### Space

**Space colonization is impossible --- humans can’t adjust**

Theunis **Piersma 10**, professor of animal ecology at the University of Groningen in the Netherlands and senior research scientist at the Royal Netherlands Institute for Sea Research in Den Burg, “Why space is the impossible frontier,” NewScientist, 11-16-10, <http://www.newscientist.com/article/mg20827860.100-why-space-is-the-impossible-frontier.html>

Hawking, Obama and other proponents of long-term space travel are making a grave error. Humans cannot leave Earth for the several years that it takes to travel to Mars and back, for the simple reason that **our biology is intimately connected to Earth.**

To function properly, we need gravity. Without it, the environment is less demanding on the human body in several ways, and this shows upon the return to Earth. Remember the sight of weakened astronauts emerging after the Apollo missions? That is as nothing compared with what would happen to astronauts returning from Mars.

One of the first things to be affected is the heart, which shrinks by as much as a quarter after just one week in orbit (The New England Journal of Medicine, vol 358, p 1370). Heart atrophy leads to decreases in blood pressure and the amount of blood pushed out by the heart. In this way heart atrophy leads to reduced exercise capacity. Astronauts returning to Earth after several months in the International Space Station experience dizziness and blackouts because blood does not reach their brains in sufficient quantities.

Six weeks in bed leads to about as much atrophy of the heart as one week in space, suggesting that the atrophy is caused by both weightlessness and the concomitant reduction in exercise.

Other muscle tissue suffers too. The effects of weightlessness on the muscles of the limbs are easy to verify experimentally. Because they bear the body's weight, the "anti-gravity" muscles of the thighs and calves degenerate significantly when they are made redundant during space flight.

Despite the best attempts to give replacement exercise to crew members on the International Space Station, after six months they had still lost 13 per cent of their calf muscle volume and 32 per cent of the maximum power that their leg muscles could deliver (Journal of Applied Physiology, vol 106, p 1159).

Various metabolic changes also occur, including a decreased capacity for fat oxidation, which can lead to the build-up of fat in atrophied muscle. Space travellers also suffer deterioration of immune function both during and after their missions (Aviation, Space, and Environmental Medicine, vol 79, p 835).

Arguably the most fearsome effect on bodies is bone loss (The Lancet, vol 355, p 1569). Although the hardness and strength of bone, and the relative ease with which it fossilises, give it an appearance of permanence, bone is actually a living and remarkably flexible tissue. In the late 19th century, the German anatomist Julius Wolff discovered that bones adjust to the loads that they are placed under. A decrease in load leads to the loss of bone material, while an increase leads to thicker bone.

It is no surprise, then, that in the microgravity of space bones demineralise, especially those which normally bear the greatest load. Cosmonauts who spent half a year in space lost up to a quarter of the material in their shin bones, despite intensive exercise (The Lancet, vol 355, p 1607). Although experiments on chicken embryos on the International Space Station have established that bone formation does continue in microgravity, formation rates are overtaken by bone loss.

What is of greatest concern here is that, unlike muscle loss which levels off with time, bone loss seems to continue at a steady rate of 1 to 2 per cent for every month of weightlessness. During a three-year mission to Mars, space travellers could lose around 50 per cent of their bone material, which would make it extremely difficult to return to Earth and its gravitational forces. Bone loss during space travel certainly brings home the maxim "use it or lose it".

Bone loss is not permanent. Within six months of their return to Earth, those cosmonauts who spent half a year in space did show partial recovery of bone mass. However, even after a year of recovery, men who had been experimentally exposed to three months of total bed rest had not fully regained all the lost bone, though their calf muscles had recovered much earlier (Bone, vol 44, p 214).

Space agencies will have to become very creative in addressing the issue of bone loss during flights to Mars. There are concepts in development for spacecraft with artificial gravity, but nobody even knows what gravitational force is needed to avoid the problems. So far, boneless creatures such as jellyfish are much more likely than people to be able to return safely to Earth after multi-year space trips. For humans, gravity is a Mars bar.

The impossibility of an escape to space is just one of many examples of how our bodies, and those of our fellow organisms, are inseparable from the environments in which we live. In our futuristic ambitions we should not forget that our minds and bodies are connected to Earth as by an umbilical cord.

#### Fission solves

**O’Neil 11**, Ian, PhD from University of Wales, founder and editor of Astroengine, space producer for Discovery News [“'Suitcase' Nuclear Reactors to Power Mars Colonies,” August 30th, http://news.discovery.com/space/mars-colonies-powered-by-mini-nuclear-reactors-110830.html]

Nuclear power is an emotive subject -- particularly in the wake of the Fukushima power plant disaster after Japan's March earthquake and tsunami -- but in space, it may be an essential component of spreading mankind beyond terrestrial shores. On Monday, at the 242nd National Meeting and Exposition of the American Chemical Society (ACS) in Denver, Colo., the future face of space nuclear power was described. You can forget the huge reactor buildings, cooling towers and hundreds of workers; the first nuclear reactors to be landed on alien worlds to support human settlement will be tiny. Think less "building sized" and more "suitcase sized." "People would never recognize the fission power system as a nuclear power reactor," said James E. Werner, lead of the Department of Energy's (DOE) Idaho National Laboratory. "The reactor itself may be about 1 feet wide by 2 feet high, about the size of a carry-on suitcase. There are no cooling towers. A fission power system is a compact, reliable, safe system that may be critical to the establishment of outposts or habitats on other planets. Fission power technology can be applied on Earth's Moon, on Mars, or wherever NASA sees the need for continuous power." The joint NASA/DOE project is aiming to build a demonstration unit next year. Obviously, this will be welcome news to Mars colonization advocates; to have a dependable power source on the Martian surface will be of paramount importance. The habitats will need to have a constant power supply simply to keep the occupants alive. This will be "climate control" on an unprecedented level. Water extraction, reclamation and recycling; food cultivation and storage; oxygen production and carbon dioxide scrubbing; lighting; hardware, tools and electronics; waste management -- these are a few of the basic systems that will need to be powered from the moment humans set foot on the Red Planet, 24 hours 39 minutes a day (or "sol" -- a Martian day), 669 sols a year. Fission reactors can provide that. However, nuclear fission reactors have had a very limited part to play in space exploration up until now. Russia has launched over 30 fission reactors, whereas the US has launched only one. All have been used to power satellites. Radioisotope thermoelectric generators (RTGs), on the other hand, have played a very important role in the exploration of the solar system since 1961. These are not fission reactors, which split uranium atoms to produce heat that can then be converted into electricity. RTGs depend on small pellets of the radioisotope plutonium-238 to produce a steady heat as they decay. NASA's Pluto New Horizons and Cassini Solstice missions are equipped with RTGs (not solar arrays) for all their power needs. The Mars Science Laboratory (MSL), to be launched in November 2011, is powered by RTGs for Mars roving day or night. RTGs are great, but to power a Mars base, fission reactors would be desirable because they deliver more energy. And although solar arrays will undoubtedly have a role to play, fission reactors will be the premier energy source for the immediate future. "The biggest difference between solar and nuclear reactors is that nuclear reactors can produce power in any environment," said Werner. "Fission power technology doesn't rely on sunlight, making it able to produce large, steady amounts of power at night or in harsh environments like those found on the Moon or Mars. A fission power system on the Moon could generate 40 kilowatts or more of electric power, approximately the same amount of energy needed to power eight houses on Earth." "The main point is that nuclear power has the ability to provide a power-rich environment to the astronauts or science packages anywhere in our solar system and that this technology is mature, affordable and safe to use." Of course, to make these "mini-nuclear reactors" a viable option for the first moon and Mars settlements, they'll need to be compact, lightweight and safe. Werner contends that once the technology is validated, we'll have one of the most versatile and affordable power resources to support manned exploration of the solar system.

### Ice Age

**No ice age**

**Berger and Loutre, 2—** Université catholique de Louvain, Institut d'Astronomie et de Géophysique**,** [André. and M.F., “An Exceptionally Long Interglacial Ahead?” *Science* 23 August, Vol. 297. no. 5585, pp. 1287 – 1288]

When paleoclimatologists gathered in 1972 to discuss how and when the present warm period would end (1), a slide into the next glacial seemed imminent. But more recent studies point toward a different future: a long interglacial that may last another **50,000 years**. An interglacial is an uninterrupted warm interval during which global climate reaches at least the preindustrial level of warmth. Based on geological records available in 1972, the last two interglacials (including the Eemian, ~125,000 years ago) were believed to have lasted about 10,000 years. This is about the length of the current warm interval--the Holocene--to date. Assuming a similar duration for all interglacials, the scientists concluded that "it is likely that the present-day warm epoch will terminate relatively soon if man does not intervene" (1, p. 267). Some assumptions made 30 years ago have since been questioned. Past interglacials may have been longer than originally assumed (2). Some, including marine isotope stage 11 (MIS-11, 400,000 years ago), may have been warmer than at present (3). We are also increasingly aware of the intensification of the greenhouse effect by human activities (4). But even without human perturbation, future climate may not develop as in past interglacials (5) because the forcings and mechanisms that produced these earlier warm periods may have been quite different from today's. Most early attempts to predict future climate at the geological time scale (6, 7) prolonged the cooling that started at the peak of the Holocene some 6000 years ago, predicting a cold interval in about 25,000 years and a glaciation in about 55,000 years. These projections were based on statistical rules or simple models that did not include any CO2 forcing. They thus implicitly assumed a value equal to the average of the last glacial-interglacial cycles [~225 parts per million by volume (ppmv) (8)]. But some studies disagreed with these projections. With a simple ice-sheet model, Oerlemans and Van der Veen (9) predicted a long interglacial lasting another 50,000 years, followed by a first glacial maximum in about 65,000 years. Ledley also stated that **an ice age is unlikely to begin in the next 70,000 years** (10), based on the relation between the observed rate of change of ice volume and the summer solstice radiation. Other studies were more oriented toward modeling, including the possible effects of anthropogenic CO2 emissions on the dynamics of the ice-age cycles. For example, according to Saltzman et al. (11) an increase in atmospheric CO2, if maintained over a long period of time, could trigger the climatic system into a stable regime with small ice sheets, if any, in the Northern Hemisphere. Loutre (12) also showed that a CO2 concentration of 710 ppmv, returning to a present-day value within 5000 years, could lead to a collapse of the Greenland Ice Sheet in a few thousand years. On a geological time scale, climate cycles are believed to be driven by changes in insolation (solar radiation received at the top of the atmosphere) as a result of variations in Earth's orbit around the Sun. Over the next 100,000 years, the amplitude of insolation variations will be small (see the figure), much smaller than during the Eemian. For example, at 65ºN in June, insolation will vary by less than 25 Wm-2 over the next 25,000 years, compared with 110 Wm-2 between 125,000 and 115,000 years ago. From the standpoint of insolation, the Eemian can hardly be taken as an analog for the next millennia, as is often assumed. The small amplitude of future insolation variations is **exceptional**. One of the few past analogs (13) occurred at about 400,000 years before the present, overlapping part of MIS-11. Then and now, very low eccentricity values coincided with the minima of the 400,000-year eccentricity cycle. Eccentricity will reach almost zero within the next 25,000 years, damping the variations of precession considerably.

**Tech can stop the Ice Age**

**Hansen, 7** – head of NASA Goddard Institute and professor of Environmental Sciences, Columbia University[James E. Hansen. Head of the NASA Goddard Institute for Space Studies in New York City and adjunct professor in the Department of Earth and Environmental Science at Columbia University. Al Gore’s science advisor. Briefing http://arxiv.org/pdf/0706.3720, “How Can We Avert Dangerous Climate Change?” delivered as a private citizen to the Select Committee on Energy Independence and Global Warming, United States House of Representatives, revised 25 June 2007]

Thus the natural tendency today, absent humans, would be toward the next ice age, albeit the tendency would not be very strong because the eccentricity of the Earth’s orbit is rather small (0.017). However, another ice age will **never occur**, unless humans go extinct. Although orbital changes are the ‘pacemaker’ of the ice ages, the two mechanisms by which the Earth becomes colder in an ice age are reduction of the long-lived GHGs and increase of ice sheet area. But these natural mechanisms are now overwhelmed by human-made emissions, so GHGs are skyrocketing and ice is melting all over the planet. Humans are now in control of global climate, for better or worse. An ice age will never be allowed to occur if humans exist, because it can be **prevented** by even a ‘thimbleful’ of CFCs (chlorofluorocarbons), which are easily produced.

### Nuclear Waste

#### Chernobyl proves there’s no permanent impact on the environment.

Bosselman, ‘7

[Fred, Professor of Law Emeritus, Chicago-Kent College of Law, “THE NEW POWER GENERATION: ENVIRONMENTAL LAW AND ELECTRICITY INNOVATION: COLLOQUIUM ARTICLE: THE ECOLOGICAL ADVANTAGES OF NUCLEAR POWER,” 15 N.Y.U. Envtl. L.J. 1, Lexis]

C. "But What About Chernobyl?" In 1986, an explosion at the Chernobyl nuclear power plant in the Ukraine caused the release of large amounts of radiation into the atmosphere. [247](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n247) Initially, the Soviet government released little information about the explosion and tried to play down its seriousness, but this secrecy caused great nervousness throughout Europe, and fed the public's fears of nuclear power all over the [\*46] world. [248](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n248) Now a comprehensive analysis of the event and its aftermath has been made: In 2005, a consortium of United Nations agencies called the Chernobyl Forum released its analysis of the long-term effects of the Chernobyl explosion. [249](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n249) The U.N. agencies' study found that the explosion caused fewer deaths than had been expected. [250](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n250) Although the Chernobyl reactor was poorly designed and badly operated [251](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n251) and lacked the basic safety protections found outside the Soviet Union, [252](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n252) fewer than seventy deaths so far have been attributed to the explosion, mostly plant employees and firefighters who suffered acute radiation sickness. [253](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n253) The Chernobyl reactor, like many Soviet reactors, was in the open rather than in an American type of pressurizable containment structure, which would have prevented the release of radiation to the environment if a similar accident had occurred. [254](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n254) [\*47] Perhaps the most surprising finding of the U.N. agencies' study was that "the ecosystems around the Chernobyl site are now flourishing.The [Chernobyl exclusion zone] has become a wildlife sanctuary, and it looks like the nature park it has become." [255](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n255) Jeffrey McNeely, the chief scientist of the World Conservation Union, has made similar observations: Chernobyl has now become the world's first radioactive nature reserve... . 200 wolves are now living in the nature reserve, which has also begun to support populations of reindeer, lynx and European bison, species that previously were not found in the region. While the impact on humans was strongly negative, the wildlife is adapting and even thriving on the site of one of the 20th century's worst environmental disasters. [256](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n256) Mary Mycio, the Kiev correspondent for the Los Angeles Times, has written a fascinating book based on her many visits to the exclusion zone and interviews with people in the area. [257](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n257) She notes that the fear that radiation would produce permanent deformities in animal species has not been borne out after twenty years; the population and diversity of animals in even some of the most heavily radiated parts of the exclusion zone is similar to comparable places that are less radioactive. [258](http://www.lexis.com/research/retrieve?_m=4a9f74e9d68358dde5b1da7c76fcc08d&docnum=49&_fmtstr=FULL&_startdoc=1&wchp=dGLbVlz-zSkAB&_md5=b940f69f179ebb657dc94d1baf8c0fbd#n258)

#### Nuclear power is safe -- no meltdowns and no impact.

**Svoboda, ‘10**

[Elizabeth, Popular Mechanics, “Debunking the Top 10 Energy Myths”, 7-7, http://www.popularmechanics.com/science/energy/debunking-myths-about-nuclear-fuel-coal-wind-solar]

Myth No. 1 Nuclear Power Isn't a Safe Solution In a recent national poll, 72 percent of respondents expressed concern about potential accidents at nuclear power plants. Some opinion-makers have encouraged this trepidation: Steven Cohen, executive director of Columbia University's Earth Institute, has called nuclear power "dangerous, complicated and politically controversial." During the first six decades of the nuclear age, however, fewer than 100 people have died as a result of nuclear power plant accidents. And comparing modern nuclear plants to Chernobyl—the Ukrainian reactor that directly caused 56 deaths after a 1986 meltdown—is like comparing World War I fighter planes to the F/A-18. Newer nuclear plants, including the fast reactor now being developed at Idaho National Laboratory (INL), contain multiple auto-shutoff mechanisms that reduce the odds of a meltdown exponentially—even in a worst-case scenario, like an industrial accident or a terrorist attack. And some also have the ability to burn spent fuel rods, a convenient way to reuse nuclear waste instead of burying it for thousands of years. Power sources such as coal and petroleum might seem safer than nuclear, but statistically they're a lot deadlier. Coal mining kills several hundred people annually—mainly from heart damage and black lung disease, but also through devastating accidents like the April mine explosion in West Virginia. The sublethal effects of coal-power generation are also greater. "The amount of radiation put out by a coal plant far exceeds that of a nuclear power plant, even if you use scrubbers," says Gerald E. Marsh, a retired nuclear physicist who worked at Argonne National Laboratory. Particulate pollution from coal plants causes nearly 24,000 people a year to die prematurely from diseases such as lung cancer. Petroleum production also has safety and environmental risks, as demonstrated by the recent oil spill in the Gulf of Mexico. INL nuclear lab's deputy associate director, Kathryn McCarthy, thinks the industry can overcome its stigma. "It's been a long time since Chernobyl and Three Mile Island," McCarthy says, "and people are willing to reconsider the benefits of nuclear energy." Nuclear plants emit only a tiny fraction of the carbon dioxide that coal plants do, and a few hundred nuclear facilities could potentially supply nearly all the energy the United States needs, reducing our dependence on fossil fuels.

### Heg

**Counterbalancing independently causes resistance to u.s. lead**

**Ikenberry et al. 9 \***G. John Ikenberry is the Albert G. Milbank Professor of Politics and International Affairs at Princeton University in the Department of Politics and the Woodrow Wilson School of Public and International Affairs, Michael Mastanduno is the associate professor of government at Dartmouth, William C. Wohlforth is Assistant Professor of International Relations in the Edmund A. Walsh School of Foreign Service at Georgetown University [http://muse.jhu.edu/journals/world\_politics/summary/v061/61.1.ikenberry.html, “Introduction: Unipolarity, State Behavior, and Systemic Consequences, PDF, January 2009]

It has long been an axiom of social science that resources (or capabilities as defined herein) do not translate automatically into power (control over outcomes or over the behavior of other actors).28� Yet most observers regard it as similarly axiomatic that there is some positive relationship between a state’s relative capability to help or harm others and its ability to get them to do what it wants. Even if the relationship is complex, more capabilities relative to others ought to translate generally into more power and influence. By this commonsense logic, a unipole should be expected to have more influence than either of the two great powers in a bipolar system. Articles in this special issue argue that the shift from bipolarity to unipolarity may not be an unambiguous benefit for the unipole’s ability to wield influence. On the contrary, a unipolar state may face the paradoxical situation of being simultaneously more capable and more constrained. Two distinct theoretical logics suggest that a unipole might enjoy less power to shape the international system than a superpower in bipolarity.

First is the logic of balancing, alliance, and opposition, discussed in the contributions by Stephen Walt and Mastanduno. The increased concentration of capabilities in the unipole may elicit increased opposition from other states—in the form of either traditional counterbalancing or subtler soft balancing. Even if such resistance falls short of offering a real counterweight, it may materially hamstring the unipole’s ability to exercise influence. As Walt argues, the structural shift to unipolarity removed one of the major motivations for the middle-ranked great powers to defer to the United States. Mastanduno offers a similar argument: the collapse of a unifying central threat signifies that in this post–cold war era the United States has less control over adjustment struggles with its principal economic partners, because it can no longer leverage their security dependence to dictate international economic outcomes. Globalization reinforces this U.S. predicament by expanding the number of relevant players in the world economy and by offering them alternatives to economic reliance on the United States. While under bipolarity the propensity of other middle powers to defer to the United States was structurally favored, under unipolarity the opposite may obtain. Even if observable balancing behavior reminiscent of bipolarity or multipolarity never occurs, a structurally induced tendency of the middle-ranked great powers to withhold cooperation may sap the unipole’s effective power.

**Unipolarity destroys coordination necessary to stop the next epidemic-abandoning heg solves**

**Weber et al. 7 \***Steven Weber is a Professor of Political Science at UC-Berkeley and Director of the Institute of International Studies, Naazneen Barma, Matthew Kroenig, Ely Ratner, [“How Globalization Went Bad”, January-February 2007, Foreign Policy]

The same is true for global public health. Globalization is turning the world into an enormous petri dish for the incubation of infectious disease. Humans cannot outsmart disease, because it just evolves too quickly. Bacteria can reproduce a new generation in less than 30 minutes, while it takes us decades to come up with a new generation of antibiotics. **Solutions are only possible when and where we get the upper hand**. Poor countries where humans live in close proximity to farm animals are the best place to breed extremely dangerous zoonotic disease. **These are often the same countries, perhaps not entirely coincidentally, that feel threatened by American powe**r. Establishing an early warning system for these diseases—exactly what we lacked in the case of SARS a few years ago and exactly what we lack for avian flu today—will require a significant level of intervention into the very places that don’t want it. That will be true as long as international intervention means American interference. The most likely sources of the next ebola or HIV-like pandemic are the countries that simply won’t let U.S. or other Western agencies in, including the World Health Organization. Yet the threat is too arcane and not immediate enough for the West to force the issue. What’s needed is another great power to take over a piece of the work, a power that has more immediate interests in the countries where diseases incubate and one that is seen as less of a threat. **As long as the United States remains the world’s lone superpower, we’re not likely to get any help.** Even after HIV, SARS, and several years of mounting hysteria about avian flu, the world is still not ready for a viral pandemic in Southeast Asia or sub-Saharan Africa. America can’t change that alone.

**No U.S. lashout**

Parent 11—Assistant Professor of Political Science at the University of Miami—AND—Paul K. MacDonald, Assistant Professor of Political Science at Williams College (Joseph M., Spring 2011, *International Security*, Vol. 35, No. 4, http://www.mitpressjournals.org/doi/pdf/10.1162/ISEC\_a\_00034, RBatra)

With regard to militarized disputes, declining great powers demonstrate more caution and restraint in the use of force: they were involved in an average of 1.7 fewer militarized disputes in the five years following ordinal change compared with other great powers over similar periods.67 Declining great powers also initiated fewer militarized disputes, and their disputes tended to escalate to lower levels of hostility than the baseline category (see figure 2).68 These findings suggest the need for a fundamental revision to the pessimist’s argument regarding the war proneness of declining powers.69 Far from being more likely to lash out aggressively, declining states refrain from initiating and escalating military disputes. Nor do declining great powers appear more vulnerable to external predation than other great powers. This may be because external predators have great difficulty assessing the vulnerability of potential victims, or because retrenchment allows vulnerable powers to effectively recover from decline and still deter potential challengers.

**Smooth transition**

Charles A. **Kupchan 3**, Political Science Quarterly, 00323195, Summer, Vol. 118, Issue 2 “The Rise of Europe, America's Changing Internationalism, and the End of U.S. Primacy” Database: Academic Search Premier

As this new century progresses, unipolarity will give way to a world of multiple centers of power. As this transition proceeds, American grand strategy should focus on making both Europe and East Asia less reliant on U.S. power, while at the same time working with major states in both regions to promote collective management of the global system. The ultimate vision that should guide U.S. grand strategy is the construction of a concert-like directorate of the major powers in North America, Europe, and East Asia. These major powers would together manage developments and regulate relations both within and among their respective regions. They would also coordinate efforts in the battle against terrorism, a struggle that will require patience and steady cooperation among many different nations. Regional centers of power also have the potential to facilitate the gradual incorporation of developing nations into global flows of trade, information, and values. Strong and vibrant regional centers, for reasons of both proximity and culture, often have the strongest incentives to promote prosperity and stability in their immediate peripheries. North America might, therefore, focus on Latin America; Europe on Russia, the Middle East, and Africa; and East Asia on South Asia and Southeast Asia. Mustering the political will and the foresight to pursue this vision will be a formidable task. The United States will need to begin ceding influence and autonomy to regions that have grown all too comfortable with American primacy. Neither American leaders, long accustomed to calling the shots, nor leaders in Europe and East Asia, long accustomed to passing the buck, will find the transition an easy one. But it is far wiser and safer to get ahead of the curve and shape structural change by design than to find unipolarity giving way to a chaotic multipolarity by default. It will take a decade, if not two, for a new international system to evolve. But the decisions taken by the United States early in the twenty-first century will play a critical role in determining whether multipolarity reemerges peacefully or brings with it the competitive jockeying that has so frequently been the precursor to great power war in the past.[\*]

### Resource Wars

**No resource wars—reject their method**

**Barnett 2009** (Thomas, visiting scholar at U Tennessee's Howard Baker Center, The Daily Sentinel, "Threat of great power war recedes" http://www.gjsentinel.com/opin/content/news/opinion/stories/2009/03/21/barnett\_power\_war.html?cxtype=rss&cxsvc=7&cxcat=9)

Why do I so casually dismiss “resource wars” as a strategic planning principle? Remember when Cold Warriors predicted we’d fight the Soviets across the “arc of crisis” for precious resources? Well, back then, both sides lived within miniature versions of today’s global economy. In that bifurcated world economy, zero-sum resource wars were entirely plausible. That bifurcated world no longer exists, as evidenced by the recent financial contagion. In globalization, demand determines power more than supply. Don’t believe me? Imagine a world where there’s no Chinese demand for U.S. debt or no U.S. demand for Chinese exports. Dreaming up future “resource wars” to obviate our military’s necessary adjustment to this era’s security tasks will not render them moot. Indeed, like Somalia’s recent pirate epidemic, they invariably attract the collaborative efforts of other great powers, like China and India, which have no choice but to defend their growing economic networks.

### Sci Dip

**Even if scientific cooperation on a national level ceases, micro-level cooperation will not be affected – that’s where the majority of cooperation occurs anyways**

**Leifert and Wagner, 08** (Harvey, American Geophysical Union Public Information Manager) and Caroline S. Wagner (Researcher at the Center for International Science and Technology Policy @ George Washington U), 1/16/2008. Article by Leifert, Cites Wagner, “Author Caroline Wagner Urges More Inclusive Global Science Cooperation”, American Association for the Advancement of Science, http://www.aaas.org/news/releases/2008/0116stls\_wagner.shtml)

Wagner told the participants that science has evolved considerably since the era of the original Invisible College. She cited the rise of professionalism in the 18th century, the expansion of distinct scientific disciplines in the 19th century, and the era of big, nationalistic science in the 20th century, when some scholars suggested that 80 to 90% of all scientists in human history (up until that time) lived. National science reached its epitome during the Cold War, she said, when the U.S. and Soviet Union built redundant scientific systems on a competitive basis. This national innovation system, which operated through the 1990s, has become dysfunctional from the point of view of the governance of science, Wagner said, because knowledge creation does not honor national borders. In the 21st century, science mostly self-organizes, she emphasized, including and most influentially on the international level. It functions through networks that are generally informal, she said, but they do have structure, norms, and rules that scientists must understand if they are to participate successfully. Although large, government-funded, international science projects are highly visible, they are just the tip of an iceberg in terms of overall international scientific activities, Wagner said; they are not in fact typical of international collaboration. "The bulk of international collaboration in science and technology happens below the waterline," she told the seminar, as scientists organize themselves into teams and conduct research of mutual interest, without regard to national boundaries or government agencies. Wagner identified four kinds of collaborative scientific activities, based on a combination of how projects are initiated and where they take place. In the first category, she described top-down and bottom-up projects: \* Top-down science includes large, directed programs, usually based in an office that one can visit, such as NASA programs, CERN, and polar research. \* Bottom-up science is based on the interests of individual researchers who contact colleagues all over the world to work ad hoc on a self-generated project; their partnerships are often invisible to outsiders. In the second category, there are centralized and distributed projects: \* Centralized projects depend on specialized laboratories or installations, such as the earthquake shake table in Japan, or the Rain Forest Research Institute in Costa Rica. \* Distributed projects take place all around the world by individuals or small teams, such as happened in the Human Genome Project; they do not depend on large facilities. Each area of scientific research combines one aspect of each of the two categories. Policy-makers must understand each of the resulting four types of international collaboration in their efforts to assure that taxpayers, who fund most of the research, get their money's worth and that the knowledge produced "comes home" and is usable at the local level, Wagner said. Science operates on a reward system, in which researchers are seeking to enhance their reputation and gain recognition from their colleagues in their fields, their own countries and worldwide. As a result, Wagner said, in many developing countries where she has worked, government officials complain that local scientists are better connected with colleagues abroad than with the needs of their own society. For example, she was amazed at how much "great science" is being conducted in ethnobotany in Mozambique—and how little it impacts Mozambique. Mozambican scientists are working with colleagues at Stanford University in the U.S., but their research has little impact on local farmers. The scientists are not against improving the lives of their countrymen, Wagner said, but they realize that "the more you gain recognition within science, the more you are able to access the resources of science. And ultimately, scientists the world over are seeking freedom—the freedom to pursue their own interests." Wagner gave the example of the Department of Energy's Center for Nanoscale Materials at its Argonne National Laboratory in Illinois. Argonne had recently hired 15 scientists recruited on a worldwide basis for this cutting edge nanotechnology laboratory. They were seeking the best scientists they could find, regardless of nationality, and 10 of the 15 chosen were from outside the United States, Wagner said. This select group includes Yugang Sun, a 29-year-old Chinese postdoctoral scientist who, in his first year at Argonne, published a seminal paper that has already been cited in the literature over 1,500 times. The Department of Energy offered Sun additional laboratory resources he needed to continue his research, Wagner said, "but these people are free agents; they can go anywhere." Sun is, at 29, "an unbelievable superstar in nanosciences," she said, and is—so far—still at Argonne.