

Science is very concerned, perhaps we should be too

Author's note: The following essay represents my fiftieth contribution to this column in The Zephyr. Collectively, these essays represent the largest and most diverse intellectual project that I have attempted in my life. I thank all the readers, especially those that have responded or reacted to my articles. And most all I want to thank Norm (for the opportunity) and my wife (for her tremendous patience and editorial feedback). Without everyone's support, the energy required to research and write would have dissipated a long time ago.

Scientific American, one of the most prestigious science magazines in the United States, dedicated its September 2005 issue, entitled, "Crossroads for Planet Earth," to environmental issues. In this special issue, leading minds on a broad array of environmental topics contribute articles that introduce recent findings in the context of historical paths and anticipated changes.

George Musser opens up with an introductory essay, "The Climax of Humanity," which notes that three concurrent transitions are underway in the areas of demography, economics, and the environment. Moreover, such changes (and how we respond to them) will set the conditions of the Earth that our children (and their children) face. And given that humans are currently consuming 15 of the 24 major services provided by nature (such as pollination and water filtration) faster than they are replenished, future generations will certainly (and rightly) look unfavorably on us for our rapacious behavior. Alternatively, society has the ability to make choices that will dictate that sufficient resources will be available for generations to come. The question is, "Will we?" The eight articles that follow Musser's opening, which will now be summarized, provide ideas on ways to live healthily and sustainably into the future.

In Joel Cohen's "Human Population Grows Up," we confront one of the key contributors to global change. Cohen reminds us that though human population is now the largest it has been in history, amazingly more than six-fold larger than in 1800, rates of growth have slowed considerably. Remarkably, the profound change in population growth rates, which have dropped from 2.1 percent to 1.2 percent since the late 1960s, were driven largely by voluntary choices! Yes, that is right. People have chosen to have fewer children. The reasons why vary widely and include, most notably, increased access to birth control for women and improved educational and economic opportunities for women. However, according to Cohen, never before have global population growth rates declined voluntarily.

Other developments in population are worthy of our attention and include: (1) For the first time in history (starting in 2000), there are more old people than young people (though it isn't made clear exactly where old and young diverge); and, (2) By 2007, there will be more people living in urban areas than in rural ones. These profound developments set us up in ways that demand thoughtful response. With more "old" people worldwide, better opportunities must be provided to ensure that they can sustain a living. More urban people likely guarantees less disease (to water-borne illnesses) but also requires immense growth in infrastructure (hospitals, schools, public transportation, etc.) to succeed. In devising a response it is important that we don't forget

to learn from our previous mistakes in the areas of sprawl, transportation juggernauts, and conspicuous consumption.

Jeffrey Sachs' "Can Extreme Poverty be Eliminated?" outlines the steps needed to continue to reduce the number of people that live in poverty, one of the key missions advanced by the U.N. Millennium Goals (promised by the nations of the world in 2000). One of the great achievements of the late-20th century was to reduce the number of people living in extreme poverty by more than 400 million people, despite significant population growth during this period. Yet, according to Sachs, the more than 1 billion people still living so miserably (on less than \$1 per day) must be provided for in order for there to be sustained peace and prosperity on the planet.

How can eliminating extreme poverty be accomplished? Well, according to Sachs, it can be done very simply. First, and foremost, it requires that developed nations give more financial support to the poor nations of the world. Shockingly, if the world's affluent nations gave only 1 percent of their collective yearly production to poor nations, this would more than take care of need. This giving (which amounts to a little more than twice what is currently given, which further demonstrates its plausibility) wouldn't be provided as a handout but rather a "hand up." Currently billions live day to day and have nothing to save or invest in their futures. Assistance should be provided to build and strengthen local food production, promote gender equality in education, and tackle illness (via distributing vaccines and mosquito nets). So a mere pittance of our collective wealth, if provided aggressively (not passively), could eradicate extreme poverty and bring the world into much great harmony.

To this end, Sachs points out, many Americans mistakenly think that they give the most and therefore it is up to other countries to give their share. As it turns out, even when you account for private giving, U.S. international aid is only 0.21 percent of its GNP, "among the lowest ratios of all donor nations." In Sachs view, the false conclusion that aid hasn't worked stems from a complete exaggeration of the effort to provide aid. If nations step up and provide financial support, as many have promised to do by 2015, not only will many fewer people suffer from abject poverty worldwide, some of the sources of ill-will towards richer nations (that breeds terrorist organizational growth and activities) will be greatly assuaged as well.

In Stuart Pimm and Clinton Jenkins' "Sustaining the Variety of Life," these conservation ecologists from Duke University implore our generation to protect biodiversity before it is too late. They remind us that extinctions cannot be undone and that rates of extinctions today are hundreds (or even thousands) of times faster than background (i.e., natural) rates. The main cause of these astronomical rate increases is human damage done to particularly vulnerable habitats, almost all located in tropical regions.

Yet despite the seemingly apocalyptic state of the planet's biodiversity, the authors see reasons for not becoming paralyzed into inaction. In many remote areas where unsustainable logging is taking place, investments of only \$5 billion dollars would protect ~5,000,000 square kilometers of forested wilderness; for comparison sake,

this amount of land is equivalent to 67 percent of the land area of the contiguous United States. If this seems like a lot of money, consider that our country has already agreed to spend twice this amount (~\$10 billion) to restore the Everglades in Florida. Thus, protecting global environments is obviously just a question of priorities. Additionally, there is still a lot to be saved (and spared annihilation). Nearly 50 percent of all tropical forests are still relatively healthy (although massive destruction continues largely unabated), and more than half of the world's species still have biologically-viable populations. And lastly, Pimm and Jenkins derive hope from the fact that potential alternatives to reckless resource extraction in these key areas will also sustain local populations economically and materially through burgeoning ecotourism, greenhouse gas emissions agreements that monetarily account for the irreplaceable plant breathing taking place within rainforests, and sustainable agriculture. In the end, the authors state that it will be choices that we make during this generation that will decide the fate of the bulk of the planet's species. This clarion call for immediate response should motivate all of us to struggle for habitat protection and eliminate dangerous consumption of tropic products (including beef, coffee, sugar, etc.)

In Amory Lovins' "More Profit with Less Carbon," we find out that both environmentalists and top U.S. government officials are completely wrong when they assert that "climate protection" (via reduced greenhouse gas emissions) will have a negative impact on our economy. Mr. Lovins, a physicist and co-founder of the Rocky Mountain Institute, defends this bold claim with figures and insights that make even the most skeptical reader give pause. Could he be right? Well, considering the following, it seems that he may be; and if he is, wow, we should all toast his wisdom and forethought. (I will try to summarize his ten-page article as succinctly as possible, but a full reading is required to get the full gist of his argument.)

The basis of Lovins' case rests on the following blatantly obvious premise: Wasting energy isn't economically rewarding. However, in our current world, where huge subsidies exist for non-renewable energies (that are heavily polluting, directly related to future climate change, and implicated in global conflict), consumers are largely unaware that better alternatives exist and/or lack access to obtain them. Also, since few incentives exist for entrepreneurs as well as consumers to make a switch towards efficiency, wasting energy has become ubiquitous and profitable (to a select few and powerful). Consider that 5 percent of household electricity in the U.S. "is lost to energizing computers, televisions, and other appliances that are turned off" and that only 1 percent of burnt gasoline in a car actually goes to move a passenger from place to place. Lovins suggests that improvements in energy efficiency, using existing technologies and materials, could easily eliminate all need for foreign oil, produce hordes of good paying jobs here in the U.S., and spare lives (from dangerously heavy — and not nearly as protective — steel framed trucks and SUVs, and reductions in air pollution). Wouldn't all three of these changes be a benefit to our economy and well-being, not an additional



draw on it?

According to Lovins, many big named companies have come to realize that using energy efficiently and productively can be a big boon to their profits as well as their long-term viability. Dupont "boosted production nearly 30 percent but cut energy use 7 percent and greenhouse gas emission 72 percent" and saved \$2 billion in the process. IBM, British Telecom and others have made similar gains by adopting energy conservation policies and practices. Isn't it time that all institutions, including the U.S. government and colleges and universities of higher learning, make similar strides?

Yet, perhaps most profound of all of Lovins' insights is his assertion that new large-scale, and extremely costly, power plants are absolutely the wrong way to turn to solve energy needs in the future. And with all the recent talk about rekindling a new wave of nuclear power plants (or worse yet, coal plants) in the coming years (as has been offered in the new energy bill recently pushed through Congress by the current Administration), this is one idea that warrants our immediate attention. Why does Lovins think these expansions are misguided? Simple, he thinks they are economically dumb. He writes, "manufacturing efficient lamps and windows takes 1,000 times less capital than building power plants and grids to do the same tasks, and the investment is recovered 10 times faster." If this factoid is hard to swallow, consider "the Revolution" — a five-seat midsize SUV designed in 2000 — that can travel over 300 miles on only 7 pounds of hydrogen fuel (an equivalent trip in the heavily marketed SUVs today require a ~120 pounds of petroleum). Better models are available today and better ones yet will be available tomorrow. Ready for a test drive? Give Lovins a look. You might be shocked what you find yourself driving in the very near future.

In Paul Polak's "The Big Potential of Small Farms," we are reminded that although there have been great strides made in the past forty years to increase food supply, still hundreds of millions of humans go hungry and malnourished. In order to remedy this situation, Polak argues that we need to provide poor, rural people a means to secure their own food. One of the most critical limiting resources to this end is reliable supplies of water. As it turns out, a simple and inexpensive human-powered machine, known as the treadle pump, now enables many small farmers to access much needed water that resides just below the ground. Use of these pumps has greatly increased production without the need for the genetic

engineering and massive chemical inputs that are being pushed as solutions by the multinational agrobusiness sector. Thus, not only are the poor able to feed their families but they do so without compromising nature's genetic diversity nor endangering their lives or the ecosystem with untested and often pernicious synthetic chemicals. Additionally, the installation of simple hoses (with small holes) have made rural farmers much more water efficient (much more so than many industrialized farms), something that is a must where water resources are limited, often inaccessible, and/or heavily fought over. Providing access to necessary water (especially during the dry seasons) seems to be enough in some areas to allow rural people to live self-sufficiently. And given that the vast majority of the world's hungry are smallholder farmers, distribution of simple and cheap technologies may be the most beneficial and least invasive way to help the have-nots lead productive and meaningful lives. Decentralized control of the world's resources may not be what the big corporations and governments want, but evidence is mounting that it is the way to serve the needs of the masses.

Barry Bloom's "Public Health in Transition" makes transparently clear that chronic disorders are the "greatest contributor to the global burden of disease." This should come as a surprise to many considering how much attention the press gives to infectious diseases like (AIDS, tuberculosis, etc.). And while infectious diseases certainly deserve our commitments, chronic diseases (such as heart disease, depression, and diabetes) will require the bulk of the globe's attention in the very near future.

One way to quantify the negative effects of disease is to use a metric called "disability adjusted life years" (DALYs). DALYs are numeric values representing the "number of healthy years lost to injury, illness, and premature death." Whereas life expectancy serves as a measure of the relative health of a population (by assuming that long lives are connected with good health), DALYs look directly at the health characteristics of a population. In the DALYs scheme, an added year of life that is spent in a hospital (or home) suffering from a major physical or mental disorder, probably shouldn't be considered a good thing. A look at the top contributors of DALYs establishes the current importance acute infections associated to respiratory disorders, diarrheal disease, and ailments affecting child-bearing mothers and newborns. However, by 2020, it is projected that the top 3 contributors to DALYs will be heart disease, depression, and vehicular accidents, all conditions more driven by behavioral choices. Thus, if public health is to be provided in the near future, we need to put a lot more stock in nutritional considerations, psychological well-being, and road safety.

Among the "eight critical steps" to improving global health, Bloom includes: (1) controlling tobacco advertising, sales and addiction; (2) reducing threats posed by environmental sources; and; (3) developing a global health architecture. The first suggestion follows from the humongous numbers of people that die each year because they are smokers (~5 million now). (I think national governments should force cigarette companies to remove nicotine from all its products.) Interestingly, if people avoid starting smoking until age 24, 95 percent of them will never smoke. The second suggestion stems from the awareness that air, water, and food pollution greatly reduces our health and too often gets overlooked in comparison to other threats. And the third suggestion draws from the recognition that public health is a global problem and requires global solutions. Nowhere is this more evident than in the anticipated flu pandemic that is predicted to occur sometime soon. When potentially infected chickens or ducks somewhere in

Indonesia carry a virus that might wipe out 20-40 percent of humanity in one fell swoop (pardon the pun), it is clearly time to develop global partnerships, standards, and objectives for human health.

In Herman Daly's "Economics in a Full World," the vivid contrast between "mainstream" economics and its alternatives strongly suggests that the "status-quo" will not suffice. "Economic growth will solve all problems," is a principle governing how many powerful players in global economies operate. Unfortunately, on a finite planet, growth (of anything) must eventually come to an end. And with ample evidence that many resources (such as ocean fisheries and petroleum) have reached (or will soon reach) their limits of supply and with the assimilative capacity of reservoirs (such as rivers, soils, and atmospheres) to absorb pollutants and biodegrade waste showing signs of overburden, other ways of accounting for societal goods seem justified.

The GDP (gross domestic product) often serves as the basis for evaluating the well-being of a national economy on the grounds that the cumulative production of goods serves as a good indicator of economic health. However, it is a very flawed indicator. First, since it considers activities surrounding negative events as positive economic growth (including, the clean up after oil spills, the rebuilding that takes place after devastating storms, and the increased use of locks following increases in crime). So, in this way, paradoxically, GDP improves when we have more oil spills, more category 4 & 5 hurricanes, and more home break-ins. Fortunately, other economic measures exist that do a much more fair and informative job of indicating true well-being. For example, the index of sustainable welfare (ISEW) subtracts negatives (such as environmental damage, increased concentration of wealth, pollution, and, international debt) from economic positives. Interestingly, when one looks at trends in GDP and ISEW over the past 50 years, something profound is observed. GDP (per capita) more than doubles over this period (and shows signs of continued, unidirectional growth). However, ISEW (per capita) exhibits reductions since the 1970s. Apparently, negative factors are growing faster than positive ones. Other economic measures (including the genuine progress indicator (GPI)) show similar trends. If the media were to report these trends rather than blindly focusing only on GNP, the public would be better informed and might begin to think more about whether growth in material goods is unquestionably good. Governments might also be compelled to spend more time reducing pollution and acting proactively in anticipation of storms.

Another step that would allow us to track progress (or the lack of it) involves focusing on wealth rather than income. While income provides an assessment of the yearly creation of capital, it fails to include an extremely important consideration accounted for by wealth. Wealth includes both the financial capital that a nation's citizens have but also the natural capital (in the form of clean and navigable rivers, healthy wetlands, etc.) that exists as well. In other words, while income fails to account for the draw down of natural resources (such as soil, petroleum, or groundwater), wealth includes it. It is imperative that we begin to consider the implications of using finite resources. Wealth allows us to do this much more so than income alone.

In closing, W. Wayt Gibbs focuses our attention in "How Should We Set Priorities?" by recapturing the essence of many of the previous articles. A close examination of a generic farm enables Gibbs to reflect on their conclusions. In the present, a typical industrial farm survives economically only if it produced a harvestable crop in sufficient quantities. In a future scenario, farms could be seen as suppliers of many goods — not just one crop. For example,

by leaving some of the land alone and free to wildlife, farms could become zones of habitat protection (and farmers could be financially compensated for preserving this essential biological need). Further, farms could be seen as providing for the uptake of greenhouse gases (through plant photosynthesis), and farmers could be rewarded by companies (for their excess CO₂ production). Expansions and breakthroughs in wind energy open up an additional window of opportunity for farms — as suppliers of usable energy. And lastly, farms could engage in sustainable harvest of timber as well as food, and farmers could be paid for managing of our precious forests. All in all, this diversity of use of our land area would not only make the farmer less susceptible to a bad meteorological conditions (or "free"-trade that virtually makes the small farmer unable to compete with large corporate farms), but would reduce the transportation costs of goods (such as timber from the Amazon that gets sold in Wisconsin), and would allow rapidly depleting ecosystems to go unspoiled — since the products they provide would be available locally as well. Gibbs believes that a farm of the future serves as a good demonstration of what can be done if environmental considerations are included in economic discussions and holistic foci force us to see the big picture rather than continued focus on incremental, specialized improvements. In the end, Gibbs suggests that only an alloying of

government functions (to protect the have-nots, resources, and freedoms) and market forces will enable us to live in peace and prosperity in the future.

No one magazine issue can be expected to provide all the answers. However, the September 2005 issue of *Scientific American* goes a long way to provide its readership with the background necessary to consider options and policies that will reward our species and the planet. Isn't it amazing that the issues raised by some of the world's top thinkers and scientists barely get a mention in our media and in our schools? It is almost as if the two existed on different planets. Unfortunately, if they cannot be brought together shortly, the bulk of us will continue to be "surprised" by the havoc that results. We all have a role in seeing that they do.

Peter Schwartzman is associate professor and chair of the Environmental Studies Program at Knox College. He is a climatologist with publications in the area of climate change and human population growth.

Announcement: Bioneers 2005 is around the corner. This environmental organization puts together an amazing three day conference every October. There are three locations sponsoring this conference within driving distance from western Illinois. Please check out the details at www.bioneers.org. If you attend, you will certainly not be disappointed as they put together one of the best programs around.

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 Saturday, October 1, 2005 9:00 a.m.

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ENTRY FEE – \$15 Registration includes a Long Sleeve Shirt
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PACKET PICKUP – Race day registration will begin at 7:30 a.m. inside the CSC gym
COURSE – 5K flat road/no hills. Timers at each mile/water stops at 1-3 mile markers.

AWARDS – Plaques will be presented after the race to the top 3 finishers in each age group
 Men's 14 & under, 15-19, 20-29, 30-39, 40-44, 45-49, 50-54, 55-59, 60 & over
 Women's 14 & under, 15-19, 20-29, 30-39, 40-44, 45-49, 50-54, 55-59, 60 & over
 Walkers (overall): Top three females & Top three males

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