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ALTERED STATES: TECHNOLOGICAL INNOVATION
IN A TIME OF GLOBAL UPHEAVAL

It is disconcerting to reflect on how quickly the post-cold war euphoria has dissipated. As the Soviet empire collapsed in the face of a surge of largely non-violent protest in the late-1980s, the United States emerged as a global hegemon with unprecedented military superiority over any conceivable combination of adversaries. And the unrivaled supremacy of its high tech weaponry appeared to be confirmed by the rout of Iraq, which had been amply supplied with Soviet arms, in the 1991 Gulf War. Concerns posed by the decades-long decline of America's manufacturing sector and rising anxiety in the 1980s that Japan was about to surpass it economically were muted by a proliferation of multinational corporate mergers and the nation's hard-won preeminence in such vital high tech industries as microchips and commercial airliners. New York, as exemplified by the World Trade Center, emerged as the epicenter of a process of globalization that now had the potential to encompass the entire world. America was widely seen as a model of techno-modernity – a perception that was

enhanced in the late-1990s by its success for the first time in decades in balancing the national budget. For much of the rest of the humanity, the demise of the MAD standoff between the hostile superpowers and decades of their armed interventions in the post-colonial world offered the prospect of a prodigious release of resources for development assistance.

Less than two decades later America's hegemonic preponderance is under assault on all sides, and its relationships with the rest of the world have been radically transformed. The appalling destruction of the terrorist attacks on 9/11 brutally revealed the vulnerability of the global colossus. A handful of Muslim militants successfully carried out a low-cost terrorist operation that evaded the nation's massive intelligence network, preempted its military forces, and turned its vaunted civilian technologies into weapons against America itself. The inevitable, but ultimately inconclusive, reprisals against Al-Qaeda and its Taliban hosts in Afghanistan and the ill-founded invasion of Iraq have once again drawn the United States into costly and counterproductive occupations that have bloated the national debt, alienated its allies, and stretched the US military to its limits. The persisting failure to find effective ways to counter the guerrilla tactics deployed by terrorist and sectarian organizations resisting American designs in both countries has both exposed the limits of its high tech military might, created fertile recruiting grounds for militant Islamic causes, and emboldened national leaders across the globe who seek to challenge US hegemony. The massive expenditure of resources, including human lives, on what have devolved into little more than military holding actions in the Middle East have shifted funding away from social programs and much-needed infrastructural improvements in the US itself, and diverted investment and talent

from the civilian sector in ways reminiscent of the Vietnam era, when Japan and other industrial nations took advantage of this situation to significantly increase their share of global markets for consumer products and investment in the US domestic economy. The precipitous plunge of the value of the dollar in relation to other international currencies and the growing possibility that the Euro may replace it as the global standard mirror the dismal levels to which international polls suggest that esteem for the United States has fallen over most of the world. And American claims to be the world's leader in the spread of development and democracy are belied by the fact that its foreign assistance has fallen to all-time lows as a percentage of per capita income. Recently published statistics reveal that the US is 20th or dead last among the twenty industrial nations with American expenditures falling to just .02 percent of national GDP(Times & other cites).

There has been a strong propensity on the part of those who both recognize and seek to address these major manifestations of America's predicament to blame the current Bush administration's neo-conservative foreign policy agenda. And nearly six years into the Bush tenure in the White House, there is little question that the aggressive, unilateralist, fiscally irresponsible, and often impulsive and short-sighted policies that he and his advisors have pursued in foreign affairs have seriously diminished the stability and security of both the United States itself and the international order as a whole. They have dangerously reduced the capacity of the American military to respond effectively to crises overseas or provide disaster relief at home, weakened longstanding ties to our allies, severely reduced America's standing in a highly interdependent global economic order, and greatly exacerbated hostility to the United States over much of the world. Nonetheless, it is important to situate our current dilemmas in the longer term history of

American foreign policy as well as in a broader framework of the global transformations that have significantly altered the position of all nation-states, particularly over the last half-century. Both perspectives are essential for understanding and beginning to cope with the growing disjuncture between recent U. S. approaches to relations with the rest of the world and the global upheavals that will vitally affect America's well-being and capacity to project its power internationally in the coming decades, and very likely the future viability of the planet as a whole.

In the past decade or so, the hotly-contested struggle to find a way out of the Iraq quagmire has shifted attention and resources away from international issues, such as global warming and the persistence of widespread human deprivation, which had begun to emerge as central concerns in the aftermath of the cold war. The accelerating pace of global environmental degradation, social inequality, regional conflict, and international rivalries suggests that it is imperative that these issues become the main focus in drawing up our foreign policy agendas for the foreseeable future, a shift that requires a fundamental reorientation of the formulation and execution of U.S. foreign policy.

The international and planetary upheavals that pose fundamental challenges to the world order as presently constituted are products of the convergence and globalization of successive waves of scientific breakthroughs and technological innovations. For centuries the impact of the scientific and early industrial "revolutions" was confined mainly to Western Europe and North America, though procedures and artifacts of those processes were carried overseas by European explorers, naturalists, artisans and engineers. From the last half of the nineteenth century, particularly with Japan's emergence as an

industrial nation from the 1880s, the scientific-industrial constellation and mindset of the Enlightenment “project” were transferred in widely varying permutations to much of the rest of the globe under the auspices of the Western colonial empires that peaked in power and extent in the decades before the First World War. The decades of global conflict and severe world depression that followed saw the widespread diffusion of industrial weaponry. But tariff barriers, wartime embargos, and autarkic-minded regimes constricted the movement of people, capital and trading goods, and slowed the extension of global communication and transport networks. War and depression also significantly reduced the resources available for colonial or philanthropic development projects in Asia, Africa and Latin America. The bifurcation of the globe by U.S.-Soviet cold war rivalries and the struggles of postcolonial societies to break free from the neo-colonial constraints of the structures and regulations of the post-World War II international order delayed the return to the full and accelerating globalization process that had been a distinguishing feature of world history from the 1890s until 1914. The political and economic maturation of a number of post-colonial states, particularly in the Pacific Rim and South Asia from the 1970s, and the passing of the cold war standoff, opened the way for the full globalization of fossil-fuel driven industrial production, multinational corporate expansion, the greatly increased circulation of capital and labor, and the renewed extension of existing global communication networks. Further scientific discoveries and technological innovations, including most prominently the mass production and distribution of computer technologies and the concomitant increase in speed and sophistication of electronic communications, accelerated and intensified the processes of globalization and integrated its diverse strands to an unprecedented degree.

The convergence in the globalizing processes set in motion by these waves of scientific, technological, political and social change has resulted in transformations that will mark the decades on either side of the beginning of the third millennium C.E. as a time of unprecedented transition in world history arguably more momentous than even the neolithic “revolution” that has undergirded societal development and its environmental repercussions for at least twelve millennia.

Some of transformative processes currently altering human societies and the earth itself have been more apparent, and thus more thoroughly analyzed, than others. But since the end of the cold war the full-fledged revival and intensification of globalization has provided both the substructure in which the multiple strands of radical change converge and has been in and of itself the impetus for a proliferating array of profound changes. Key innovations in trans-global communications and transportation, corporate organization, commercial transactions, resource extraction and the organization of production have contributed in essential ways to such pivotal processes as the erosion of the influence and autonomy of the nation-state, the resurgence of China and India as leading centers of economic production, and environmental degradation on land and sea over much of the world. Though in most cases these fundamental reconfigurations of international political economy and the nature of the earth itself preceded the current phase of globalization, and in some instances even the pre-World War I version driven by Western colonialism, the spatial reach and temporal acceleration of their repercussions has depended heavily on the technological innovations, networks, modes of organization and altered mindsets associated with the globalizing process. The widespread cross-cultural transmission of consumer products -- from the fast foods of America to the

animated films of the Japanese-- and the resulting homogenization of popular culture worldwide that has been such a pronounced feature, particularly in urban areas, of the current phase of globalization has much to do with our more acute awareness of this component of the larger convergence of watershed transitions underway. It also helps to account for the fact that only the extent and nature of world climate change has produced more fierce and fractious debate than the effects of globalization. And it is revealing that the latter has been a good deal more evenly contested and more focused on current conditions than the lopsided rebuttal against those who continue to dispute the high degree of scientific and environmental consensus regarding global change.

There is little question that globalization has enhanced the status and living standards of often substantial segments of the human population in different parts of the globe. But a growing number of critics have shown that the benefits of spread of new technologies and techniques have been unequally distributed to a troubling degree and done little to relieve the poverty and deprivation of substantial majorities in societies across the developing world. Thus far, the main beneficiaries of the globalizing process have been overwhelmingly, multi-national corporations and the better-educated portions of the established or burgeoning middle classes in both the developed and developing nations. Multi-national corporations have put new communications technologies to good use both to facilitate international financial transactions and maximize profits through outsourcing, overseas tax shelters and improved access to national resources over most of the globe. By contrast and to varying degrees in different locales, unemployed or low income social groups from most of the developing nations have been drawn into the global economy as sweat shop laborers or poorly paid workers producing primary

products, such as foodstuffs or minerals for overseas export markets. In mature industrial societies, most notably those in western Europe and North America, as well as in the oil-rich kingdoms of the Persian Gulf, minorities of migrant workers recruited from these same social strata perform most of the hard physical labor and menial domestic chores that earlier migrant groups and all but the poorest of the local citizenry eschew.

Somewhat perversely, however, the wage earning opportunities that sustain the flow of migrant laborers from developing countries provide in the form of remittances often critical sustenance for families that remain behind in sprawling slums and forlorn villages over much of the postcolonial world.

The same communications and transport networks that contribute to the increasing disparity worldwide between the well-to-do and the poor in terms of the wealth and services they enjoy or are denied have also greatly increased opportunities for cross-cultural interaction and expanded awareness of social, political and environmental crises in areas such as Darfur, Myanmar and Chechnya that previously would have received little notice beyond the regions in which they occur. Satellite technologies that have rendered television broadcasts ubiquitous over much of the world have heightened the sense of ethnic or religious connectedness across national boundaries. This shared sense of identity has frequently evoked outrage and mobilized opposition to perceived oppression and especially to violent assaults inflicted by heavy-handed agents of threatened states or foreign military interventions that target members of their imagined transnational communities. These once remote and largely ignored “trouble spots,” whose travails are often symptomatic of deeper sources of dysfunction in the international order, now routinely receive intense scrutiny on the part of much of the world’s media, public

intellectuals, the United Nations, and NGOs and other aid agencies. They have also given great impetus to populist movements, such as those in Venezuela and Bolivia, which pose significant challenges to the global economic order as presently constituted.

The extent to which globalization has eroded the power and cohesion of the nation-state is a matter of considerable contention. But, as the foregoing suggests, some of the major effects of globalization have certainly diminished or at least called into question the viability and appropriateness of the pivotal position nations have held in the international order, in some instances since the early modern era. Worker and refugee migrant flows and minority immigrant populations have become the focus of ongoing debates on which political fortunes of national leaders can hinge throughout western Europe, in North America, and increasingly in the Middle East and Africa. And sudden surges in outmigration, such as that caused by the factional violence and chaos that have become pervasive in Iraq in the wake of the U.S. occupation, can sometimes threaten to spawn crisis conditions in the states and broader regions to which the refugees flood in unchecked and scarcely regulated streams. Controversies relating to migration issues also underscore the growing permeability of national borders, which represents a reversion to the porous nature of state boundaries that has predominated through much of world history. And the transnational movement of human populations, which includes the very sizable illegal traffic in what amounts to bonded or indentured laborers and sexual slavery, has been, as in the past, often closely linked with the smuggling of contraband goods, including drugs and high tech weaponry that pose obvious threats to national societies and the regimes that very often struggle to hold them together. These commodities are often among the most profitable sold on the “black” or alternative

markets that recent research has shown are the locus for a much higher percentage of national commercial transactions over much of the developing world than has long been assumed. These markets are, of course, beyond the purview of the state and deny it substantial revenues, while often enriching criminal or sectarian organizations that are dedicated to weakening the control or subverting fatally the states in which they operate.

Beyond porous borders and illegal trafficking in people and goods, limits of the nation-state in the context of globalization have been made clear in diverse ways. The prodigious growth in travel by ever larger jet airliners, for example, has greatly enhanced the prospects of worldwide epidemics. Communicable diseases, most infamously HIV-AIDs, have reached epidemic levels on several continents within one generation. And transmutations of even more virulent diseases for which there are no known antidotes, such as the Hantha and Ebola viruses, whose spread appears to be linked to the beginnings of the opening of the central African rainforests, or Avian Flu that as its name suggests has been linked to millennia-old cohabitation on the part of humans and domesticated animals, have the potential to trigger global pandemics that would dwarf the post-World War I influenza outbreak that killed tens of millions. No matter how scientifically advanced, no single state can cope with these threats. Nor can any one state, however environmentally-minded it might be, take effective measures to slow and eventually reverse global warming in isolation from the rest of the world. Like migration and the spread of disease, environmental degradation is a trans-global phenomenon that, despite myriad permutations in different locales, can only be reduced to tolerable levels through multi-national cooperation.

Unlike population movements or the spread of epidemics, global warming is the one transformative process in this phase of profound historical change that in the long-term threatens the survival of the human species and the planet itself, at least in the configuration which humanity has come to dominate. But American administrations, even those predating the current Bush regime, have repeatedly refused to even negotiate the terms of international protocols, such as the landmark agreements produced by global summits in Rio de Janeiro and Kyoto. And this stonewalling has persisted despite the urgency conveyed and the level of trans-national consensus achieved at these conclaves, which leave little doubt that environmental degradation and global warming have become the most widely recognized and most troubling of the challenges arising from the radical transformations facing not only humanity but the planet as a whole. As the world's most polluting and promiscuously consuming nation by far, the approaches that American leaders and the American citizenry take to these formidable problems in the coming years will vitally affect the efficacy of the measures taken by the rest of humanity, which in many instances have already moved well beyond responses that Americans can even accept in principle. The future of the United States as a model for world economic and political development will depend heavily on whether its citizenry can, as Kenneth Galbraith observed decades ago, curb its seemingly insatiable appetite for consumption. But the stakes are now considerably higher and America must also refashion itself into a pioneer in devising new technologies and methods for significantly reducing pollution and making more efficient use of available resources.

The profligate waste of resources and human talent during the cold war decades in the enterprise of producing ever more lethal nuclear-ballistic weaponry that traumatized

two to three generations of humanity and ended in the MAD standoff has done much to render obsolescent one of the most cherished and largely unchallenged functions allotted to the state from earliest times – making war. If the outbreak of a major conflict between industrialized nations is not quite yet unthinkable, it is far more improbable than at in any other phase of the long twentieth century. Even the local and regional conflicts that have become endemic in parts of sub-Saharan Africa have devolved into lower level clashes between highly factionalized, poor-organized guerilla forces, whose loyalties are predominantly rooted in ethnicity and religion rather than invested in fragmented polities that struggle to become viable states. It is noteworthy that most successful military operation since the end of the cold war has been the genuinely multi-lateral police action in 1990-1991 to thwart Iraq's aggression against Kuwait. And the contrast between that intervention and the ill-fated U.S. invasion and occupation of Iraq in 2003 accentuates a further shift in organized international conflict that has further reduced the effectiveness of unilateral military responses.

The transmutation of guerrilla warfare from its classic Maoist guise beginning in the late cold war has been vitally influenced by the processes of globalization and the related vulnerability of advanced industrial states that can be sustained only by complex, pervasive and interlinked technological systems. Innovative and miniaturized communications devices – most famously the audio cassettes that Ayatollah Khomeini used to transmit his sermons to those fomenting the revolutionary overthrow of the Shah of Iran; most ubiquitously cell phones -- and ever more sophisticated improvised explosive devices and high-tech, hand-held weaponry, which is readily available in the world arms bazaar, have paradoxically contributed in major ways to both the

fragmentation and internationalization of guerilla resistance to advanced industrial nations with global reach as well as localized regimes armed with conventional weaponry. The harrowing clashes of superbly-trained and armed American forces with disheveled warlord bands in Mogadishu in 1993 dramatically displayed the potency of the reformulation of guerrilla resistance to great power interventions in the developing world. That brief but fierce firefight was emblematic of what was becoming a global shift on the part of violent dissidents away from the organization and tactics of the wave of hierarchically-ordered and cadre-centered peasant guerilla wars of the mid and late twentieth century.

By the late-1990s the mass-based revolutionary movements of the cold war era, which were usually rooted in national and local grievances and mobilizations, had been reconfigured into a proliferating array of quasi-autonomous, clandestine, and locally-embedded cells of what are routinely labeled terrorist operatives. Thus far these cells have with mixed success concentrated on achieving the objectives of the first phase of guerrilla warfare as it was conceived by Mao and his compatriots – recruitment, indoctrination, and terrorist operations to demonstrate the potency of the forces of resistance and the vulnerability of its state-linked adversaries. They have rarely – and never in a sustained way – moved to the second phase of widespread guerrilla assaults and territorial control. And even al-Qaeda, which has staged some of the most devastating operations, appears to have no serious plans to move to the third stage of guerrilla warfare, which is focused on the seizure of political power in an existing state or the creation of an alternative national regime. Its declared intention to restore the Islamic Caliphate and revive the *umma* (or the extended community of Muslim believers)

advances political alternatives that are diametrically opposed to extant nation-states in the Muslim world. None of the protocols or diplomatic procedures observed by states in everyday trans-national exchanges or in times of inter-state crises apply in dealing with terrorist organizations like al-Qaeda. Attacks, such as that on 9/11, come without warning, any possibility for negotiation, and often little or no opportunity to forestall the death and destruction inflicted or kill or capture its perpetrators. Since these operatives often resort to profoundly counterproductive suicidal missions it is doubly difficult to track them to the bases and cells in which they were trained and their operations plotted. Attempts to determine responsibility on the part of states that shelter them also face obstacles not usually encountered in state to state confrontations. As the very nature of the shift from Maoist-style guerrilla warfare to terrorism makes clear, effective security measures and strategies of contravention will necessarily be multi-national.

Another key dimension of the current phase of global transformation that is somewhat familiar, but rarely considered as part of these even larger processes, is the remarkable economic resurgence of China and India, which is restoring them to the central place they occupied for millennia as centers of manufacturing, trade, scientific inquiry and technological innovation. In important ways their trajectories were foreshadowed by Japan's recovery from the devastation of World War II and ascent to second place among industrial nations. But because of their large populations and the sheer scale of their economic expansion, China and India's emergence as industrial giants will alter the existing global order in fundamental ways. In somewhat different ways both nations have already established themselves as serious competitors of established industrial powers, to this point mainly because they have proved reliable, cost-effective

sites for the outsourcing of manufacturing and technical services. China in particular has become in the last decade or so a major competitor of the United States and other mature industrial societies as well as developing nations for such essential resources as oil, thereby unsettling global commodities markets, and potentially currency standards in ways that may well further imperil America's economic leadership.

Whatever the disruptive potential of significant shifts in the global economic order, fallout from the determination of both mega-nations to follow the fossil-fuel driven, large-scale manufacturing, mass consumerist path to affluence and power has much more troubling implications for the rest of the planet. At present, both emerging mega-economies depend heavily on coal, the most polluting of the fossil-fuel options, for the energy to power their factories and light their sprawling conurbations. And the increasingly acquisitive middle classes in each society have resorted on a massive scale to reliance on ozone-destroying chlorofluorocarbons for cooling their homes and workplaces, thereby calling into question one of the central signs of hope offered in Al Gore's assessment of the state of the planet in "An Inconvenient Truth." Because each is seeking to industrialize heavily populated societies that are building on resource bases depleted by millennia of agricultural production, resource extraction and environmental degradation, the sustainability of their current trajectories is doubtful at best. And their potential to create vast swaths of denatured landscape in China and other developing countries has been vividly chronicled in Mark Herzgard's *Earth Odyssey*. Severe water shortages alone may prove insurmountable obstacles to the realization of India and China's present growth strategies and render them untenable for much of the rest of the developing world.

The course of development currently pursued by India and China also encapsulates a sequence of global changes that are in their combined impact equaled only by global warming as indices of the watershed transition in world history that we are presently struggling to comprehend and cope with. In 2006 for the first time in the human experience the number of people residing in urban areas surpassed the total of those still living in the countryside. Driven by local and global forces that have become ever more pronounced since World War II, peasants and other rural dwellers have abandoned their age-old agricultural pursuits. Forced off small family plots by the intrusion of factory farming oriented to market production, unable to compete with wealthy landowners for access to water and petroleum-based fertilizers necessary to grow the genetically-altered crops of the green revolution, and in many instances trapped in lives of poorly-paid drudge laborer or unable to find any employment at all, peasants across the developing world have been migrating en masse to the cities.

This exodus from the countryside has resulted in a sea-change from the sedentary agrarian societies that have supported the vast majority of human populations worldwide for millennia to more and more densely populated cities and towns, whose incessant growth is one of the defining features of the 20th century and particularly pronounced in the decades of transition to the 21st. By the year 2000, for example, there were 19 megacities with a population of ten million or more inhabitants. But for the majority of the migrants the promise of jobs paying more than bare subsistence wages and even modest consumer amenities has soon dissipated. Virtually none of the overcrowded cities of the developing world has had the infrastructure or a large enough manufacturing sectors to adequately accommodate the daunting influx of the rural poor and dispossessed. The vast

slums that make up the larger part of the metropolitan areas of Mexico City, Mumbai, Cairo or Lagos are hard-pressed or simply unable to supply clean water, sewage clearance, and even electricity, much less security or adequate housing, to either their long-term residents or recently-arrived squatter families. Most of these conurbations have been decidedly “parasitic” – that is densely populated areas that drain the surrounding countryside and neighboring regions of resources, including food surpluses and raw materials and in some instances manufactured or processed commodities for urban consumption or export. And most of those left behind in the rural areas live in impoverished conditions in settings where the wealth of small landowning and entrepreneurial minorities renders the destitution of much of the population all the more disturbing and a force that threatens to undermine the economic “miracles” that have transformed the lives of minority social strata in India, China and other rapidly developing nations.

The global challenges posed by the unprecedented convergence of transformations surveyed above make it imperative for the United States to reorient its foreign policies in fundamental ways. Current American interventions in the international arena not only fail to address most of the dilemmas posed by these transformations, they very often increase the disjuncture between the global predicament and American approaches. But because the United States is at the epicenter of such key processes as globalization, environmental change, and the struggle to combat international terrorism, the fullest commitment of its skills and resources is essential if humanity is to successfully navigate the many perils of this epoch of radical transitions. And if history is

any gauge, technological ingenuity and innovation will prove central to America's contributions to transnational efforts to restore stability and enhance sustainability worldwide. Since the decades of early English settlement in North America, technology has been a major determinant of Anglo-American approaches to overseas interventions and dealings with foreign rivals. In the concluding portions of this essay, I will focus on several critical ways in which more appropriate applications of technology at several levels can contribute to essential alterations in American approaches to foreign relations, particularly with societies in the developing world, and solutions to the daunting challenges that all of humanity will need to address in the decades, perhaps centuries, ahead.

Of the many ways in which American foreign policy needs to be fundamentally altered in order to cope with the current global predicament, no shift is more critical than away from the current emphasis on military interventionism in postcolonial nations to a significantly expanded commitment to development assistance. The return at the onset of the 21st century to the resort to massive military occupations and costly wars of attrition, such as those fought in Korea and Vietnam in the cold war era, has stretched the U.S. armed services to their limits and aroused strong hostility, and often active resistance, over much of the world. Substantial majorities in developing societies in particular, but also European nations that have long been closely allied, have come to view America as a force for destruction, excess and chaos in the global arena rather than a source of stability and a model for emerging nations to emulate. The profligate squandering of America's military might in a war of choice against Iraq, which was pursued on the basis of alleged dangers that have all proved to be fabrications, and the

subsequent ineptitude displayed by those who were charged with much-hyped mission to restore the state and society which U.S. assaults and embargoes had destroyed in the first place, has raised grave doubts about America's willingness and capacity to respond constructively to -- or even seriously address -- global upheavals that are gaining momentum.

Much of this is reminiscent of Vietnam, a society the U.S. also devastated with the false promise of bestowing democracy and generating capitalist prosperity. But in contrast to Vietnam, the development side the American occupation of Iraq, and Afghanistan as well, has never been seriously pursued. And in the case of Iraq at least, a nation well on its way to modernity has been reduced to a land of ruins, civil conflict and despair. As was the case with the counterinsurgency effort in Vietnam, the high tech war waged against the Iraqi and Afghani guerrilla insurgencies, while appallingly destructive, has been largely counterproductive. Whatever the intent of those wielding them, the distanced killing and destruction wrought by high tech weapons inevitably means high levels of civilian casualties because the smartest of bombs cannot discriminate. In tandem with more calculated assaults on the technological systems that support the targeted society and the devastation of the physical environment in which it lives, waging counterinsurgency with high tech weaponry generates a steady flow of recruits for the terrorist organizations and militias that sustain guerrilla resistance and civil strife. As a good deal of research has shown, combat with high tech weapons that distance those who deploy them from the suffering and destruction that is very often visited upon innocent bystanders is a good deal easier to routinize than killing that is "up close and personal." If recent history is any gauge, the potential to strike with the speed and impunity provided

by satellite communications and laser-guided missiles makes the resort to war a far more appealing option for leaders impatient with the indecisiveness of prolonged inspections and negotiations. It is also not coincidental that all of the major causes, from the need for access to oil to allegations that Saddam Hussein's regime was on the verge of "having" operational nuclear weapons, invoked in the buildup to the second US-Iraq war were linked to alleged threats to systems dependent societies of the United States and its allies. But the most advanced weaponry has not proved an effective antidote to guerrilla resistance in either its Maoist or more recent terrorist incarnations. And "shock and awe" assaults magnify rather than ameliorate the forces of degradation that are becoming ever more pronounced in this time of precarious transition.

The continuation of America's hyper-aggressive, unilateral approach to challenges emanating from the developing world will not only divert attention and resources from problems that I have argued are far more pressing, it is markedly undermining the economic, technological and moral foundations on which the United States has built its global power and international credibility. The contrast between the level of international backing for the first and second American interventions in Iraq also suggests that unilateralism, as exemplified by the more recent of the two conflicts, has greatly increased the American citizenry's share of the casualties and financial burdens of the wars, occupations, and reconstruction efforts that have been driven in large part by the shock of 9/11. And going it alone in ways that so deliberately flaunt world opinion makes the United States the preferred target for future guerrilla-terrorist operations. All of these ill-considered postures have contributed in major ways to ever higher levels of American over-extension worldwide, which was already apparent in the cold war

decades. And unilateralism and promiscuous interventionism will almost certainly demand increases in the proportion of national resources allocated to the military rather than the civilian sectors of the economy. With the reduction of both capital and ingenuity needed for research and development for consumer production, America may again fall behind its major industrial competitors in such key markets as automobiles, audio-visual equipment, and personal computers as it did in the late-1970s and 1980s, when it struggled to retool after the end of the Indochina wars. These trends are likely to renew fears of economic decline that preoccupied financial pundits and members of Congress in the 1980s, and they could in the long-term undermine the United States' capacity to maintain its global dominance. If these concerns again become central to debates over America's position in the world system, it will be critical to include the costs of popular resistance and guerrilla-terrorist reprisals emanating from the developing world--issues that were largely neglected in the high-profile debates over the causes of the decline and fall of empires in the last decade of the cold war.

Of the many initiatives that could serve to reverse the misguided course that the United States has pursued in its relations with the nations of the developing world over much of both the cold war and post-cold war decades, I would like to conclude by suggesting two levels of international engagement at which America's technological prowess could be very effectively deployed to reduce the deleterious repercussions of the global transformations currently underway and thus repair the disjuncture between the foreign policies it has pursued and the needs and expectations of much of the rest of humanity. The first would bring a renewal of efforts in the post-Vietnam decades of the 1970s and 1980s to devise and introduce in developing countries small-scale technologies

that are designed, and can be readily modified, to be appropriate for local conditions and largely independent of expensive, vulnerable and often unconnected national technological systems. Like the post-Vietnam push (which included several Congressional resolutions) to make projects of this sort a major dimension of United States interventions in the developing world, technology transfers at this level would be explicitly intended to empower local communities and women and yield incremental but readily perceptible improvements in living standards. As Paul O'Neill, the original, and soon banished, Secretary of the Treasury in the first George W. Bush administration discovered on a remarkable journey across Africa with the rock musician and philanthropist Bonno, vital changes, such as the provision of clean water to the billions of people who have no (or impossibly difficult) access to it, would cost a small fraction of what we currently spend on failed military missions in the developing world. And the comparatively brief time frame in which its beneficial effects would be felt could contribute much to the essential task of altering much of the world's perception of the United States as a bullying, self-serving hyperpower with little interest in the plight of the world's laboring classes or poor.

Drawing on the visions of Mohandas Gandhi and E.F. Schumacher, but going far beyond them in its emphasis on high tech devices of appropriate scale, this broadly-based transfer of micro as well as mid-scale technologies would include inexpensive, but sophisticated pumps and non-corrosive piping to tap local water sources currently unavailable. These could be driven by solar or biogas powered generators rather than dependent on fossil-fuel burning and often unreliable national or regional electrical grids. The recruitment and training of local mechanics to maintain these technologies would not

only provide badly needed employment opportunities in the rural and urban sectors of developing societies, they would alleviate deforestation by providing alternate fuel sources for generating electricity. With the introduction of small, efficient stoves, preparing meals, which recent research has shown has shown consumes a surprising of the time and energy of the world's peasants and poor, would become less arduous and open up possibilities for activities beyond those necessary for mere subsistence that could bring significant improvements in living standards. The provision of energy and clean water locally, for example, would release women over much of the developing world from the long and debilitating trips they must make daily to gather firewood or collect potable water for their families. The extension of these grassroots technological inputs to enhance cultivation techniques, improve waste removal or upgrade local irrigation systems would make possible significant improvements in the health and hygiene of the peasantry left behind by the mass migrations to the cities and the slum dwellers struggling to make a living there. It could greatly reduce, for example, the scourge of diarrhea and other intestinal diseases, which are the second leading cause of infant mortality in the developing world. And these gains could be made without reliance on the very expensive big dam projects and state- or corporate-supplied, petroleum-based fertilizers and expensive seeds, which have so often had such disintegrative effects on local communities and environments.

The emphasis on the provision of aid in the form of appropriate technologies rather than cash would reduce opportunities for corrupt bureaucrats and aid advisors to siphon off resources intended for local development projects. The refinement and mass production of a whole range of alternative technologies from solar and wind powered

generators to photovoltaic cells, water purifiers and latrines could also provide significant numbers of jobs to revive the U.S. manufacturing sectors and contribute to the vital task of redirecting our technical skills and machines to productive enterprises rather devising ever more lethal engines of death and destruction. And the increasing sophistication of these devices, and efforts to use them widely domestically as well, should go far to alleviating the concern of leaders in developing countries that their societies are being relegated to the low tech end of the development scale. Rather remarkably, microtechnologies and development assistance that targets grass roots needs and aspirations can address the problems posed by virtually all of the transformative global processes discussed above, from migration and the threat of pandemics to environmental degradation and deprivation.

While microtechnologies and improved living standards at the local level are likely to have the most immediate impact on both U.S. relations with developing societies and ameliorating social inequities globally, technological innovation and transfer on a much greater scale will also be essential. This is precisely the level at which American technical expertise, inventiveness and financial resources have traditionally been pitched in formulating aid projects, but unfortunately there has often been a serious disconnect between the mega-technologies delivered – dams, steel mills and highways -- and the actual needs of recipient societies and the environments into which they were introduced. One of the most pressing questions related to the current phase of unprecedented planetary transition relates to the ways in which global warming has led to rising seas and severe and recurrent flooding in coastal areas over much of the world. Although the devastation wrought by hurricane Katrina on the Gulf Coast of the United States and

recent flooding along the Rhine and in northern England makes it clear that industrial societies are not immune, the recurring inundation of low-lying, often densely populated coastal areas and river valleys of developing societies, such as Bangladesh, India, south China, and the islands of the South Pacific, presages the potentially catastrophic consequences of rising seas and the growing intensity of oceanic storm systems. If, as has already happened on islands in the South Pacific, large swaths of densely populated areas, such as Bangladesh where over half the country is flooded annually, are lost to the sea, another sort of mass migration could be triggered. Tens of millions of people, abandoning submerged lands or those rendered uncultivable due to saturation by salt water, would be forced inland overwhelming the already strained infrastructures and support systems of often equally densely populated areas. Almost inevitably these conditions would lead to rising tensions among neighboring states, whose boundaries would become irrelevant, and social conflict on a staggering scale.

Under these conditions, devising and introducing technologies that have any chance of dealing with one of the most daunting harbingers of the future shocks global warming portends will require massive financial and material resources, all the ingenuity planners and hydraulic engineers can muster, and hydraulic construction projects on perhaps an unparalleled scale. The soaring costs and massive, adjustable, undersea barriers built to prevent the flooding that was slowly obliterating the city of Venice give some sense of the size of the task when conceived on a global scale. Compared to Bangladesh, for example, Venice is a very small outpost on a relatively shallow, calm, and enclosed sea. For any hope of success in containing the now inexorable advance of the sea, it will be essential for the United States to work in tandem with the technicians of

the countries afflicted but above all with experts from other nations, perhaps most notably the Netherlands that has struggled with many of these problems nearly a millennium. In dealing with areas like Bangladesh in particular, the experience of hydraulic engineers centered at universities in Delft and Eindhoven is likely to prove critical, in part because the Low Countries have grappled for centuries with severe flooding that is results from the same combination as Bangladesh of rapidly rising river flows that converge in those coastal flatlands with inundations driven by ocean storms and tidal surges. And this need for collaborative efforts to deal with just one dimension of global warming underscores the necessity for American overseas assistance initiatives to be overwhelmingly multilateral in conception and execution. Unilateral solutions to challenges of this magnitude that are so profoundly global are no longer feasible. In these and myriad other ways the globalization of development and degradation are draining the power and influence from nation-states.

Whatever the overall strategies ultimately adopted and the site-specific project pursued, once one conceives them in the context of the time of global transformations underway, the need for fundamental reorientations of American foreign policy is apparent. It is also clear that these issues and options are far too vital to entrust solely to foreign policymakers, who are so severely limited by political constraints and narrow definitions of national interest. And it also suggests that writing about and debating the history of U.S. foreign relations needs to move beyond the America-centric (or at best bilateral) focus and the elite exchanges and policy fixations that have so dominated the subfield from its inception. In our age of intense globalization America's national

interests and interventions in the rest of the world need to take much more seriously the perspectives and responses of not only our longstanding allies but leaders and societies that seek to find alternative ways of coping with the current global predicament. As I have argued, engineers and technical experts have vital and very direct roles to play in this process of reorientation, but so too have historians of technology and other social scientists who study the dynamics of invention, innovation, systems building and technology transfers. The latter's ability to interrogate and draw cautionary guidelines from past interventions, both military and developmental, makes it possible to gain broader perspectives and in depth understandings on which to base the multitude of difficult choices that will need to be made in the coming decades in dealing with the converging transformations that are fundamentally altering the human condition and the planet on which it depends.