Comment

Banana republic

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What do you call a country in which the 13,000 richest families have as much income as the 20 million poorest families? One in which those same 13,000 richest families have incomes 300 times that of the average family? And in which the richest 1% of families receive 16% of the total pretax income in that country, a percentage as large as that received by the entire bottom 40% of the population? Some might call it a banana republic. I call it the United States of America.

The figures I just cited are taken from a recent article by the political/economic columnist Paul Krugman ("For Richer: How the permissive capitalism of the boom destroyed American equality." *New York Times* Magazine, October 20, 2002). His thesis is that during the past 20-30 years the gap in income between the rich and rest of the population in the U.S. has grown so large that economic policy now increasingly caters to the interests of the elite, while public services for the rest of the population - he focuses on public education but the point covers other services as well - are starved of resources. Anyone who has looked at, for example, the largest U.S. cities can appreciate his point. New York City has become basically a two-tiered society: the very rich and the poor. Middle class neighborhoods are disappearing from the urban center, as are middle class people themselves. The United States used to be largely a middle-class society, both in appearance and actuality. But income disparities have increased so much in recent decades that now both the economic and the political systems are driven not by the needs of the middle class but by those of the wealthy. Krugman warns that the U.S. "may become a country in which the big rewards are reserved for the people with the right connections; in which ordinary people see little hope of advancement; in which political involvement seems pointless, because in the end the interests of the elite always get served." In short, a banana republic.

'Banana republic' is a pejorative with a hundred-year old history. Thomas H. Holloway, Professor of Latin American History at Cornell University in Ithaca, New York, traces it back to O. Henry (1862-1910), the famous American short story writer. O. Henry, whose real name was William Sydney Porter, began his working life as a financier. Unfortunately his financial activities strayed over the border of legality - behavior unknown to the financial officers and accountants of our day, of course - and he ended up serving time in prison for bank fraud. Incarceration has a bad reputation as a mechanism for rehabilitation, but it seems to have worked for O. Henry: while in prison he began his writing career. But before being jailed he hid out for a time in Central America, on the north coast of Honduras. He used his experiences there as fodder for his book *Cabbages and Kings*, a loosely connected set of vignettes recounting the misadventures of various gringos in the mythical Latin American republic of 'Anchuria', which is Spanish for 'widths' ('Honduras' is Spanish for 'depths'). Professor Holloway notes that the material was apparently first copyrighted in 1904; in any case, on page 328 of the 1912 edition (Doubleday and Page, Garden City, USA) he found the earliest reference to the term in an explanation from a gringo character as to why he chose to emigrate swiftly to such a benighted tropical venue: "At that time we had a treaty with about every foreign country except Belgium and that banana republic, Anchuria."

My Collins dictionary defines banana republic as "A small country, esp. in Central America, that is politically unstable and has its economy dominated by foreign interest, usually dependent on one export, such as bananas." Now, I love my Collins but I disagree with this definition. I don't think the domination of the economy by foreign interest has to be there (although I concede that typically it is) and I think political instability isn't a requirement either. 'Republic' here is a euphemism for dictatorship, and as any Iraqi can tell you, dictatorships can be more stable than one might wish. The dictatorship implied in this case is rule by a small, wealthy (usually corrupt) clique. A banana republic, in other words, is a country where a very small percentage of the population has a very large share of the wealth and power.

We can argue about whether Krugman's concern that the United States is headed in that direction is justified, and if so what can be done about it. But it's becoming less and less easy to argue that the term doesn't apply to biological research, and one of the biggest reasons is genomics. The trend has been evident for some time. I think it started in the U.S. in the 1970s, when a small number of clinical research labs in medical schools grew to enormous size, necessitating equally huge research grants. It became institutionalized in the 1980s, when the Howard Hughes Medical Institutes poured large sums of money into select subjects, guaranteeing chosen investigators lavish support for many years, thereby freeing them from the insecurity of the federal funding process. (Although Hughes Investigators were almost entirely U.S.-based, a small number of foreign scientists benefited from this largess as well.) It was no coincidence that, in its early years, the Hughes program was restricted to researchers in medical schools, and thus tended to accelerate the distinction between the level of support enjoyed by some investigators there and their brethren on main campuses. When the program expanded in the 1990s to include scientists not affiliated with medical schools, a class structure was created in American science. The upper class consisted of Hughes investigators. Blessed with the best equipment money could buy plus long-term support more easily renewable than federal grants, they could - and did - embark on high-risk/high-return projects and projects requiring long incubation periods. A small number of favored lab leaders at a few privately endowed research institutes also belonged in this category. The middle class comprised those academic scientists fortunate enough to have a number of large federal grants, perhaps augmented with support from non-governmental foundations. They could do front-line research provided it didn't require lavish instrumentation and large numbers of personnel. Everyone else made up the underclass.

Some other countries had a similar class structure long before. In Germany, for example, directors of Max Planck Institutes enjoyed a research life-style much like that of Hughes Investigators. Some professors in Britain were similarly blessed (I recall a famous report in the late 1980s, I believe, showing that a very few senior organic chemists in the U.K. commanded a disproportionately large share of the total research funds in that field). My description isn't meant to be critical; admission to the upper class, in the U.S. and elsewhere, was usually based on merit. Nor was it an accident that so many of the breakthroughs in biology came from the upper-class labs: the ability to take both risks and a long-term view was as important to these advances as superior infrastructure. I don't think science as a whole was too ill-served by this system, despite the jealousy and envy it created. Even though a small percentage of scientists were significantly better off than those in the next tier, for the most part the middle class were not shut out from any broad area of biological research, although some specific problems were beyond their available resources.

But I think something has happened in the past 5-10 years that may be widening the gap between the classes to the point where entire fields of biology may become closed to those below the top. In other words, I think that in some areas there will cease to be a scientific middle class. And the area that strikes me as the most likely to become a banana republic is genomics. I'm not referring to genome sequencing; it's more a technology than a field, intellectually speaking. Structural genomics is similar. By genomics, here, I mean an integrated approach to biology that is genome-driven. It focuses on pathways and processes involving the functions and interactions of many gene products. It makes heavy use of genome-wide technologies such as microarrays and high-throughput mass spectrometry as well as expensive genetic methods like knockout mice. Heavy reliance on expensive, large-scale instrumentation is only one reason that this new science is difficult for all but the largest, best-funded labs. The need to employ many very different techniques - and disparate modes of thinking as well - is another barrier to entry.

Now none of this would matter much if we were talking only about a sub-discipline. But genomics and biology are fast becoming one thing. The transformation of the life sciences from a purely reductionist discipline to one in which the cell, organ and organism are the real objects of study is not just a trend. I see it as an inevitable progression that marks the maturing of biology, and it would be a pity - and would retard that maturation - if the field balkanized into a small number of labs that think and work at that level and a large number of labs that can't.

So I think there's a message here for those who set science policy at all levels, from the heads of funding agencies to deans, department chairs and center directors. If the middle class of scientists is to benefit fully from, and participate fully in, the age of genomics, then creative approaches to the funding and conduct of research are needed. I think that more attention must be paid to providing shared instrumentation resources available at low cost. Collaborations are one way in which individual small labs can acquire the techniques and breadth of expertise that otherwise might require a large, interdisciplinary group or center, but funding mechanisms that facilitate such multi-lab programs are spotty and underfinanced. The length of the average government research grant, 3-4 years, is too short for the kinds of problems that collaborations like these are meant to tackle. Junior investigators are often discouraged from participating in such program projects because independence is a frequent criterion for promotion. Only their senior colleagues can change a culture that penalizes those who wish to build communities while rewarding the selfish.

The choice seems to me to be clear: we can share equipment, projects, students and ideas, and provide the individual investigator with financial support that encourages such

sharing, or we can sit back while a small group of biologists with access to specialized resources and dependable support wield ever more influence and carry out ever more of the important, trend-setting experiments. That wouldn't spell doom for genomics, but it would mean that this new field, and thus perhaps modern biology, would be dominated by a small, elite group that controls most of the wealth and power. And you know what kind of republic that is.