C2 – Some Contentious Communications

Dear: In an earlier draft of Chapter **C**, this Chapter **C2** was an "End Note" (entitled *Some Light on "Nuclear Shadows")* for Chapter **C1**. I've put it here as **C2** because it's so long; yet, because it's basically an "End Note", you may want to skip it: I won't be referring to it again in the rest of the book. In sum, it's a particular illustration of my "mantra" mentioned in **C1**:

> Every light that shines also causes shadows – but if there were no shadows, new lights would never shine.

By the way, the Buddha (Siddhartha Gautama, c.563 – c.483 BCE) saw some of the same (namely, the first clause), saying:

> Wherever there is light, there is shadow; wherever there is length, there is shortness; wherever there is white, there is black.

In any case, before showing you this illustration (providing "illumination"!), I should probably provide some background information.

What follows isn't a "poem"; it's an "essay" I wrote after my return from the Soviet Union, I think it was in 1984 (a few years before the Berlin Wall fell). This time was near the coldest of the "cold war". The initial stimulation for this essay was a paper dealing with "nuclear winter" published by the physicist/ astronomer Carl Sagan and co-authors. In their paper, the authors mathematically modeled the climatic consequences of a nuclear war, using a variety of assumptions (including how many nuclear weapons would be detonated). Their conclusion was that, with so much dirt and dust and smoke injected into the atmosphere by the explosions and resulting fires, the temperature at the Earth's surface would drop dramatically, causing a "nuclear winter".

Now, as you might expect, their model contained a substantial number of assumptions about how the atmosphere would behave, and the International Council of Scientific Unions (ICSU, a nongovernmental organization, established by cooperation among a number of scientific organizations) convened a meeting in Tallinn, Estonia (then a part of the Soviet Union) to examine and comment on such assumptions. ICSU invited (and paid the travel for) some of the world's experts to attend, and because one of the

important assumptions of the Sagan et al. model was in my field of specialty, I was invited to attend to present a paper (along with about 10 others).

Well, I did that, doing it all according to "established procedures". I put as much time as I could into preparing my presentation and paper, but I certainly wasn't prepared for what I encountered. Now, I'll try here to avoid describing the encounters that aren't relevant, but if you're to gain some appreciation for why the essay is so different from "normal" scientific reports (and from what I presented), I should describe some of them.

At the beginning, while in London on our way to the Soviet Union (your grandmother went with me), we read something in a newspaper that alerted us to what we might encounter. Someone had just returned from the Soviet Union and was reported to have said (as near as I can recall): "The USSR isn't so much an oppressive dictatorship as it is a bungling bureaucracy." Well, of course we didn't gain much data to test the assessment about the dictatorial character of the USSR (but some!), but the assessment of it being a bungling bureaucracy was "right on"!

Dear, think of the worst bureaucracy you've ever experienced. Now, imagine how it could be ten times worse. And now, imagine that it was everywhere (from the grocery store, to the fast-food place, to your school)! It was mind boggling – or, actually, mind numbing! On our first day of encounters with the Soviets (and we were "honored guests"), we stood in lines for 8 hours. I kid you not! Eight hours! Two hours getting on the boat in Helsinki (having our papers checked), 3 hours getting off (having our luggage searched – and I have some stories about that, because my daughter had asked me to send some postcards back to the U.S., to her friends, as a joke – as a result of which the Soviet custom agents searched and searched, and questioned and questioned, but could find absolutely no humor!), and then 3 hours for the line to get on the bus and to get registered at the hotel.

Actually, it would have been even more than 8 hours in lines that first day, save for the help of an Estonian who spoke a little English. After we finally were registered, we decided to get some food at the hotel's restaurant. We were especially in need of a cup of coffee (courtesy our addiction to caffeine). And what did we encounter outside the restaurant? What else, but another huge line (maybe a hundred people), which we joined. The Estonian next to us in the line must of overheard our conversation in English and kindly pointed out to us that the line we were in was for "the locals".

But such was minor compared to the bureaucracy at the Conference. As I mentioned, about 10-or-so of us presented our "expert papers". Then, at almost the end of the Conference, some "chief scientist" of some Soviet laboratory got up and started reading something, in Russian, to all the 200-or-so assembled scientists. I should add that, by this time, I had gotten to know the Russian-to-English translator fairly well (which is another story – the one good experience of our trip!), and maybe I should add that, although I may have a tendency to avoid confrontations in my personal life, I've never shied from confrontations on scientific matters. Consequently, in the middle of the Russian's "speech", I leapt to my feet and yelled: "Tanya [the translator's name]: what the devil is he doing?" Whereupon, without consulting him, she responded: "He's reading the 'Conference Summary'." To which I replied: "Well, that might be the way it's done in the Soviet Union, but it's not the way it's done at an International Conference! How dare he dictate to us what our conclusions are?!" And the assembled scientists burst into applause – including Soviet scientists!

Well, I won't go into details about what happened next (he backed off, a draft "resolution" was circulated among participants, etc.) and I'll wait until a convenient time to talk to tell you stories about other incidents on the trip (conversations with a Soviet "newspaper reporter", becoming friends with a famous Russian scientist, later having him and Tanya come to the U.S., etc.). Instead, to conclude this "introduction", let me just say that, after leaving the U.S.S.R. (when the passengers onboard the aircraft burst into applause, because we were leaving!), after returning to London (when I had the almost uncontrollable urge to stand up at the restaurant at Heathrow Airport and yell: "People, you don't realize how lucky you are!"), and after returning to the lab to put my paper in "publishable form", I realized that I couldn't do it. That is, I refused to be a pawn in their political game: "nuclear winter" had become a "hot potato" in cold-war politics. Consequently, I instead wrote what follows. Subsequently, by the way, it was rejected for inclusion in the Conference Proceedings (understandably so), but Tanya kindly translated it into Russian for me, distributed it to Soviet scientists, and from them, later, I received many comments that convinced me that I had made "the right choice". Thereby, I did what I felt I could to try to end the cold war.

Incidentally, I also sent a copy to Sagan, but received no response – probably, also, "understandably so" – but I don't think that he talked or wrote again about "nuclear winter". In any case, my "essay" follows.

NUCLEAR SHADOWS

"Ladies and Gentlemen: there is a difficult decision I must make, and I would be grateful for your good advice."[1]

"Advice is cheap."

"You get what you pay for."

"Thank you – but spare me the platitudes."

"What do you mean 'platitudes'?"

"People paid dearly to gain such knowledge."

"I suppose."

"So what's your problem?"

"Thank you. I need to decide how to write this nuclear-winter paper."

"That's simple: stick to science; never mind politics, economics, and philosophy."

"But the science is all entangled with politics and economics, i.e., applied philosophy."

"Never mind applied philosophy or even applied science: stick to pure science."

"Sure:[2] from your Chamberlain paper, show them how the atmospheric residence time of particles depends on their sizes and that wet removal usually dominates;[3] remind them of

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[1] Dear: as you would probably infer, the "Ladies and Gentlemen" being addressed here are not in some audience but are those "people" who were assembled in the "Board Room" of my mind. I don't identify "individual" speakers in what follows; only "their" thoughts appear; but based on what I wrote in **B**, maybe you can identify some of them.

[2] Dear: the science in this paragraph (and throughout this essay) can be ignored; I used it only as a "prop" for other ideas, which I consider to be more important. Nonetheless, I'll add a few footnotes to show you at least a little about the relevant science, in case you might be interested.

[3] Here, I'm referring to a paper that I presented at what was known as "The Chamberlain Conference" (Arthur Chamberlain was one of the most famous scientists who investigated how particles are removed from the atmosphere); by "atmospheric residence time" is meant the average time that particles remain in the atmosphere; such particles are removed by rain and other types of precipitation ("precipitation scavenging" or "wet removal") and by processes that don't require precipitation (collectively known as "dry deposition", the most obvious process being just gravitational settling).

Junge's result that nucleation scavenging is of prime importance;[4] show them Ogren and Charlson's result, from the most recent issue of *Tellus B,* that elemental carbon is removed essentially as fast as sulfate (i.e., EC probably can act as a CCN, presumably because the EC develops a hygroscopic coating within a day or so after being exposed to atmospheric gases);[5] remind them of the Thompson et al. results, recently published in *Ambio*, that showed the substantial flow from the northern to the southern troposphere (with an exchange time of about 10 days and which obviously would stimulate substantial rain);[6] comment on the likelihood that cold air over the continents would result in substantial precipitation along the coastlines;[7] and therefore, overall, suggest the residence time of the smoke is likely to be even less than the usual 10 days."

"I disagree – those points are interesting, but they shouldn't be made."

"Why?"

"Because none of them is firm."

"It's similar to what got us into this mess in the first place: hand-waving, flaky science."

"Good point. What's been published brings to mind a child loose in a huge control room of a modern electrical-power plant, with knobs and dials everywhere; the child turns a single knob and shouts with glee: "Look what happens when I turn this knob'!"

"Agreed. None of it's good science. Not only are there no experimental tests of the theories, but the models have too few dimensions and none properly accounts for interactions between the smoke and the dynamics."

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[4] C.E. Junge was another famous scientist in the field; by "nucleation scavenging" is meant the process by which particles start the formation of (or "nucleate") cloud droplets and ice crystals; the particles are then brought to the Earth's surface by subsequent precipitation.

[5] *Tellus B* is a scientific journal; elemental carbon (EC) particles (e.g., "soot particles"), many of which were assumed would be produced by fires associated with nuclear war, are normally hydrophobic (not preferred sites for water condensation); in contrast, sulfate particles (such as the ammonium sulfate particles in some fertilizers) are normally hygroscopic, i.e., they are effective as "cloud condensation nuclei" = CCN.

[6] *Ambio* is another scientific journal; the concept here is that, if a nuclear war occurred in the Northern Hemisphere, the air in the Northern Hemisphere's lower atmosphere (the "troposphere") would mix to the Southern Hemisphere much more rapidly than was estimated in the original paper by Sagan et al., and such air, mixed between the hemispheres, would usually encounter the "Intertropical Convergence Zone", which is where massive tropical clouds occur, with their associated rainfall (and atmospheric cleansing).

[7] This was another weakness of the original paper by Sagan et al. They convinced themselves that the continents would cool rapidly ("nuclear winter"), but they neglected that the oceans wouldn't (the oceans have much larger "thermal inertia" than the continents, i.e., the oceans are slower to cool in the winter and slower to warm in the summer than are adjacent continents); then, this induced temperature change between the continents and adjacent oceans would stimulate more rainfall (over the oceans, where the air would rise, later to settle over the continents).

"So, you would like an experimental test of the theory?!"

"Come off it. The total theory needn't be tested for it to be good science: the components can be tested, and so can the way in which the components are synthesized."

"It better be testable; otherwise it's metaphysics."

"But neither the components nor the synthesis has been tested."

"Well, then, criticize them for publishing a paper that's so flaky!"

"Why? Nothing that an individual could write would be so devastating as the criticism by the National Academy:[8] 'The committee cannot subscribe with confidence to any specific quantitative conclusions drawn from calculations based on current scientific knowledge'."

"Pity they didn't say they couldn't trust the theory even qualitatively."

"Come off it. That's as close as any official committee will ever come to saying: 'It's a bunch of bull'!"

"But it didn't seem to devastate the theory!"

"Well, did you see the news headlines: 'Committee Supports Nuclear-Winter Predictions'?"

"Where did they get that?"

"I don't know. And did you see the comments, by some of the original actors, that the National Academy 'legitimized' their studies?"

"That's nothing. The *Newsweek* Ad for Sagan's TV special said: 'U.S. and Soviet scientists agree that 'nuclear winter' would mean the end of life on earth… based on fact'."

"That's a lie."

"That's show biz."

"It sure as hell ain't science."

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[8] This refers to (and quotes from) a review of "nuclear winter" ideas by the U.S. National Academy of Sciences.

"Well, that it's 'based on fact' is a lie; but who knows, maybe there is agreement between at least two scientists."

"Maybe – but there are a lot more who agree that it's a bunch of garbage."

"A part of the problem may be that the Academy added its own calculations."

"Sure, with another set of slow removal rates and another set of one-dimensional calculations."[9]

"So, criticize the Academy, too."

"Again, no! Then you'll be involved in the same that you're criticizing: flaky science."

"Well, then, solidify the science!"

"Oh, sure: this weekend or next?"

"It can't be done now. As the Academy said, all this stuff is beyond current knowledge. It'll take years to clean up this mess."

"Then hit them with some qualitative stuff."

"Fight fire with fire."

"He who lives by the sword will die by the sword."

"Thanks a lot!"

"Then recommend additional research; that's always a safe bet."

"No."

"Why?"

"Well, first, recommending additional research, in effect, puts a blessing on this whole business."

"But it won't hurt to do additional research: even if this whole nuclear-winter business turns out to be a ruse, an infusion of new research dollars will likely lead to some good new information about the atmosphere."

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[9] That is, in the calculations by the Committee of the U.S. National Academy of Sciences (and in the original paper by Sagan et al.), the rates at which the particles were assumed to be removed from the atmosphere by wet and dry deposition were too slow, and the mathematical models, themselves, were woefully inadequate, for they included only one spatial dimension (height) rather than three.

"Oh sure. And what if the results demonstrate that there would NOT be a nuclear winter? Will someone then decide it's okay go ahead with a nuclear war?"

"No one would be that stupid."

"Oh?"

"Then show them the likelihood that there would be even more intense fires, associated with the high winds and low humidity."

"You mean 'cry wolf' a second time?"

"But it seems likely."

"And is that theory any more firm than this nuclear-winter business?"

"Let's cross that bridge when we come to it."

"Plan ahead."[10]

"Thanks again."

"Besides: do we really need any additional evidence that war is hell?"

"Someone said that he thought a nuclear war could be won."

"Yah, but what's his I.Q.?"

"Enough of that: you're back talking politics! What additional reasons for not recommending additional research?"

"Well, there's only limited research talent and research funding, and if you support the Academy's recommendation for additional research on nuclear winter, you're simultaneously recommending against research on other topics."

"You can never do just one thing."[11]

"With so much money and talent wasted on this stupid arms race, recommend that some be deflected to conduct further research."

"Oh sure – and let the other side get ahead in the race?"

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[10] With this example (and earlier ones), I'm trying to illustrate the concept that one can usually find a maxim to fit any occasion – and also its converse!

[11] This is a quotation (source unknown) that has come to be known as "the first principle of ecology".

"Why not recommend that the race be terminated?"

"And who is going to listen to you, when no one has listened during the past third of a century?"

"More like the past 30 centuries."

"Why can't people get along?"

"Everyone is just trying to survive."

"Well, if there's a common goal, why can't we cooperatively pursue it?"

"Because each side thinks that the other is an impediment to reaching its own goal of survival."

"But the biggest threat to survival is this lack of cooperation!"

"There's more: each side thinks it has THE magic formula for reaching the goal."

"Maybe there's more than one."

"Maybe there's none!"

"Everyone struggling to reach some utopia, not realizing that 'utopia' means 'not a place'!"

"Everyone struggling to get nowhere!"

"Not realizing that successful struggling is what's desired."

"Class struggle?"[12]

"No – against whatever threatens one's survival."

"Sounds circular."

"There is an out: the struggle for security is the cause of the insecurity."

"'Hold your breath and you lose it'!"[13]

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[12] That, of course, was Marx's idea.

[13] These ideas about utopia and security (and, I'm fairly sure, also this quotation) are from one of the books by Alan Watts.

"'Forget about the pursuit of happiness and concentrate on the happiness of pursuit'!"[14]

"The damnedest thing is that the economic methods used by both sides are converging: a compromise between free enterprise with regulations (vs. a regulated economy with incentives!), a consumer driven economy, with much of the road dominated by state traffic (vs. a state-planned economy, trying to meet consumer pressures), constraints on the brutality of efficiency (vs. freedoms to bypass bureaucratic inefficiency), and so on."

"If so, why?"

"Same objective: survival / security."

"What about freedoms?"

"They follow economics."

"Maybe so, but there is another schism: one side sees religion as 'opium for the masses'; the other see collectivism as 'cocaine for the intellectuals'."[15]

"Sounds like a lot of drug addicts."

"Drugged on causes; running from reality."

"Running from 'existential isolation'."

"So says the isolated ego."

"Try breathing in isolation!"

"Such a stupid species."

"Too much philosophy."

"'The only serious philosophical question is whether or not to commit suicide'!"[16]

"B.S. The only serious philosophical question is: how do you stop laughing?"

"That's easy: just have your survival threatened."

"That's reality, not philosophy."

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[14] This is from a poster that you might have seen on my wall; I don't know who created this stunning line.

[15] "Religion is opium for the masses" is, of course, from Marx; I'm sorry, but I've forgotten where I came across the other quotation.

[16] That quote, which I'll address in a later chapter, is from Albert Camus.

"Let's get back to reality."

"The problem at hand is with nuclear winter."

"I disagree: it's all politics and philosophy."

"Then stay out of the whole business."

"You may want to, but you're already in it; and if you don't comment, then you leave the field open for others."

"Let them have it!"

"But it's such a travesty."

"Of what?"

"Science."

"Is that your main complaint?"

"I guess so: I'm worried that science will be damaged."

"How?"

"The public will lose respect for science – confidence that science will yet find solutions to some of these horrendous problems."

"Wait a minute: the goal of science was never to help solve practical problems; it was to understand nature!"

"Yes, but it was always expected that the understanding would be used to solve practical problems."

"Sure: even Einstein engaged in applications."

"He didn't become involved in them; that was left for the politicians, engineers, and technicians."

"B.S. In fact, triple B.S.! First, recall that he recommended to Roosevelt that a nuclear bomb be built."

"Yah, okay, but that was a very special circumstance – and he regretted it."

"Second, he subsequently spent most of the last 20 years of his life working for peace."

"Yah, and his science suffered for it."

"But did we?"

"I don't know. Who knows what he might have discovered if he had kept working, full-time, on science."

"And third: why leave the applications to others? Does someone else have better training to be a citizen?"

"But it's such as waste of scientific talent!"

"So, is that your problem: the waste?"

"Well, sure, that's a problem: everything about this asinine arms race is a waste. But there's more: people who have earned reputations in science use this reputation to promote non-scientific ideas."

"So what? They have a right to their own ideas and a right to promote them in any way they desire, so long as it doesn't damage someone else's equal rights."

"But they're dragging science down in the process."

"Down to applications – or up to applications?"

"You have a point."

"No. That's not the point here. The point is, in this application, the science is so damn weak."

"Is that your main complaint?"

"Yes."

"Then say so."

"Hell: we're going in circles; we've just been through all that; the Academy already torpedoed them."

"Then let them sink."

"But they're not sinking; there's too much politics supporting them."

"Then fight the politics."

"Great – and hurt science even more?"

"Scientists are becoming like hired guns, like lawyers: available to bolster anyone's pet cause."

"How did this happen?"

"What passes for science seems to be deteriorating, plus the ease with which 'scientists' can 'go public'."

"Watch out: more of that, and the politicians will step in and control science."

"I doubt it. They can't afford to – which leads to an interesting point: likely the largest common denominator of the two competing systems is that both must rely on scientific advances, and these are shared."

"And it's great that, in the main, neither side can afford to restrict the publication of scientific results."

"Freedom of press for truth?"

"But who's to decide what's true?"

"There is a method for its protection: scientific peer review."

"Was it applied here?"

"I don't know; and even if it was, how does that stop publicity hounds from calling a press conference?"

"Hey, go easy! You don't know that they're publicity hounds. Give them the benefit of the doubt. Assume they are convinced that this nuclear-winter business is real."

"They couldn't be convinced; they must know how weak the theory is!"

"Well, they do now, courtesy the Academy."

"But they're not listening; they say they've been 'legitimized'."

"Then tell them!"

"Here we go again, round and round in circles."

"It sounds like a problem for the scientific community to solve."

"How about a committee of scientists who could withdraw scientific credentials?"

"More regulations?"

"Who will regulate the regulators?"

"Let it be!

"It sure as hell doesn't help science to have all these arguments in the open."

"Are you sure?"

"Sounds to me like you have a distorted view of science."

"Go on."

"What's science?"

"Well, of course it means 'knowledge'."

"And scientific studies?"

"Well, how about: studies in which there are a few knowns and an unknown number of unknowns?"

"What's meant by known?"

"If something's known, then verifiable predictions can be made."

"And who is a scientist?"

"Someone who knows the difference between knowns and unknowns, is trying hard to change some of the unknowns into knowns, and proceeds according to an obvious method; i.e., the scientific method."

"And are there arguments in science?"

"Of course! But they're about whether something yet belongs in the known category."

"And should the public be allowed to hear these arguments?"

"Of course – but I doubt if they would want to."

"Why?"

"They're too damn complicated; I can barely follow the arguments in my own specialty."

"And are nuclear-winter science arguments complicated?"

"Well, yes and no: the concepts seem simple enough (the accuracy of one-dimensional models, the ability of smoke particles to act as cloud condensation nuclei, the amount of precipitation induced by the smoke, and so on), but to answer such questions will take years of research."

"So, what's wrong with the public hearing that?"

"Nothing, that's what the Academy already said; but that's not what's going on here."

"So, what is?"

"Well, first, what the public is hearing (for example, from Sagan) is not one side of a scientific argument; instead, it's speculations derived from an untested and severely criticized theory."

"And the theory just happens to support his political views."

"A new religion?"

"A new cause."

"Not a bad cause."

"A be cause!"

"Because he wants to be!"

"That's not the point: it's not science."

"Somewhere in all of this, presumably, there's scientific truth – verifiable predictions."

"Yah, years away."

"Second, it's becoming a popularity contest."

"A new messiah?"

"But personalities and reputations must be irrelevant to science."

"Come off it: you mean if Einstein said something it doesn't carry more weight?"

"Weight, yes, but it's different: it would mean that more people would more rapidly try to prove him wrong!"

"Agreed: an Einstein, or any scientist worth her credentials, would be extremely pleased to learn she's wrong, if she thereby learns more."

"That's why this nuclear-winter business isn't science, these people aren't behaving like scientists, and the whole business isn't a scientific argument: people care if the theory is right or wrong."

"Loss of objectivity."

"Means loss of science."

"And do you have so little respect for the public that you think they can't understand that?"

"It's not that. The problem is that this whole nuclear-winter business is disguised as science: 'U.S. and Soviet scientists agree that nuclear winter would mean the end of life on earth'."

"Does Nature agree?"

"These show-biz freaks no longer care about her opinion!"

"Then yell!"

"Would I be heard over the voices of the National Academy?"

"Here we go again!"

"These circles are making me dizzy."

"They're making me sick."

"No, maybe there's something more. Here, the science is linked with international politics, different economic systems, and war."

"Why do I think he's drifting away?"

"Hear me out. In the past, science has caused the evolution of philosophical systems."

"A mighty slow evolution!"

"In some cases it's slow, I agree. But look at the evolution caused by global communications, in turn courtesy electrodynamics."

"I suppose."

"Who modified more: Maxwell and Marconi, or Marx?"

"That's not the point: Maxwell and Marconi modified Marx."

"And it's nothing compared to what computers will do."

"Man is not just a tool-making animal; man is modified by his tools."

"And so long as science and technology continue to evolve – and they must in the present systems – then so will man."

"If our tools don't kill us!"

"Yes, but there's more: in so far as we are rational and our understanding evolves, then whatever isn't 'advisable' in the present systems will evolve into something with a firmer scientific foundation."

"That's hopeful."

"It's about time we heard something hopeful."

"But what's meant by 'advisable'? That sounds like a moral judgment; moral codes can differ for different systems; and therefore, scientific advances may not lead to any decrease in tensions."

"I disagree: morality can only be judged with respect to an objective, and if there's a common objective, then there'll be a common morality."

"What did you say was this common objective?"

"It's obvious: every person wants to survive, which, in turn, is how these human genes go on."

"You say that humanity's survival is the common goal?"

"Of course."

"Well, then, with such a simple, common goal, why can't we get along?"

"A huge number of reasons: thoughts that others threaten our own survival, different devised schemes for promoting this survival, confused thoughts about how to survive, and so on."

"What a bunch of crap: I know many people who don't give a damn about the survival of your genes."

"It's confused thought – or lack of thought. They're uneducated. When they learn that all humans are related – that all humans are closer than 50th cousins – then they'll understand that the common goal is humanity's survival, even, prosperity."

"Ha! I know of many religious people who vehemently disagree that 'humanity's survival' is the prime goal; they have their own concepts of how to survive."

"Precisely! You said it: survival. And I already covered their case: confused thought."

"But isn't there a best way to promote one's own survival (and therefore, if I agree with you) humanity's survival and prosperity?"

"Who knows? But more: who cares? It makes life more interesting when many different methods are explored."

"Provided that one method doesn't include the extermination of others."

"Yes, and therefore the need for some universal moral codes."

"Oh great: and therefore a universal government, a single economy, and all the rest!"

"No, that's not needed: the universal code is so obvious that it's already known and practiced throughout the world."

"Go on."

"Well, look at the common denominator in the following codes, as given by Confucius, Aristotle, Christ, and Marx: 'What you do not want done to yourself, do not do to others'; 'We should behave to our friends as we would wish our friends to behave to us'; 'Whatsoever ye would that men should do to you, do ye even so to them'; 'The free development of each is the condition for the free development of all'."

"Hmm."

"Precisely."

"And the reason is obvious: one's own chance of survival is improved if all agree that everyone has an equal right to claims one's own existence."

"Enlightened self interest!"

"A survival code!"

"B.S."

"Would you care to be more explicit?"

"Survival is what animals seek; man is more than animal; man seeks freedom, pleasure, art, and on and on."

"Superficial though; Spinoza called it confused thought. Make a list of all your pleasures (and pains). Then, maybe you'll see even farther than Spinoza saw: pleasure (happiness) is just a signal telling you that you and the species are surviving; pain signals the opposite."

"Nothing but animals? Robots programmed to survive by some dumb molecules? What's the point?"

"Careful. More than animals because of our rational minds, the best applications of which are in science. The point? The meaning? The value? These can be judged only with respect to an objective; in this case, the objective it to help these human genes continue."

"Is that all?"

"Another circle: the good is to survive, because to survive is good!"

"Well, at least it's closed!"

"Running in damn circles!"

"A new religion?"

"Actually, it's quite old."

"And no, that's not all: you can choose any number of sub-objectives, but you'll find that for any, except suicide, survival will remain the prime objective."

"Some examples?"

"Well, that depends on your background and the society in which you live. If you are free to make your own choice, then a huge number of options are available: lessening of drudgery, perfection of some style, diminution of unnecessary pain, exploration of new frontiers, pursuit of knowledge,…"

"Back to science?"

"Yes – and back to this nuclear-winter business: not only does nuclear war threaten an individual's and even humanity's survival, now this nuclear-winter junk is likely to damage science."

"We've been through that: open arguments may also help science."

"Open scientific arguments, yes; but not political arguments disguised as science."

"Well, open arguments about anything (politics, philosophy, whatever) sound pretty good."

"Provided it's made clear that one is arguing as a scientist or as a politician or as a… whatever."

"Too many damn labels."

"What an argumentative bunch."

"That's not too bad, provided we remain civilized."

"Robert's Rules for Arguments"

"That's good!"

"Here's one: when scientists argue about political matters, scientific hats must be removed."

"A more important one: don't get physical."

"Like war?"

"'All's fair in love and war'."

"No it's not. Starting war is unfair. War violates the moral code: everyone has an equal right to claim one's own existence."

"But recourse to war, the 'final arbitrator', may result from earlier violations of that same code."

"Rape a man's life and expect a fight."

"In a civilized society, courts set it right."

"Poetry?"

"Versification."

"But it's not a civilized world. What's needed are international courts with some muscle."

"That'll require a universal moral code."

"We have that!"

"Maybe."

"What other options?"

"Well, we could build new systems that make nuclear weapons obsolete – star wars and all that sort of stuff."

"It won't work; it'll just lead to an arms race in space."

"Well, as soon as the method is perfected, bomb the other side out of existence; then we won't need to worry about their threats to our survival."

"Come off it."

"Never mind: I'm talking theory."

"It won't work. Even if technology allowed and even if one side clearly got there first, peace among the survivors would never succeed, built on such an immoral base."

"Well, then, how about going, now, for peace: disarm, become pacifists, let them take over, win by surrendering, love will conquer all, etc."

"The probability of being able to go that way is even smaller than the small probability of nuclear war."

"Then suggest world government, as Einstein recommended."

"Under what system?"

"Then what? Continue this way?"

"Probably so."

"It's too dangerous."

"Maybe not: with every passing day, the probability of nuclear war decreases. It's said that a nuclear war would take about seven minutes; if we divide the past 30 years, or so, into seven minute intervals, then the probability of a nuclear war during the next seven minutes is about 4.4×10^{-7}, and it's falling continuously."

"More likely to be killed on the highway!"

"You mean you think we WILL survive?"

"Yes, and even more: with another century of scientific and technological advances similar to those of the past century, then likely we'll all be friends, all appreciating our common objectives and the value to each of each other's presence."

"I see little cause for such optimism."

"What scares me is that some with their fingers on the nuclear trigger believe in 'life' after 'death'."

"Sounds like a pretty good 'lief'."

"Do words no longer need meaning?"

"But there is hope: a common goal, a common moral code, and a common method – via science."

"And therefore, since the first two are firm, strengthen science?"

"Precisely."

"Then do you recommend that I criticize these nuclear-winter predictions?"

"No – enough has already been said."

"Then what do you recommend?"

"Let me remind you of what that fellow said on his death bed."

"What 'fellow'?"

"I've forgotten his name; a guy who helped build the first atomic bomb."

"So, what did he say?"

"The world will likely blow itself to bits; and as far as I can see, the only chance that it won't – is if no one tries to do anything about it."

"Beware of saviors?"

"Said the savior."

"Every light that shines also causes shadows."

"But if there were no shadows, new lights would never shine."

"Thank you, Ladies and Gentlemen."

"So what are you going to do?"

"I plan to thank Tanya for the card, celebrating the birth of the sun."[17]

"Is that all?!"

"It's all that matters."

"Does it really matter?"

"Isn't that the title of a book by Alan Watts?"

"Yah."

"He's dead, isn't he?"

"No: he died, but he isn't dead."

"Ideas live on?"

"Yah."

"Too bad more people didn't realize that words are just symbols: do you think that, in a million years from now, people will still be arguing about the meaning of existence?"

"I doubt it: in another century or so, surely people will realize that base words can't be defined in terms of other words."

"Maybe with math?"

"Maybe."

"I never understood the root of minus one."

"It follows because zero was defined."

"You mean there is no zero?"

"Well, you can have zero buckets of water in a well, but try having minus one."

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[17] Dear: As I mentioned in the "introduction", Tanya was a wonderful woman who your grandmother and I met in Russia, who was a translator for one of the Russian scientists, and who later became a good friend. She had sent me a card – and later she translated this essay for me into Russian and distributed it in the USSR.

"Zero is what gives one meaning!"

"Without nothing, there would be nothing."

"The point is: if something is negative, then it isn't a scalar; it's a higher-order tensor."

"So, any imaginary number is an illusion!"

"Oh – cute."

"Would you guys kindly shut up?!"

"Thank you."

"You're welcome"

"Shh… I think he wants to snooze."

"Remember: 'the mystery of life is not a problem to solve, but a reality to be experienced'."

"Who said that?"

"Shh…"

"One, two; three, four. One, two…"

"Look at the scenes."

"Beautiful."

"Mere illusions."

"Quiet… or they'll disappear."