

## WHAT HAS POSTERITY EVER DONE FOR ME?

The fourth of four discussions on the theme, "Space Debris"

International Space University  
Stockholm Summer Session

July 19, 1995

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One of my favorite cartoons from The Far Side by Gary Larson, depicts a dinosaur addressing a group of other dinosaurs as follows: "The picture's pretty bleak, gentlemen. The world's climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut."

We humans can laugh at that because, after all, our brains are much bigger. Thus, we are capable of foresight, anticipation, planning and pro-action.

Yes, we are capable of that, but how often do we effectively exercise those capabilities? From my observation and understanding, humans use their brains extremely effectively to dream and to scheme, and to invent and to use technologies to help their dreams come true. But, generally speaking, humans are not able to anticipate, or assume responsibility for, the many unintended and often negative consequences of their technologically-augmented dreams.

The problem, as I see it, is that while our brains are indeed bigger than a walnut, our conscience--our sense of ethics and morality--is about the size of the smallest detectable piece of space debris. Our conscience is a very thin microchip upon which so much garbage has been programmed--if not actually hard-wired in--that all we seem to get, ethically speaking, most of the time, is "garbage out."

So, gentlemen and gentlewomen, that dinosaur is correct: the picture is pretty bleak because our hubris, our pride, greatly outruns our ethics, laws, and institutions of responsibility towards the future.

I. Space Debris as a symptom of our times. In other words, I see the problem of "Space Debris" to be just one more symptom of--or another metaphor for--all the major problems facing humanity today.

In addition to the perspective from The Far Side, the challenge before us can also be understood by reference to various well-known--or not so well-known--phrases which capture the human dilemma:

What has posterity ever done for me?  
Am I my brother's keeper?  
Why worry? Nothing bad has happened yet!  
After me, the deluge! (or: Don't change things until I retire!)

Let me give you some examples of what I mean:

The "Space Debris" problem is like:

- "Development" and "progress" generally:  
It springs from our desire to conquer nature and bend it to human will;  
It reflects our belief that it is OK to pollute now because then we can create enough wealth to clean up our mess later.
- Waste and the Environment:  
Just throw it away. Nature will take care of it.  
Nature is vast and man is so small. We can't do any real harm to such a powerful system. Don't worry.
- Current attitudes towards "global change" generally:  
The problem is not serious now, and we have too many other pressing problems to worry about.  
There are too many uncertainties about the present situation because we have to rely on unproven models and statistical methods, and not on clear empirical evidence;  
There are too many uncertainties in any forecast of the future for it to be taken seriously: How many launches will there be? Will future launches have built-in amelioration or not? Will there be breakthroughs in cleanup techniques? If and when chain reaction collisions occur, no one can know what the consequences will be.  
"Space is by nature and treaty a global commons, available for use by all nations. With this potential comes responsibility for keeping space safe," R. A. Williamson, "The growing hazard of orbiting debris," in Issues in Science and Technology, Vol. 8, No. 1, Fall 1991, p. 82. Quoted by Penny and Swan, in Flury, p. 283. Perhaps. But because space is a general commons, and (not yet?) owned by anyone, it currently suffers from the "tragedy of the commons" effect long ago identified by Garret Hardin. It thus does not make economic sense for anyone now to "waste" money on amelioration, much less on cleanup--some other "freerider" will just add more pollution for you to clean up for him.

The one big possible difference between space debris and "global change" is that continued space pollution mainly effects the space industry and not the general public, while "global change" will clearly impact everyone. Since there is a special economic/political/military/scientific interest in clear orbits, though not in preventing global change, there is a much more powerful incentive for the space industry to clean up space, and keep it clean.

- Our "Faustian Bargain" with the future: we are willing to get tremendous technological power now which may cause great, but unknown dangers for future generations. Some examples:
  - Nuclear energy waste management for tens of thousands of years into the future;
  - The population "bomb" In 1960, an article in Science reckoned that "Doomsday" (when the entire globe would be covered by humanity, and humans would begin piling up on one another and exponentially growing into space--some real "space debris") would be Friday, Nov. 13, 2026. This mathematical estimate was confirmed again in Science in 1985--but, though some impressive plans here and there have lowered

some birth rates, and while there are some mild reasons for optimism arising from Cairo conference, the "population bomb" is still a vastly under-rated, and under-addressed threat--one which will certainly get worse, and can't possibly get better until the 22nd Century at the earliest.)

--The creation of a global casino economy in the 1980s and continuing; the end of secure "jobs" for billions of people, with no clear alternative in sight, much less prepared for. At the same time, the accumulation of huge and still-growing levels of public, corporate, and private debt which greatly limit future options.

- A few "developed" nations muck it up for all the rest, as well as for their own descendants.
  - For example, although the small island nations did not contribute one nanodegree to global warming and sea level rise, they will be among the first to have their entire nations submerged--if the seas rise.
  - Also, the US and the USSR are far and away the major contributors to space debris. Thus the magnitude of the current space debris problem is part of the Cold War insanity of the 20th Century which warped everything and yet which still lingers on and on into the future, continuing to distort perceptions and priorities.

As a consequence:

We desperately need an applied ethic of responsibility for future generations of humans and all life everywhere.

II. On Looking Ahead.

Of course, thinking about the future is not new. Traditional societies may have had a "7 generations" sense of ethical responsibility, as some people contend today. But in actuality, for traditional, and agricultural, societies, the future was basically like the past. So blindly following any custom that worked made good sense. There really was no need to look ahead (that is, until some nations became "developed" and tried to "develop" everyone else, and the future for everyone became unlike the past for the first time, and on purpose.)

So the industrial revolution severed the linearity of time, making the past/present/future no longer continuous, and with the past having almost no relevance for understanding the future--again, as I say, on purpose; this was done purposely in the name of "development"!

This feature of discontinuity was even more the case in the "new nations" (The US, Canada, Australia, New Zealand) which were created by immigrants from Europe who "disappeared" the First People and "terraformed" the primeval forests and plains into their Brave New Worlds.

Modern industrial society also did have a specific vision of the future. It was "progress". As long as you continued "developing," then every day, in every way, things would get better and better. Your children's lives would be better than--and different from--yours.

There was no essential difference between communism and capitalism on this point--only a question of how best to create a continuously progressive heaven on earth.

Now, while many people and most institutions still hold steadfast to "development"--it is still the official view of the future everywhere--more and more people are not so sure that "progress" is inevitable, possible--or even desirable. Many people are concerned that we of the present generations seem to be handing future generations tremendous and novel problems which we caused but for which we ourselves have no solutions.

So some voices are beginning to say that this is irresponsible of us, and that we must become more responsible to future generations.

III. Yet, there is no widely accepted moral basis for that responsibility, and no normal, routine, institutional way to exercise our responsibility towards future generations.

A. Responsibility to future generations is not part of any religious or ethical system.

It was not a problem for Plato, Jesus, Mohammed or the Buddha, so there is no clear guidance from past/present religious or philosophical traditions concerning future generations. Obligations towards future generations is one of the few things--maybe the only thing--that is "new" in ethics and morals.

Traditionally, and even now, the basis of all human ethics has been reciprocity--"Do unto others as you would have them do unto you"--on the assumption that "they" CAN and WILL "do" unto you, if you aren't careful.

Ethics deals primarily with you and your neighbors--your mutual and reciprocal obligations towards those physically around you, which future generations are not.

Traditional ethics also has tried to deal with people who are not physically present with you--who are not your neighbors but who are your contemporaries--"strangers", "foreigners," "The Other." You are to be wary of strangers, but also be kind to them should a stranger wander into your land (again, the basis of that morality is actually also reciprocity: you are kind to Others so that they will take care of you--or yours--should you ever go abroad. Or at least, if you are kind to them, they might not attack you).

Now of course, morality towards The Other--especially the invisible other--is a huge problem at the present time. Xenophobia is very real, and characteristic of all groups. Loving your neighbor is hard enough, but loving your enemy? Or people "different" from yourself? Almost impossible.

Given the fact of both xenophobia on the one hand and globalism and increasing cross-cultural contact on the other, this, alone is a huge and probably unsolvable problem for humans who are evolved, biologically and psychologically, for a very different world from the one we actually now live in.

A subsidiary question which I will only mention in passing is what is your ethical responsibility towards other living things (non-human), in the present as well as in the future?

But what can posterity do for you? You can do a lot to or for posterity as you please, but the future is helpless to hurt, or to help, you, as the title of my talk here is meant to imply. So why worry about future generations at all? Anyway, who can really know what future generations will want? Even if we try to take their needs into consideration, we might fail, and do the wrong thing for them. So why even try? Forget the future.

"The present is the future getting back at you" is a new phrase expressing the thought that lots of PRESENT problems were caused by past neglect or abuse. But "you ain't seen nothing yet"--things we are doing--or failing to do--will have a MUCH greater negative impact on our children or grandchildren.

So, OK, we say, we will protect those who are literally OUR children, by giving them advantages and protections, but to hell with everyone else.

If there are no ethical or spiritual traditions of care for future generations, what about our economic or political systems?

B. Concern for future generations (human or nonhuman) is not part of any currently dominant economic theory or application.

In theory, we have ways to figure how to "discount the future", and all of them discount the future VERY heavily, when they reckon it at all.

In practice, we worry only about "the bottom line" (daily, weekly, monthly, quarterly, annually); maybe 5-10 years for some things, and maybe even 20-50 for some rare things (like weapons development or electrical power generation, etc.). But nothing in classical economics, including Marxism, clearly is focused on the future as a guide to present economic decisions and actions.

Once upon a time, when unions, and job security, and lifetime ownership of corporations existed, the owners and workers of a firm cared about its future, and therefore to some small, but significant extent, about each other. Now, really-existing modern capitalism, with total job mobility and enormous wealth for owners and top managers, and total job insecurity and poverty for everyone else, means that no one in the economic system per se today is concerned about the long-range consequences of anything.

Well, then it is up to government to take care of the future? Right?

Wrong.

C. Concern about future generations is not part of current political theory or application.

There is absolutely nothing about future generations in democratic theory, ancient or modern.

And nothing in democratic practice (especially in the American Presidentialist system, but also in Parliamentary systems).

For elected officials, "the future" means "the next election" at best, and since the future does not vote, and the future does not have a PAC (Political Action Committee, which provides money to candidates), the longer and broader ranged issues of the future do not figure in the minds and actions of elected politicians at all.

For bureaucrats, "the future" is the next budget cycle (or their own retirement), at best.

There have been noble attempts to make democratic governments more future-oriented:

Alvin Toffler's concept of "Anticipatory Democracy" from the 1970s

The Secretariat for Futures Studies which was in the Office of the Prime Minister of Sweden for seven years during the 1970s.

The US Office of Technology Assessment, reporting to Congress, since the 1970s.

The creation by the Hawaii Legislature of the Hawaii Research Center for Futures Studies in 1971, and our 25 years of work with Hawaii and other legislatures, governors, and especially judiciaries.

The sponsorship, by the Future Generations Alliance Foundation, headquartered in Kyoto, Japan, of an international symposium to be held in Hawaii next January, 1996, on future-oriented governance (Prof. Kim, head of that Foundation, will be at ISU next week).

It appears that non-democratic elements of democratic governments (e. g., judiciaries) do better than democratic ones, and that authoritarian governments can do better than democratic ones, once they decide to act (e.g., Singapore?)

D. Some people would justifiably object to my saying there are "no" ways at all economics or governments consider the future.

True, there are ways to deal with certain specific future-oriented issues, but no regular, systematic, or systemic way by which the interests of the future are considered routinely and deeply on every issue--as the interests in the present are, or as certain constitutional features usually are in the case of modern governance.

Moreover, these remedies are also usually ex post facto--they apply after a situation gets intolerably bad for some significant and/or wealthy person or group of people, not beforehand, so they often are too late or too feeble to be of much use. They often are instruments which are more accessible to the already rich and powerful few than they are to the poor and powerless many. And in any event, arguably avoidable damage has already been done.

Examples of some of the ad hoc remedies are (1) insurance (Kunstadter in Simpson), (2) legal action--or fear of a law suit--for compensation for damages or lost opportunities (Wood, in Simpson), (3) national laws, treaties, international agreements (Maclure & Bartley, Gorove, Meredith, each in Simpson), and (4) forms of "risk analysis" which determine a "reasonable" amount of, say, pollution (between the extremes of "none" and "intolerable" or even "lethal" amounts) (Macauley in Simpson).

IV. Now, a word about how futures studies considers the future, in comparison with what I have seen in the literature of space debris.

Kessler (in Flury) and Loftus & Reynolds (in Allahdadi) both present charts of what appear to be alternative futures for space debris, reproduced here.

But basically, these are all merely variations within a single future--the future which assumes that space exploration will continue basically as it has in the past, but at varying degrees, and with varying attempts to mitigate and clean up space debris.

This is the way most "sensible" planning for the future of anything is done--as varieties of "continued growth", or simply, "continuation" of whatever is thought to be happening now.

But futurists know that while "continuation of the present system" is always a possibility, it may not be a probability, and it definitely is not a certainty.

Indeed, I like to point out that "the 'most likely future' is in fact the least likely future." The future that most people expect--continuation--is not very likely in actuality.

I think a trip through history--of anything--will demonstrate how "discontinuous" it actually is. It is smooth and predictable ONLY in hindsight. Indeed, it is the fundamentally unpredictable and discontinuous nature of society that makes some people believe that Futures Studies is impossible. If Futures Studies is believed to mean "predicting the future," then it is impossible. But Futures studies is not about predicting the future. It is about forecasting and examining sets of alternative futures, and envisioning and creating preferred futures--routinely, continuously, as a matter of course.

So we need to consider some other, more usefully "alternative," futures for space debris.

Alternative Futures. Over years of futures research, I have concluded that while there are literally countless "alternative futures" one of which eventually will become (or will seem to become) "THE Future", it still is possible to distill the myriad alternatives into no fewer than four generic alternatives. Thus any attempt to consider the future of anything should seek to formulate and explore at least these four--and any number of other alternative futures felt to be more specific to each case which need to be constructed and examined as well:

1. Continued growth
2. Collapse
3. Disciplined Society (or "Steady State")
4. Transformational Society.

I have already discussed "continued growth."

A society (or system) can collapse for any number of reasons, and over any number of intervals of time. Using the US as an example, in the 70s, environmental collapse was on many people's minds. In the early 80s, it was nuclear holocaust. People are now more worried about economic collapse--or maybe even moral decay. What might "collapse" which could present a future for space debris which is substantially different from "continued growth."

Don't tell me a society (or system) can't, or won't, collapse. I think all of you would have said that about the Soviet empire in 1985. But it did. I am not saying any given society or system will in fact collapse within the time horizon of concern here, but how that collapse might occur, why, when, and to what effect, should--MUST--be part of any responsible futures exercise.

Similarly, what would a "steady state"--or "disciplined society"--mean for space debris? Perhaps something analogous to "sustainable development" (Macauley, in Simpson)? Or something else?

Finally, a system might "transform" as a caterpillar transforms into a butterfly--or as evolutionary systems theory says all major system breaks occur in all systems, so that while the cause of the transformation might be more or less clear, the consequences of the transformation--what the system will look like "on the other side"--can only be the subject of speculation--or of design, hardwork, and luck.

For example, even though it might not seem to be "practical" and "realistic," what if we were to get over our fixation on huge heavy space vehicles dependent on massive amounts of fuel and metal, and achieve as quickly as Freeman Dyson thinks possible his vision of the spaceship of the very near future. He says that "it is reasonable to think of the microspacecraft of the year 2010, not as a structure of metal and glass and silicon, but as a living creature, fed on Earth like a caterpillar, launched into space like a chrysalis, riding a laser beam into orbit, and metamorphosing itself in space like a butterfly." "The next hundred years will be a period of transition between the metal-and-silicon technology of today and the enzyme-and-nerve technology of tomorrow." "Big main-frame computers, nuclear power stations and Space Shuttles are dinosaurs. Microcomputers, STIG gas turbines, Voyager, and Astrochicken are birds. The future belongs to the birds." [Freeman Dyson, Infinite in all directions. New York: Harper and Row, 1998, pp. 178, 197, 200, 286]

Is space debris quite the problem for an Space Butterfly or Astrochicken as it is for the massive vehicles we deploy now?

V. Getting greater awareness of the problem. The US National Research Council issued a report on "Orbital Debris--a Technical Assessment, on June 14, 1995. Paul Shawcross, the NRC Study Director for the report, said, "One of the intentions of this report is to raise the awareness level of orbital debris...to make this a high-visibility issue. It is an issue that deserves more attention."

Nicholas Johnson said that "a better understanding of the spread of space debris over the next 10 to 20 years is critical." "The bottom line is that the space environment today is not severe enough to create operational problems. But we just don't know how long we can say that." "A lot of people across the space community are now convinced that this is something they shouldn't sweep under the rug. Whether you are a spacecraft designer, spacecraft operator, or are in space launch transportation, more and more people are paying attention," Johnson said. [From Leonard David, "Scientists worry about critical gaps in orbital debris data," Space News, June 26-July 2, 1995, p. 22]

But how can the matter of space debris be made more highly-visible to more people--maybe to the general public--so that necessary actions can be undertaken?

It may be (as Dietrich Rex said in Simpson, p. 37) that the terms we use to talk about space in general, and space debris in particular, are misleading. We use



the term "space" to mean everything from low earth orbit to the restaurant at the end of the Universe. Terms like astronaut or cosmonaut, for example, suggest we have traveled, or soon will be traveling, much farther away from earth than we have, or are likely to do any time soon. In reality, with "space debris" we are dealing with a problem really quite close to earth.

Arne Sorensen, a Danish futurist, used to say that if we couldn't get people to think usefully about "the future," then we ought to try "to make the present a little wider"--so that when we say, "the present," we mean now and the next 20 years.

Maybe we need to make "the earth" bigger, so that we can all be concerned about "earth orbiting debris"--or even "earth threatening orbital debris". In any event, perhaps we should do what I notice others are already doing--stop calling it "space debris" and start calling it "earth debris" or at least something that places it closer to our cradle

And if we want to capture the popular mind, we might consider de-emphasizing collisions in orbit (after all, we have to go into space to have such collisions, and those who argue against going into space at all will simply have one more reason to object). Instead, we might try to emphasize things like light pollution, which is of concern to astronomers (admittedly nothing of concern to ordinary people). But my point is, what are the disadvantages to the earthbound of continued space (earth) debris? And if we do want to talk about space debris collisions, we should stress how that will foul up your TV viewing, or disrupt cellular phone conversations. Or how those "brilliant pebbles" might end up being "falling stones". In this era of demonstrating how useful space research is in satisfying basic human needs, why not emphasize how dangerous to earth all that space debris is?

Finally unlike earth, space certainly can't heal itself or naturally recover from man-made wounds. We caused it, we must cure it.

"May our foresight in controlling the growth of artificial space debris provide boundless opportunities for the exploration of the cosmos for generations to come," (in forward of Nicholas Johnson and Darren McKnight, Artificial Space Debris, (Malabar, Florida: Orbit Book, Company, 1987) quoted by Penny and Swan, in Flury, p. 283.

Well, yes. May it indeed. But merely wishing won't make it so. Though without wishing--and dreaming--it won't happen at all.

#### V. Bibliography:

Three recent volumes, which are basically proceedings of conferences dealing with space debris, have been particularly helpful to me in developing my ideas here. I have indicated the articles within each volume that helped me understand some of the future- and policy-oriented aspects of the problem.

**W. Flury, ed., Space Debris.** Advances in Space Research. Vol. 13, No. 8, August 1993 Proceeding of the Topical Meeting of the COSPAR Interdisciplinary Scientific Commission B (Meeting B8) of the COSPAR Twenty-ninth Plenary Meeting held in Washington, DC, USA 28 August-5 September, 1992

See especially:

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- P. Eichler, et al., "Reliability of space debris modeling and the impact on current and future space flight activities," 225-228
- Dietrich Rex, "The effectiveness of space debris reduction measures," 249-262
- Joseph Loftus, et al., "Orbital debris minimization and mitigation techniques," 263-282
- Robert Penny and Peter Swan, "Orbital debris mitigation: the IRIDIUM(tm) way," 283-286

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See especially:

- Joseph Loftus and Robert Reynolds, "Orbital debris mitigation: issues and options," 144-153
- Norman Bowles and Derek Lang, "Commercial space transportation regulation and its effect of space safety," 154-158
- Deborah Nerio, "Space safety policies for debris characterization, control, and mitigation," 159-166
- Lubos Perek, "Space debris before the United Nations," 167-172
- Pamela Meredith, "Orbital debris: Possible causes and issues for litigation," 173-180
- Ray Williamson and Richard Obermann, "Addressing the orbital debris problem: Congress and the international policy challenge," 199-206
- R. Reynolds, et al., "Assessing the effectiveness of techniques to limit orbital debris generation," 240-249
- Robert Penny, "IRIDIUM (TM) debris mitigation practices," 250-253

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See especially:

- Nicholas Johnson, "The earth satellite population: Official growth and constituents," 7-18
- Donald Kessler, "The current and future environment: An overall assessment," 19-36
- Dietrich Rex, "The current and future space debris environment as assessed in Europe," 37-55
- Bernard Bloom, "Human survivability issues in the Low Earth Orbit space debris environment," 56-70
- Joel Primack, "Protecting the space environment for astronomy," 71-76
- Albert Reinhardt, "Potential effects of the space debris environment on military space systems," 84-94
- Joseph Loftus, et al., "Orbital debris minimization and mitigation techniques," 132-144
- Molly Macauley, "In pursuit of a sustainable space environment: Economic issues in regulating space debris," 147-158
- Christopher Kunstadter, "The economics of space operations: Insurance aspects" 159-161

- Winifred Lang, "Environmental treaty-making: Lessons learned for controlling pollution of outer space" 165-179
- Howard Baker, "Regulation of orbital debris--Current status," 180-188
- Diane Wood, "Who should regulate the space environment: The laissez-faire, national, and multinational options," 189-197
- Jeffrey Maclure and William Bartley, "Orbital debris: Prospects for international cooperation,"
- Stephen Gorove, "Preservation of near earth space for future generations: Current initiatives on space debris in the United Nations," 205-213
- Pamela Meredith, "A legal regime for orbital debris: Elements of a multilateral treaty," 214-226