scientific curve positive despite local and global obstacles. I deal with the politics of science every day in my lab and office when I try to buy equipment, submit papers, download articles and programs, request documents, or attend gatherings.

The really alarming danger is when those in countries not directly affected by the politics of science close their eyes to what is going on elsewhere. Such neglect may damage the integrity and unity of the scientific community as a whole. Someone who does not directly suffer under political sanctions can simply ignore the situation, justify it, or even make it worse by applying the rules in an overly restrictive way. Scientists who live in countries that are direct targets of restrictions and sanctions watch carefully and wait to see how their less-restricted colleagues react. A naive reaction—for example, ignoring the obstacles colleagues in sanctioned countries face just to get their work published—causes them to feel abandoned and therefore less motivated to connect with the broader community.

I have encountered a few difficulties myself. I cannot enter the website of one supplier of ordinary scientific tools, let alone order anything. A distributor of open-source programs that were written by volunteers around the world under General Public License recently banned access to its website from certain countries. The distributor does not even own the license, and the website is merely a sharing site that happens to be in the US.

Some publishers are, I believe, applying their own interpretations of government regulations so as to make it harder for residents of certain countries, Iran included, to submit and publish their work.

With so many obstacles, scientists need to think twice about where to buy the next piece of lab equipment, where to submit the next research paper, or how to distribute the nice software

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programs they have written so that others can use and develop them.

We scientists who work under sanctions and restrictions do not expect policymakers to make changes overnight that are favorable to us. We don't expect our colleagues around the world to break the law either, of course, but we urge them to be aware of, and sensitive to, what is happening around them and to do what can be done in changing policy to better support the work of science.

The global scientific community is a single body that is healthy only when each of its members can function properly. If one group of scientists, large or small, is restricted, all of science and all scientists suffer the damage.

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Notes on the Oak Ridge Pelletron

I was pleased to see the photo of the Oak Ridge Pelletron on the cover of the August 2010 issue of *PHYSICS TODAY*. The 25URC Pelletron, made by National Electrostatics Corp (NEC) in Middleton, Wisconsin, was delivered to Oak Ridge National Laboratory around 1980. The man in the cover photo is Dan Stark, an electrical engineer who worked for NEC at the time.

It's unfortunate that the photo caption refers to the accelerator as a Van de Graaff. Although Robert Van de Graaff may have first developed the concept of electrostatic charging to high voltage, his contemporary, Raymond Herb, working here at the University of

Wisconsin–Madison physics department, spent many years perfecting a much better accelerating tube, column structure, and charging system. Herb founded NEC in 1965 to build Pelletrons, named after the NEC charging chain that replaced the Van de Graaff rubber belt.

Van de Graaff's company, High Voltage Engineering Corp, sold a great many belt-charged Van de Graaff accelerators, but the 25URC NEC Pelletron at Oak Ridge holds the records for the highest sustained DC voltage ever achieved, about 30 MV, and the highest terminal potential while running an ion beam, 25.5 MV for Ni^{+13} at 357 MeV. The 25URC has accelerated heavier ions to about 600 MeV.

The 25URC at Oak Ridge was one of the first accelerators I worked on after I started at NEC in 1977. I no longer work there, but I respect its product and believe that appropriate credit should go to the late Ray Herb and to NEC for that remarkable device.

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Painlevé Project on the Web

In recent years the Painlevé equations, particularly the six Painlevé transcendents $\text{PI}^{\text{--}}\text{PVI}$, have emerged as the core of modern special-function theory. In the 18th and 19th centuries, the classical special functions, including the Bessel, Legendre, Airy, and hypergeometric functions, were recognized and developed in response to problems in electromagnetism, acoustics, hydrodynamics, elasticity, and many other areas. Similarly, around the middle of the 20th century, as science and engineering continued to expand in new directions, a new class of equations, the Painlevé equations, and their solutions, the Painlevé functions, started to appear in applications. The equations are second order and nonlinear.¹

The list of problems now known to be described by the Painlevé equations is large, varied, and expanding rapidly. The list includes, at one end, the scattering of neutrons off heavy nuclei, and at the other, the statistics of the zeros of the Riemann zeta function on the critical line $\text{Re } z = \frac{1}{2}$. Included in between are random matrix theory, the asymptotic theory of orthogonal polynomials, self-similar solutions of integrable equations, combinatorial problems

such as Ulam's longest increasing subsequence problem, tiling problems, multivariate statistics in the important asymptotic regime where the number of variables and the number of samples are comparable and large, and random growth problems.

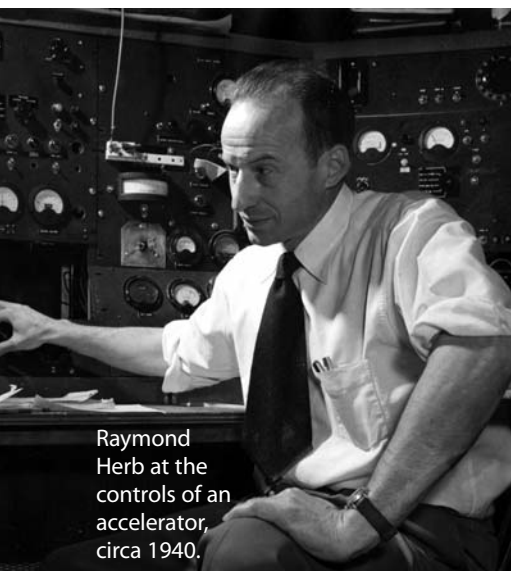
Over the years the properties—algebraic, analytical, asymptotic, and numerical—of the classical special functions have been organized and tabulated in various handbooks such as the Bateman Project or the 1964 National Bureau of Standards *Handbook of Mathematical Functions*, edited by Milton Abramowitz and Irene Stegun. What is needed now is a comparable organization and tabulation of the same properties of the Painlevé functions. This letter is an appeal to interested parties in the scientific community at large for help in developing such a “Painlevé Project.”

Although the Painlevé equations are nonlinear, much is already known about their solutions, particularly their algebraic, analytical, and asymptotic properties. That is because the equations are integrable in the sense that they have a Lax pair and a Riemann–Hilbert representation. A Riemann–Hilbert representation is a nonlinear analog of the familiar integral representations of the classical special functions. And just as one can apply these integral representations to determine the asymptotic behavior of those functions using the classical method of steepest-descent, so too there exists a nonlinear steepest-descent method which can be used to determine the asymptotic behavior of the Painlevé functions, with equal efficiency and accuracy. The numerical analysis of the equations, however, is less developed and presents novel challenges. In particular, in contrast to the classical special functions, for which the linearity of the equations greatly simplifies the calculations, each problem for the nonlinear Painlevé equations arises essentially anew.

As a first step in the Painlevé Project, we have established a webpage (<http://math.nist.gov/~lozier/PainleveProject/>), maintained by NIST. We ask interested readers to visit the site, subscribe, and report new work on the theory of the Painlevé equations, whether algebraic, analytical, asymptotic, or numerical. Users can also request specific information about solutions of the equations and draw attention to possible new applications.

Reference

1. For more information, see A. Fokas, A. Its, A. Kapaev, V. Novokshenov, *Painlevé Transcendents: The Riemann–Hilbert*



Raymond Herb at the controls of an accelerator, circa 1940.