

Politics is Everything.

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The very last sentence in the book, Politics and Space: Image making by NASA, by Mark Byrnes, p. 180 states: "Even though NASA's mission points it towards the heavens, the agency cannot lose sight of politics on Earth, for that is where its fate is determined."

Exploring Space, by William Burrows, is a kind of history of space exploration primarily focusing on the United States. Near the end (p. 350) of his lengthy account, Burrows says: "In the most honest of all possible worlds there would be two monuments, standing side by side, at the Kennedy Space Center. One would be dedicated to the Soviet space program; the other to the news media in the United States. A common tablet might read: 'without whose presence this establishment might not exist.'"

I have been asked by Ram Jakhu to talk on the theme, "Politics is Everything."

Since I am a political scientist, how could I possibly think otherwise?

There truly is no escape from politics. Every aspect of life is political--just as every aspect of life is also economics, biology, culture, chemistry, physics...well, you get the point: life is everything, and everything is a part of all life.

There is politics in this room today, expressed by who gets to speak and who must remain silent; who gets to stand and deliver, and who must silently sit and receive; whether their are desks bolted to the floor, facing forward toward a lecturer hiding behind a podium on a raised stage, or whether their are chairs which can be arranged in a circle with no discernible beginning or end.

There is clearly politics in all aspects of education.

Politics is found in everything about the family, as well. Does "father know best?" Should children perhaps "be seen, but not heard?" Is mother's proper place in the kitchen? Or is everything decided by majority rule with each family member getting one vote?

Politics is NOT restricted to what happens in government or the state. That is only a place where politics is highly concentrated and also much more studied and remarked on.

But there is every bit as much politics in a classroom, or a living room (and certainly in a bed room), or in a church, or in a scientific laboratory as there is in any government or political party.

So it is a big mistake--one of the biggest mistakes which people make--to ignore the political dimension of everyday life, and the political dimensions of all aspects of life.

In particular, it is important for scholars, scientists and technicians to realize that what makes sense to them as scholars, scientists and technicians may not make any sense at all, or, if it does make sense, may not be of any positive value at all, to people who are not scholars, scientists or technicians, but who are, instead, politicians, or ordinary taxpaying citizens.

Politics and NASA.

So I will begin my talk today with some illustrations of how politics, in both the narrow and the broad sense, has influenced the course of space science, research, and exploration so far. For the most part, I will be quoting directly from various sources which document the primacy of politics in the American space program.

The book by Mark Byrnes from which I quoted at the outset of my talk, titled Politics and Space, is subtitled, Image making by NASA. Towards the end of the book, Byrnes writes, "This book argues that NASA has changed the images it projects in response to external political shifts, and that the agency's attempts to match its image to its prevailing political environment has been the fundamental determinant of the kind of image it pursues." (176)

Another book about NASA, Howard McCurdy's Inside NASA primarily analyzes NASA from the point of view of the life cycle through which all organizations go--from early inspirational youth, through cautious maturity, into fumbling old age. In NASA's case, McCurdy also believes that the progress of NASA through its lifecycle marked a shift from the primacy of professional judgment to the primary of politics within the organization.

"NASA's accomplishments during [the early years of the 1960s] became synonymous with outstanding performance and high reliability," McCurdy writes. "It became fashionable to judge other government programs by space agency standards." (2) But during the late 1970s and 1980s, NASA experienced a series of management and technical failures which tarnished its public image. "It came as quite a shock to NASA professionals," writes McCurdy, "when, as the space race came to an end, political considerations began to supersede their professional judgments." (85)

In addition to sources which document the changing importance of the shift from "expertise" to "politics" in decisionmaking in NASA in general, there is a significant literature which focuses on particular projects and the role which politics plays in them.

For the next several minutes, I will mention six different space projects which illustrate the place of politics in each of them. They are the US Space Shuttle, the Space Station, the International Solar Polar Mission, the Space Telescope, the Space Exploration Initiative., and the Strategic Defense Initiative. You will notice I am not even mentioning the most famous example of the primacy of politics--the Cold War rivalry between the USSR and the US leading to

Kennedy's decision to go to the Moon. For that, I must simply defer and refer you to John Logsdon and his book, The decision to go to the Moon: Project Apollo and the national interest. Cambridge: MIT Press, 1970).

The space shuttle.

Jeffrey Banks has written that the "history of the space shuttle program illuminates the interaction and influence of economic and political variables on government-sponsored R&D programs. The political environment surrounding the initial decisions to proceed with the shuttle program was such that further manned adventures into space would not have the widespread support of previous programs such as Apollo. Hence NASA was required to justify the need for the shuttle program on economic grounds; in addition, this justification could not rely on the shuttle's prospective role in future manned space endeavors. Political considerations therefore framed the decision to proceed with the shuttle in a straight stand-alone, cost-benefit analysis. Such an analysis revealed that the best NASA could hope for was not the fully reusable spacecraft they sought, but rather a partially reusable system. Even this conclusion required a rosy scenario from a technological standpoint (for example, sixty flights a year at a \$10 million cost per flight).

Once the shuttle program was underway and the contractors were selected, the program picked up political steam as the relevant constituencies became enfranchised and the contract benefits of the program began to accrue. These political considerations then were sufficient to keep the shuttle program going when, in the late 1970s, the economic rationale initially offered for the shuttle was in jeopardy." " At the time, however, the core political constituency, which by then also included those with a stake in maintaining NASA's 'prestige' as an organization, was sufficiently influential to overcome any arguments about the economic shortcomings of the program. In other words, even if NASA had wished to scale back the program (and there is no evidence that it did), political considerations alone generated constraints on the ability of decisionmakers to implement the economically correct course of actions. " (213f)

"What should not be too surprising, given NASA's attempts in the early 1970s to proceed with a number of large-scale projects, is that one of the principal justifications for the shuttle's current existence is its role in developing the next major NASA project, namely the Earth-(214) orbiting space station. The space station is predicated on the existence of the shuttle, because (it is argued) the only means of developing it is with a shuttle-based technology. Thus, as the economic shortcomings of the shuttle became apparent, the justification for the program shifted from the efficacy of the shuttle in launching satellites towards its role in the larger space development program envisioned by NASA." (214f)

The space station.

One of the longest-lived projects--still ongoing and unresolved--is the space station. Howard McCurdy has also written a book about that, titled, The Space Station Decision. Here is a lengthy quotation from that book:

"In 1969, the year in which Americans first landed on the moon, NASA officials sought approval for a space station by presenting it as one of the key steps in a twenty-year exploration plan." "The strategy failed. Neither the space station nor the long-term plan was approved. Sensing the limits imposed by the lack of consensus, NASA officials decided to pursue the steps in the long term plan incrementally, one at a time." (viii)

"Incremental policies permit politicians to move forward or backward from the status quo as conditions change. Incrementalism promotes flexibility, a much prized commodity in the world of politics. Gains in flexibility, however, are paid for through losses in commitment. Politicians tinker with incremental policies, even after incremental policies are approved." (ix)

In contrast with incremental politics, "in making the decision to send Americans to the moon, President Kennedy brought about what is generally characterized as a 'comprehensive' decision. He established an overriding purpose--a space spectacular at which the United States could beat the Soviet Union--and imposed that purpose upon his White House staff. In making the shuttle decision, President Richard Nixon did not impose a similar objective on warring factions within his administration. Lacking such a purpose, members of Nixon's White House staff found themselves hammering out short-term compromises between parties with unresolved points of view. President Ronald Reagan created a similar process in making the space station decision. He allowed the White House staff to debate the merits of a space station without establishing the purpose for which it would be built, stepping in to decide the fate of the orbital facility only when staffers could not agree." (ix)

"Leaders of [Reagan's] Office of Management and Budget thought [the space station to be] a foolish idea, an extravagant waste of funds for a government with a deficit so large that public officials had to borrow more than 20 cents out of every dollar they spent [Remember this is 1980 we are talking about!]. A majority of the members of the President's National Security Council opposed the idea, convinced that a space station would produce no military benefits while drawing funds away from more important priorities..." "The President's science adviser counseled against the initiative, portraying the space station as an outdated idea made unnecessary by advances in technology and robotics. With the exception of the director of the Office of Management and Budget, David Stockman, all of these people favored a more ambitious space program. They did not, however, share the belief that the space station was the next logical step within it. There was, in 1982, when Jim Beggs made his space station speech, no political consensus about the future direction the American space program should take. Nor had there been any since 1969, after Americans first landed on the moon." (2)

"By the mid-1980s, most big-spending federal agencies had escaped the insecurity of incrementalism as their advocates locked long-term commitments into law, creating legal obligations that required Congress to appropriate their funds. Agency advocates did this through entitlements (legal obligations that required the payment of benefits to any eligible person), earmarked revenues (taxes committed to a specific purpose), and credit obligations (the creation of large financial obligations in the future without big cash outlays in the present). NASA's projects, on the other hand, languished among a shrinking number of 'discretionary programs' whose budgets could be adjusted by the President and Congress each year. By the

mid-1980s, less than 20 percent of all federal appropriations were decided through the 'old politics' of discretionary budgeting. Though they sought to remain on the leading edge of science and technology, NASA officials found themselves in a backwater of budgetary review. NASA officials also discovered, as they moved funding proposals for the space station through the budget review process, that many participants no longer observed the rules that guided the old incrementalism. The old rule of reciprocity, in which different parties tended not to interfere in each other's budget requests, gave way to a new level of conflict over scarce resources. The space station was the first major program in which the Department of Defense worked to stop a NASA initiative." (225)

"NASA officials needed a very large clientele." "A large clientele, however would not fit on a single space station. The international partners did not want to be on a space station with the U. S. military. Space scientists did not want to share a space station with astronauts repairing satellites. People studying the Earth wanted to be in polar orbit; people studying the heavens preferred an orbit near the equator. Space explorers wanted a station with artificial gravity; space manufacturers wanted one with no noticeable gravity at all." (227)

"A long-range exploration objective would have resolved those disagreements.... Without any such an objective, NASA officials had to unify their supporters in a more creative way. For that reason alone, they had to adopt an incremental rather than a comprehensive approach...." (228)

International space projects.

So far, we have focused on what might be called "domestic politics"--the politics inside one country, or even one organization.

But the space station was--and is--an international project, and so there are very interesting international political activities going on as well.

The example of both the international space station and the ill-fated International Solar Polar Mission figure prominently in Roger Bonnet and Vittorio Manno's book on ESA, titled International Cooperation in Space. The authors describe the elaborate and lengthy discussions which went on within the international membership of ESA, and between ESA and NASA concerning both the solar polar mission and the space station, and the utter shock and anger which occurred when, in 1980, the United States unilaterally canceled their agreements:

Bonnet and Manno wrote, "the cause for the ultimate and unilateral cancellation of the US spacecraft resided in fundamental changes brought about in the budget process by the election in November 1980 of Ronald Reagan as President, and, less visible to world eyes but very important for the NASA budget, by the appointment of David Stockman as Director of the Office of Management and Budget. Stockman introduced a top-down approach which effectively led the White House to control budget initiatives, a power which had previously rested with the various agencies and the committees of Congress." (102)

Bonnet and Manno continue: "History has in fact shown that, whenever it is faced with internal budget difficulties, the US administration does not consider the MOU (Memorandum of Understanding) to be of any relevance to its internal deliberations. Because of the annual budget approval procedure in the US, there can be no guarantee that a project may not be canceled at any time." (106)

Bonnet and Manno point out that "even the name of the station, Freedom, was decided unilaterally, by the President himself, without consulting the international partners, whose only 'freedom' was to accept the decision of the leader." (111)

The two authors conclude by observing that "the reader may wonder why, as scientists, we are so concerned about the fate of the station. Why are we displeased that this big swallower of space money might disappear from the programming of the major agencies? The reason is simple. We are not arguing here for or against the station on the basis of scientific arguments, but we are concerned that this program--the biggest cooperative international space venture so far--may end in a fiasco which may endanger future international ventures. We know very well that, in today's context, without international cooperation space science missions will be much more difficult to conduct, since most of them cannot be envisaged in isolation, even less in competition." (117f)

Joan Johnson-Freese also discusses America's decision to cancel the international polar mission:

"The incredulity regarding NASA's willingness to cancel an international program reflected ESA's stunned realization of a fundamental difference in attitude between the two organizations concerning the sanctity of international agreements. Within ESA, in a similar budget situation national space projects would have given way to ESA projects; ESA had assumed that the same was true for NASA--that international projects would be given precedence over national projects. " (Changing patterns of international cooperation in space, p. 9)

National politics and economics still plague the international space station, and can be expected to do so even more as nation-states continue to lose control because of the greater pressures of global finance and economics, and of transnational corporations generally. The recent problems which Italy has had in meeting its commitments to the international space station, and conflicts between Germany and Italy, are probably only pale harbingers of the ghost of political futures yet to come, I believe.

When nations fail.

And then there are problems, already experienced in the former Soviet Union, of what happens when a country falls apart--especially if the headquarters of the nation's space agency are in the part of the country doing the splitting.

Consider this excerpt from an article in a recent Space News:

"The prospect of Quebec separating from Canada raises a number of questions concerning the future of the CSA [Canadian Space Agency], which is located in Montreal.

Would the agency be moved out of a sovereign Quebec? Would employees from Quebec be Canadian citizens? Would they move with the agency? Would CSA contracts with Quebec companies be terminated? Until the issue is settled either way, will the CSA programs be used to influence the political situation? And how is all this affecting other Canadian contractors?

The Canadian government has refused to address these questions publicly, fearing that any public statement could be exploited by the separatists. The official position is that until Quebec actually separates, it is business as usual for the space agency, and that no contingency plans have been made." " However, one government official privately conceded that contingency plans had been developed, but he refused to discuss any details."

"The CSA official said...that the agency could be used as a bargaining card as it had been in the 1980 referendum.

At that point the Canadian government was planning to establish the space agency, and promised that it would be located in Quebec in return for support in defeating the separatists. They won only 40 percent of the vote in 1980. The CSA was duly established in Montreal in 1987, and most existing components of the Canadian space program were moved there, losing many veterans in the process who refused to move to Quebec.

Since then, the province has exercised such significant influence over the development of the CSA that Stephen Strauss, science columnist for the Toronto Globe & Mail newspaper, wrote a column in 1993 describing it as the "Quebec Space Agency."

[Bill Knapp, "Quebec Struggle Continues, Casts Shadow on CSA" Space News, November 6-12, 1995]

The space telescope.

Historically speaking, the problem of obtaining governmental money for science projects is a relatively new one, as Robert Smith indicates in his book The Space Telescope which traces the road to the Hubble space telescope and beyond.

"Before World War II," Smith writes, "most funding for US science came from industry, private foundations, and the states. During the war, that pattern changed radically, and the federal government became the chief sponsor of the scientific enterprise, a shift that was swiftly (383) institutionalized in the years following 1945. That shift brought with it not only more money but also new obligations and a new political framework within which scientists had to work." (383f)

"In the first few years after the war, many astronomers had been chary of accepting government money for fear that the source might soon dry up. By the 1960s, this fear had disappeared. And even in the early 1960s, it was clear to its advocates that the price of the [space] telescope put it well beyond the reach of private or industrial patronage. It was therefore agreed by everyone that if it was to be built at all, it would, like most of the major science facilities since the war, have to be built with the support of the federal government."

"Hence, because of the need to win government patronage, winning approval for the telescope was an intricate process." (384)

The Space Exploration Initiative.

The hearts of many space enthusiasts in America repeatedly leapt to the heavens during the Go-Go, spendthrift days of the 1980s. It was a time when, by robbing massively from the future, everyone was promised everything they wanted in the present. Guns were as plentiful and cheap as butter, and civilian and military space programs alike were promised everything they wanted, and more.

For better or worse, neither received anything as much as they had been promised though it currently appears that the military side will, as usual, get more than the civilian.

Let's start by considering the civilian side--a series of plans and aborted projects during the late 1980s and early 1990s that had as their goal manned space missions of one sort or another, and are often referred to jointly as the Space Exploration Initiative (SEI).

Dwayne Day has presented a useful overview in a recent issue of Spaceflight (March 1995, pp 79-83). His article is inauspiciously titled, "Doomed to Fail."

The origins of most American's ideas for manned space flight are often traced to a series of articles which Wernher von Braun wrote for the then-very popular magazine, Colliers, in the early 1950s [See Randy Liebermann, "The Collier's and Disney Series," in Ordway and Liebermann, eds., Blueprint for Space]. These ideas were essentially, if more elegantly, re-presented in Nixon's Space Task Group in 1969. But neither Nixon nor Carter were themselves particularly interested in manned spaceflight during that period of America's psychological decline following the end of the Vietnam War and significant economic restructuring precipitated by the two Oil Crises.

The 1980s, however, saw a return to space enthusiasm best exemplified by the people who envisioned and created ISU itself. It is also exhibited in the various "Case for Mars" conferences lead by "The Mars Underground" group.

The visionary US Senator from Hawaii, Spark Matsunaga, himself furthered the case for Mars through his book, The Mars Project. Journeys beyond the Cold War in which he envisioned a joint Soviet-US mission to Mars as a way of ending the Cold War through their cooperation on a long-range project of mutual interest and benefit. Senator Matsunaga (who also is primarily responsible for the creation of the United States Institute for Peace) was also the leading American political figure in back of the International Space Year activities of 1992.

A series of space commissions, task forces and committees followed each other in rapid succession throughout the 1980s, the first being the National Commission on Space headed by former NASA administrator, Thomas Paine. This was then followed by a "response" written largely by former astronaut Sally Ride. The newly-created Office of Exploration in NASA produced several more expansive reports, and "In February 1988, the Reagan administration

issued a national space policy document that called for the 'expansion of human presence beyond Earth orbit,' tacitly endorsing human missions to the Moon and Mars." (80)

When Bush became President following Reagan, the Space Council, which had languished in the Executive Office since the time NASA itself was created, was refurbished with Vice President Quayle as its chair. This was interpreted as meaning that President Bush himself was prepared to support a major presence in space, and indeed, on July 20, 1989, the 20th Anniversary of the Apollo Moon Landing, and with great fanfare, Bush announced his plans for humans to return to the Moon "to stay" and then to push on to Mars.

On the assumption that the President meant what he said, and was prepared to back it up with money, the space establishment burst into action, if not over-action. Even though the NASA administrator, Richard Truly, "was not terribly enthusiastic about going to the Moon and was primarily concerned with flying shuttles and building the space station," (81) a "90-Day Study" was prepared which outlined a series of projects which had a total price tag of \$300-\$400 billion dollars over a period of 30 years. "This meant doubling NASA's budget immediately, from about \$11 billion a year to \$22 billion a year, and maintaining it for the next three decades. They were essentially Apollo spending levels." (81).

Day says that "as a policy document, it proved to be a total disaster." (81) "What NASA did was to simply wrap up every project on its wish list and put it in the report." "One of the requirements for the lunar base was a crane for lifting cargo off the landers and depositing it on carts to be wheeled to the base. The accountants went to work and came back with a price tag for the crane--ten billion dollars...for a crane.

"One of the more astounding projections in the report called for 14 shuttle flights a year in support of the program. This would have exceeded the maximum flight record of nine shuttle flights in a year and may have required the construction of an additional large launch pad at Cape Canaveral." (82)

There was no way this document would fly and so yet another blue-ribbon panel was convened to review and make recommendations about the Study. The new report pushed the discussion to the opposite side of the space continuum. "It would have bypassed NASA completely and relied on ignoring traditional government procurement procedures. Wood's estimate was that such a programme, including the Moon and Mars, could be done for about \$10 billion in ten years--the cost of NASA's lunar crane." (82)

"Almost immediately everyone started taking about a \$500 billion boondoggle. The high numbers themselves may have scared Bush away and led him to think that the programme was a liability." (82) So a "Synthesis Group" was convened and issued yet another report in the summer of 1991. "In essence, what the Synthesis Group said was that there were no cheap routes either to the Moon or Mars. There were no truly groundbreaking ideas floating around which would make SEI possible." (83) SEI was thus essentially dead.

Day concludes his article on SEI with this paragraph:

"At the fourth Case for Mars conference in 1990, Air Force Colonel Pete Worden...managed to sum up what by that time had already gone wrong. Worden said, 'Our final piece of political advice from those of us involved in SDI: For everyone's sake, make sure you know exactly what and when you want to build before you have the president give a speech about it.'" (83)

Star Wars.

Ah yes. SDI. That was the other would-be space extravaganza of the Go-Go years. But it is everything that SEI was not. It is the most interesting example so far of the primacy of politics over science and technology: the Star Wars project of Ronald Reagan's dreams.

In their book, A Shield in Space?, Sanford Lakoff and Herbert York put it this way:

"Our general findings can be stated simply: SDI is a classic example of misplaced faith in the promise of technological salvation. The project was initiated on the basis of political rather than scientific judgment in a deliberate effort to bypass the ordinary process by which innovations in military technology are proposed, reviewed, and adopted when they are considered feasible and appropriate. A popular but technically uninformed president made the decision without consulting his own cabinet or the two agencies of government with primary responsibilities for military and foreign policy, the Defense and State departments, in the hope of promoting advanced technologies that would remove the need to rely indefinitely on nuclear deterrence." (vii)

"SDI, the evidence suggests, was far from inevitable. Unlike virtually all other comparable weapons-innovation projects since World War II, this one reflected nothing so much as the mind-set of a single person--the president who enunciated it on the recommendation of a handful of like-minded political supporters. The decision was adopted without benefit of prior review by specialists in defense technology and strategy. It was not considered by the president's formal cabinet, by leaders of Congress, or by U. S. allies. The policy attracted initial support because Reagan succeeded in making a direct appeal to U. S. public opinion." (3)

"Although the decision to establish SDI did not come altogether out of the blue, the events that led to it were almost exclusively political and personal." Lakoff and York report that "in 1940, as a Hollywood actor, Reagan starred in a film entitled, 'Murder in the Air,' about a secret miracle weapon, an 'inertia projector,' that could bring down aircraft by destroying their electrical systems. In the movie, after the weapon's promoters announce that it 'will make America invincible in war and therefore be the greatest force for peace ever invented,' Communist spies attempt to steal the plans, but a U. S. secret agent pursues them and uses the device to destroy their airplane in midflight. The role of the secret agent was played by Reagan." (7)

"The decision did not reflect the evolution of military technology or the judgment of what was possible or required by the 'defense establishment'--the civilians responsible for advanced research, the chiefs of the military services, the leaders of the major weapons laboratories, and the research

directors and other officers of the major defense contractors. It was arrived at largely by bypassing this establishment, in the belief that specialists in positions of authority would resist such a radical departure from conventional thinking. In this respect, the decision smacked of the same mix of populism and conservatism that helped elect Ronald Reagan." (320)

Lakoff and York then raise the interesting question of what they call "the myth of technological determinism."

"These political factors point to a larger consideration," they write. "It is sometimes supposed, even if rarely put forward so boldly, that in matters of defense policy, technological momentum is an irresistible force. A 'technological determinism' is thought to hold sway, according to which whatever can be done will be done.

"It is too simple--in the case of SDI certainly--because, as we have seen the decision to embark on the project was not determined by technological advances. It was very much a political decision made with factors other than the advances themselves exclusively in mind. Had the decision been left up to the technologists, it would certainly not have been taken," Lakoff and York conclude.(350)

Technological determinism vs politics.

The issue of which is primary--scientific-technological determinism or political decisionmaking--is found prominently in the literature of science policy, and space policy generally.

For example, Walter McDougall, in his masterful book, ...the Heavens and the Earth, seems to make a strong case for technological determinism:

"How did it all come about? Are our societies locked into irreversible technological change to the point where human institutions themselves have become 'part of the machine?' Or do people, acting through politics, retain their ability to choose which future to invent, or whether to try? If so, can we and our leaders be trusted with such responsibility? What is the relationship between man and his machines?" (11)

McDougall continues, "'We came in peace for all mankind' reads the plaque Armstrong and Aldrin left on the moon--the...irony of Apollo was that this grandest of all space missions was not even central in shaping the role of space technology in international politics. The moon was not what space was all about. It was about science, sometimes spectacular science, but mostly about spy satellites, and comsats, and other orbital systems for military and commercial advantage." (413)

McDougall then goes on to show how similar considerations drove other countries as well.

"Why a French space program?" McDougall asks. "Surely if prestige was a primary motive of Gaullist policy, then space beckoned irresistibly. But the fundamental reason for a French space program was the centrality of space technology in the drive for permanent technological revolution." (424)

The British, too, awoke to the cockcrow of Sputnik, insists McDougall, as did ESA itself (426-428)

Faith in scientific and technological progress.

"Technocratic methods first appeared in American government in the 19th century and became widespread in the military emergency during and after World War II. But technocratic *ideology* captured the country only after Sputnik, when a new willingness to view state management as a social good and not a necessary evil turned a quantitative change into a qualitative one," McDougall concludes. (436)

So, is it the case that politics is in fact NOT everything--or even of any special importance? In addition to specific decisions or nondecisions made by specific political actors, which have greatly affected the past, present, and future of space exploration, there is also something which can be called the "zeitgeist"--the spirit of the times--fads, beliefs, fears, widely held perceptions which seem to wash over all people, somewhat like a disease, and then subside, leaving everyone, as it were, immune to the idea for a while.

I believe the evidence clearly shows that much which characterized the space activities of countries in the 20th Century was primarily a reflection of the "zeitgeist" of the time. This was characterized by a limitless faith in "progress," which itself was the result of continuous and necessary economic growth which advances in science and technology would inevitably bring about.

Since it was Western Civilization that invented modern science and thus understood the true nature of progress, and how to achieve continuous economic growth, this also meant that Western culture, ideas, institutions, and people should rightly lead and dominate, in Heaven, as well as on Earth.

One particularly unusual aspect of this Western structure of global cultural dominance was the invention of "the nation-state" with the further belief that war (and organized violence generally) was a monopoly of the state and, most importantly, a legitimate instrument of policy, a necessary and proper way to advance state ("national") interests internally, against "enemies of the state" and externally, against other states.

And, with the completion of the "science and technology revolution" of the late 19th and early 20th centuries, the purpose of education, of research, and of science policy was to develop the personnel and materiel which would enable each state to compete effectively internally and externally, and indeed to hope to achieve global dominance in the international system.

The science-technology pork barrel.

There are many sources which document the transformation of the United States, the countries of Europe, and especially Japan, from locally-focused and comparatively weak feudal communities to nation-states capable of, and eager to, wage war in pursuit of national interests on a global--and, when it became necessary, interplanetary--level.

In their book appropriately titled, The Technology Pork Barrel, Linda Cohen and Roger Noll document some of the highlights of this worldshaking transformation:

"In 1836, Congress appropriated \$30,000 to subsidize Samuel Morse's first telegraph, an experimental line from Washington, DC to Baltimore. The land-grant colleges were created after the Civil War in part to advance technology in resource-based industries, and in the 1890s, the Department of Agriculture supported research that produced the first high-yield hybrid sees.

"These examples illustrate the historical persuasiveness of federal policies to develop new technology. They also illustrate the heterogeneity of the purpose, success, and means of R&D programs.

"Programs differ in the extent to which they blend three conceptually distinct purposes: contributing to the general scientific and technological base from which new technologies will be developed; advancing technology in the production and performance of goods and services for which government is the dominant customer (for example, national defense); and developing advanced technologies for producing goods and services primarily for the private sector." "The success of programs in all three categories has been mixed." (2)

By the time NASA came along and the US embarked on a full-fledged space program, in competition with its Cold War rival, the Evil Empire of the Soviet Union, the Military Industrial Complex, about which President (and former General and Commander in Chief) Dwight D. Eisenhower warned during his famous farewell speech when he left government office and retired to a quiet civilian life--the Military Industrial Complex had assumed effective total control of the American political-economy, and of American educational and research institutions (including most importantly most private and all public universities).

As McDougall asks:

"But how could the government police the billions of dollars that flowed to private firms? Expanding the arsenal system seemed to border on socialism. But the alternative 'contract state,' according to critics, prevented socialism only by corrupting capitalism." (439)

"The picture emerging from such critiques was of a bloated R & D complex propagating a technocratic ideology to milk agencies incapable of judging even their performance, much less the social value of their products." (440)

"The explosion of state-funded R & D was not confined to aerospace. A great society needed great technology, which needed great science." "Basic science, however, was above all a university matter. In 1960 Seaborg had called for more and more scientific spending with no end in sight." (440)

"Social scientists resented the prizes heaped on their colleagues and questioned a society that valued technical more than 'human-oriented' research...." (441)

"Sociologist Kingsley Davis testified that 'the first nation which breaks through the barrier and manages to put social science on a footing at least as sound as that of the natural sciences, will be way ahead of every other nation in the world. I would like to see the US be that nation....' (441)

"French futurist Bertrand de Jouvenel glimpsed three ages of history: those ruled by priests, by lawyers, and by scientists. The politics of the first age derived from sacred scripture and a presumption of popular ignorance; the politics of the second [derived] from human scripture and the presumption that We The People could judge matters of common concern; the politics of the third age [was] anomalous. Demos still had the responsibility, but had lost the competence to judge matters of arcane technology. 'This great age of science is, by way of corollary, an age of personal ignorance.' Must policy, therefore, fall into the hands of a technical elite?" (441)

"But if experts cannot, or do not, run society, then Jouvenel's anomaly stands: ours is a society run for the acceleration of change, on analytical principles, but by politicians and pressure groups incompetent to judge the extended effects of change," McDougall concludes. (442)

He goes on to observe that "Eisenhower was surely right--the American system was not set up for central planning, nor did its values condone it. But JFK was also right--the old invisible hand was no longer equal to the foreign challenge in an age of technological revolution. In the end, the United States got the worst of both worlds: a 'free market' twisted at every turn by state intervention and a technocratic state incapable of managing the change it provoked." (444)

"American technocracy, however, has always promised economic growth and clean air, support for excellence and mass education, a booming stock market and universal welfare, guns and butter. The objective of American technocracy was to avoid defining its objective. Hence, the United States got bad technocracy," McDougall concludes. (447)

As a consequence, the United States had become, by the end of the Cold War in the late 1980s, not the bastion of free-market economics it proclaims itself as being, but rather (with the collapse of the Soviet Union) the only surviving command economy in the world. NASA and the aerospace industries generally are still very much part of this command economy.

The war economy.

In his book, The Permanent War Economy, Seymour Melman writes:

"Traditional economic competence of every sort is being eroded by the state capitalist directorate that elevates inefficiency into a national purpose, that disables the market system, that destroys the value of the currency, and that diminishes the decision power of all institutions other than its own. Industrial productivity, the foundation of every nation's economic growth, is eroded by the relentless predatory effects of the military economy.

"All this began in the circumstances of World War II that made a war economy look like a boon to economy and society, apparently solving the economic problems of the Great Depression. But the self-assured operators of the military economy that burgeoned from 1950 on never reckoned with the possibility that a permanent war economy would function as a parasite, weakening the larger host economy that feeds it. The very perception of such developments has been made difficult by an ideological consensus about war economy that classifies this as a source of economic health. Such ideology, by filtering what we look at, prevents us from seeing both the quality and the depth of the deterioration of American productive competence." (7)

"The conventional facade of corporate outward appearances obscures the presence and the distinctive nature of the state-managed economy. This system concentrates on military economy. It can draw on the federal budget for virtually unlimited capital. It operates in an insulated, monopoly market that makes the state-capitalist firms, singly and jointly, impervious to inflation, to poor productive performance, to poor product design and poor production managing. This subsidy pattern has made the state-capitalist firms failure-proof. That is the state-capitalist replacement for the classic self-correcting mechanisms of the competitive, cost-minimizing, profit-maximizing firm." (21)

"Making weapons has been well-paid work for thirty years. Paying no attention to the fact that the product of all this activity was, economically speaking, nonproductive (not contributing to consumer goods and services or to further production), our economists counted all the money paid out for this work as part of the gross national product. A growing GNP seemed sufficient as a harbinger of economic health. Through the eyes of the conventional wisdom, the vast quantities of productive goods and services that were forgone for American society because of the sustained effort applied to war economy went unacknowledged. Unseen, for example, was the fact that while the stock of missiles was enlarged and renewed, the railroad rolling stock deteriorated without replacement.

"The permanent war economy, far from solving problems of capital and labor surplus in American economy, as suggested by the conventional wisdom, will be shown to perform as a prime generator of uninvestable capital, unemployable labor, and industrial inefficiency." (24)

"Once the Department of Defense decided to rely primarily on business enterprise rather than on government arsenals for research, development and production of weapons, the managers of such firms, old and new, lost no time in taking advantage of the opportunities for growth and profits that were afforded by escalating military budgets." (29)

"Big contracts especially are arranged by negotiation with one selected supplier, so there is no competitor selling to a single buyer, the Pentagon. And the Pentagon, having ordered a product, usually wants it. Thus even if the price turns out to be as much as three to four times the originally negotiated amount, the Pentagon finds the money to pay for it. Under such conditions the managers of military-industry firms are under no external pressures to do all of the demanding work of problem-solving that is involved in trying to minimize costs through internal efficiencies. Why bother? If costs go up, so

too can prices, and thereby profits. This, in a nutshell, is the logic of *cost-maximization*." (34)

"On the Pentagon side, rising prices have ordinarily been paid by asking for and getting more money in the annual budgets appropriated by Congress. Again, the added money paid to the military-serving enterprises is justified as being good for the economy as a whole, making jobs and putting money into circulation. That is the logic of *subsidy-maximization*, the readiness of government to pay for more than the conceivable cost of given work if it were to be done under other than cost-maximizing conditions." (34)

"The concept of the subsidy-maximizing policy of the state management was set forth in a dramatic exchange between Senator William A. Proxmire and Secretary of the Treasury John B. Connally on June 8, 1971, as the Senate Banking Committee was considering the special legislation to guarantee a \$250-million loan to the Lockheed Corporation.

"Senator Proxmire:...I would remind you in a subsidy program it is different, there is a *quid pro quo*. you make a payment to a railroad and in return they build trackage; you make a payment to an airline and they provide a certain amount of service for it. In welfare, of course, you make a payment and there is no return. In this case, we have a guarantee and there is no requirement on the part of Lockheed to perform under that guarantee. A guarantee of \$250 million and no benefit, no *quid pro quo*.

Secretary Connally: What do you mean, no benefit?

Senator Proxmire: Well, they don't have to perform. (55)

Secretary Connally: What do we care whether they perform? We are guaranteeing them basically a \$250 million loan. What for? Basically so they can hopefully minimize their losses, so they can provide employment for 31,000 people throughout the country at a time when we desperately need that type of employment. That is basically the rationale and justification." (56)

The transformation of the United States from a small, rural semi-industrial economy in the 19th Century into a huge war economy by the end of the 20th Century has also been well documented by foreign observers. For example, Arimo Vayrynen in his book, Military Industrialization and Economic Development, surveys the role of the war economy on the economy of many nations of the world. About the United States he says this:

"Extensive allocation of human R&D resources to military purposes in the United States--the estimates vary between 15 and 35 percent of engineers and scientists--has made a dent in the potential progress of civilian technology and productivity growth. In addition, a minimum of one-half of the federal R&D funds have been directed to military purposes. During the Reagan years, this share approached three-quarters, especially in such cutting-edge technologies as lasers, artificial intelligence and new materials. To get a longer view, one can observe that in 1980 the military R&D absorbed 47 percent of the total US federal spending on R&D, while in 1990 the corresponding figure was 61 percent." (67)

"The military budget....is really a part of the particular late-twentieth-century American version of the welfare state" (Benjamin Friedmann 1990, pp. 32f) (70)

"In fact, it has been suggested that the US federal government has a closet industrial policy implemented by the Pentagon through a variety of organizational arrangements such as the Defense Advanced Research Projects Agency (DARPA) and the Office of Economic Adjustment. The Strategic Defense Initiative (SDI) and the Strategic Computing Initiative (SCI) have been identified as practical manifestations of the Pentagon's effort to bolster the strength and productivity of the US economy by allocating military spending to R&D projects which also have a long-term commercial potential. The Pentagon's industrial policy has often been considered, along with demand management, a paramount example of the 'military Keynesianism.' In particular, DARPA has funded over the years a wide range of projects in critical technologies." (70)

"A long-term trends appears to be that high-tech industries are replacing heavy industries, such as steel, machinery and construction, as targets of military funds. The heavy industries are thus increasingly dependent on public investment in the maintenance of their infrastructures, which has been badly neglected in the United States since the 1960s. Apart from its potential positive consequences the strengthening linkage between military spending and high-tech industries may increase the economic problems of the United States by undermining industrial employment and contributing to the unevenness of regional economic performance." (70f)

"The relative economic decline of the United States correlates thus with the inability to commercialize the technologies developed by the Department of Defense funding. This is largely due to the 'sheltered culture' of arms manufacturers. The military requirements of the DoD and the requirements of the civilian market diverged increasingly from the middle of the 1960s onwards." "Most innovations for the market, for instance in electronics, came from the companies which did not collaborate with the Pentagon or had initiated such a relationship only recently." (72)

"A consequence of the weakening of the manufacturing base in the United States has been its growing dependence on foreign suppliers of critical technologies. The US weapons systems are increasingly dependent on foreign micro-electronics and special materials needed in optics, computers and other military equipment." (73)

"Military spending has not inspired the development of competitive products and efficient production technologies, in particular, for the consumer goods market, but has instead served the specific military needs. The civilian products, to the extent they have emerged from the diversification of military manufacturers into new areas, have often turned out to be 'quasi-weapons systems' rather than genuine civilian versions." (79)

"Thus, while the US civilian industries have failed largely for their own reasons, the military industry, increasingly isolated and inefficient, is not able to fill the gap and is becoming a drag on the overall industrial strength." (80)

Space welfare, the war economy, and popular support for space exploration.

While polls show that most Americans support space exploration, and even still think well of NASA, more and more Americans appear to be fed up with military/space welfare practices and abuses, such as those documented daily in newspaper articles such as the following two:

"Defense firm's bonus stirs controversy" Honolulu Advertiser, November 1, 1995

"In 1993, executives of Martin Marietta Corp. apologized for a string of disasters that ended up costing taxpayers \$2.3 billion. But now, those same executives would get an \$11 million bonus--backdated to 1993--under a plan approved by the Clinton administration."

"The \$11 million is part of a controversial \$31 million Pentagon payment to officials of the national's largest defense contractor. Under the plan, taxpayers would finance a third of the \$92 million bonus package the executives gave themselves for staging the merger of Martin Marietta and Lockheed earlier this year."

"Are Research Centers Dynamos or Dinosaurs? Commercial firms question centers' special relationship with government" Space News, September 18-24, 1995

"In 1991 the US Air Force gave the Aerospace Corporation of El Segundo, Calif., \$15 million worth of systems engineering and integration work on the US satellites that provide weather information vital to modern military operations.

"The work was never put out for competitive bidding even though the Pentagon's Inspector General subsequently decided that the job could have been done by the satellite builder."

"Few who know or see the Aerospace Corp. name can distinguish it on sight from that of a commercial corporation. But the primary function of Aerospace is not to make a profit. It is to run a Federally Funded Research and Development Center for the Air Force. Like most other companies and universities that operate federal research centers, Aerospace Corp. is non-profit, receives sole-source contracts, does not respond to solicitations, is immune from bid protests, does not pay taxes and has ready access of Air Force and intelligence officials. In many cases, its staff members work in Air Force program offices."

The legislative branch of the US government is currently controlled by a faction of the Republican Party which has vowed it will reduce the huge US federal debt by eliminating almost everything the US government does, and severely restricting the rest. That is, it will eliminate or reduce everything except for the defense/space industry which continues to receive massive amounts of federal welfare [See Roger Handberg, "'Newt' Space"], even more than the Department of Defense itself is requesting. This is particularly ironic since it was largely the decades of military welfare spending that produced the deficit in the first place, although the debate in the US tends to focus instead

on such other contributors as aid to dependent children, food stamps, and various so-called entitlement programs.

Yet it was the years of military/space overspending which contributed to most of the deficit, most spectacularly in the early days of the Reaganomic Revolution when the US, in a period of only two years (1981-83) went from being the number one creditor nation in the world (nations owed the US more money than the US owed them, and the total owed to the US was greater than the amount owed to any other country) to being the number one debtor nation (the US owed more money to other nations than they owed to the US, and the total was more than that owed to any other country), a feature which the US has retained and indeed expanded on during enormously over the following decade.

There is no doubt that the federal debt urgently needs to be reduced substantially and it is good that a Republican faction appears to be willing to do it. But the hope of an equitable, across the board, reduction has not materialized, and instead certain big money and big power interests have not only been spared serious cuts but have seen additional money flow towards them.

Unfortunately, space industries, and hence space activities (if not necessarily NASA itself) have been among those spared and boosted (most notably the revived SDI) and thus the average American's enthusiasm for space activities has diminished if it has not yet been entirely extinguished by the duplicity.

Even though there has been some downsizing, base-closing, and restrictions of the military--and certainly of NASA--proposed, and some carried out, it is still clear from congressional action in increasing military procurement budgets in the post-Cold War period, with no plausible military justification possible, that the military and space industries play an absolutely vital role in the American command economy, and are indeed America's surrogate industrial, science & technology, and manpower policies.

For space programs to move forward, it is absolutely essential, I believe, that commercial, and especially spiritual and other humane and nonmilitary purposes become paramount.

Or at least that is my thoroughly political conclusion about a thoroughly political issue. Whatever position I, or anyone else, takes on this issue is a political, indeed, ideological, and not a coolly scientific or objective position. While scientists, including social scientists, should strive for dispassionate and objective analysis--and I have--in truth, there ultimately is no such thing as complete objectivity. All analysis is political analysis--someone wins and someone loses when decisions are made and actions are taken (well, there are of course situations where it seems everyone wins, or everyone loses, but they are truly rare).

So, once again, the conclusion must be that politics always wins because all decisions, even scientific ones, are to some extent political.

The future.

Let me conclude this overlong statement by simply observing that in thinking about the future of space activities it is very important not to focus any longer so much--if at all--on the activities of nation-states. While national space agencies will remain important for some time in all countries, and more important in some countries than others, it should be clear that non-governmental actors will become increasingly more important in the long run.

I would stress that many of the future major actors in space will not even be state-based. That is, I would look more to transnational, global organizations such as the large transnational economic corporations, transnational nongovernmental organizations, such as The Planetary Society, the various world religions, and, I am sorry to say, to organized crime which, as governmental institutions lose power and legitimacy everywhere, will rise in power and influence over the 21st Century.

Indeed, if this is the case, a good analog for 21st space activities might be the 16th Century when pirates and adventurers roamed the seas of Earth seeking Glory, God, and Gold. In such a future, the old 20th Century Cold War rivalry between the US and the USSR might seem very tame and peaceful indeed.

Or the anarchy on Earth in the 21st Century might mean that there will be no major science and technology projects of any kind for a century or so. Since big science & technology, of all kinds, arose from the big state, and since it appears that the era of the big, well-funded nation-state is over, then so is the funding for basic research and development for big science and technology generally.

The US has not really engaged in a new megaproject of any kind for more than twenty years. Japan engaged in, or proposed, some for a while, but seems in economic and spiritual doldrums now. European unity does not seem to mean big bucks for big science and technology.

So where will the money come from?

China, probably. India, perhaps. The Islamic world? Could be.

Perhaps from no one. There may be no funds available for some time for space or any large projects.

On the other hand, high levels of funding and concentrations of humans may not be necessary for the biological and nanotechnologies of the 21st Century. There may indeed be "plenty of room at the bottom" for entirely new kinds of space ventures.

All in all, expect a very different future for space and Earth as well.

But regardless of who does what with what kinds of technologies, you can be sure that politics will remain and will surely win in the end. And that means that the most important thing about the future is not economics, or technology, or even politics in the narrow sense. The most important thing for the future--and for the present--is will: human will, desire, effort,

imagination, and organization--your will, desire, effort, imagination, and organization.

So let's get out of here and start dreaming, working, and organizing. If the future of space is not in your hands, you can be sure it is in the hands of someone else, and that their politics will win over yours if you are not active in furthering it. It is very much up to you.

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