

Visions of a Sustainable World

by Murray Gell-Mann

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What do we mean by “sustainable”? In *Through the Looking Glass* Humpty Dumpty explained to Alice how he used words to mean anything he wanted, paying them on Saturday night (the end of the work week) for the privilege. If Mr. Dumpty were in charge today, a great many people would be paying wages to the word “sustainable.” For example, if the World Bank finances some old-fashioned development project destructive of the environment, these days it is sure to be labeled “sustainable development” in the hope of making it more acceptable. So perhaps we, too, can feel free to *assign* a meaning, at least a vague one, to “sustainable” for the purposes of our symposium.

Surely we do not mean stagnation, with no hope of improvement in the lives of hungry or oppressed human beings. But neither do we mean continued growing abuse of the environment as population increases, as the poor try to raise their standard of living, and as the wealthy exert an enormous per-capita environmental impact. Environmental quality, however, is not the only quality about which we are concerned. In negative terms, we need to avoid catastrophic war, widespread tyranny, and the continued prevalence of extreme poverty, as well as disastrous degradation of the biosphere and destruction of biological and ecological diversity.

The literal meaning of the word “sustainable” is not useful here. For example, complete absence of life or of human life might be sustainable for a long time, but it is not what we mean. Universal tyranny might be sustainable, but that is not what we mean either.

The key concept is probably the achievement of sustainable quality, quality not purchased mainly at the expense of the future. It encompasses quality of human life and quality of the biosphere, including survival of many of the organisms with which we share the planet and the ecological systems that they form. Even if a very crowded, highly regimented, extremely violent world with only a few species surviving could be kept going somehow, this is not what we mean by “sustainable.”

Some of us may be technological optimists, believing that we humans do not need to change course very much in order to avoid that kind of future and achieve sustainability through an endless series of technological fixes. And some of us may not believe in the goal of sustainability at all. Nevertheless, we can still discuss the topic, even do research on it. Even if we do not accept “sustainability,” as it is discussed here, as a goal, we can still ask whether there are ways to approach it during the next 50 to 100 years and, if there are, what those ways might be and what the world might look like as a result. The discussion of the questions does not require the sharing of the values of those who asked them.

Historians tend to be impatient with people who claim, “This is a unique period in history.” That has been said about too many eras. Still, our time is special in at least two well-defined and closely related ways: First, the human race has attained the capability of altering the biosphere in a major way. A full-scale thermonuclear war could wipe out a significant fraction of life on the planet, not to mention the trouble that could be





The population of Bangladesh is increasing at an economically unsustainable rate. Although not even among the top 50 nations in land area, its population of 115 million will double in 28 years, approaching that of the U.S. Shown here is the main Friday market in Dhaka.

caused by biological and chemical weapons. And by our procreation and our economic activities, we are altering the global climate and exterminating large numbers of the species that share the biosphere with us. Actually, our destructive effect was greater in the past than is usually admitted—for example, deforestation by the axe and by domesticated goats and sheep, followed by erosion and desiccation. Even the tiny numbers of ice-age people in North America may have contributed to the extinction of the North American ice-age megafauna, such as the woolly mammoth. Nevertheless, today's potential for damage concerns the entire biosphere in ways that are unprecedented. We have a growing multiplicity of environmental problems affecting climate, the oceans, the quality of water and air, to say nothing of the disappearance of species and ecological systems, deforestation, desertification, soil erosion, and so on. Many of the problems are old, but the scale is new.

Second, the rising curves of world population and natural-resource depletion cannot go on rising steeply forever; they must soon pass through inflection points. Will those curves flatten out as a result of human foresight and progress toward a sustainable world? Or will they turn down as a result of the traditional scourges of war, famine, and pestilence? If they do flatten out, will it be at levels that permit a reasonable quality of human life, including a measure of freedom, and the persistence of a large measure of biological diversity? Or will it be at levels that correspond, if there is a sustainable society at all, to a gray world of scarcity, pollu-

tion, and regimentation, with plants and animals restricted to a few species that co-exist with mankind?

We can look at the progressive development of the means and the scale of military competition in a similar way. Will we allow large-scale, thoroughly destructive wars to break out, or will we use intelligence and foresight to limit and redirect competition, to damp down conflict, and to balance competition with cooperation? Will we learn, or have we perhaps already learned, to manage our differences short of catastrophic war?

Gus Speth, president of the World Resources Institute, has suggested that the challenge to the human race over the next few decades is to accomplish a set of interlinked transitions. I have modified his list slightly, incorporating more political, military, and diplomatic considerations in addition to the social, economic, and environmental ones that he emphasized. Much of the discussion that follows is organized around this somewhat crude but useful notion of transitions.

The Demographic Transition

Today, in many parts of the world, there are still high rates of population growth. That is particularly true of tropical, less-developed regions—often in countries that can least afford it. Most authorities estimate that world population will level off some time in the next century, but at a level something like twice the present number of 5-1/2 billion or so. The factors (including improvements in the position of women, availability of safe and effective contraception, and the erosion of traditional incentives

for large families) that are thought to be responsible for the decline in net fertility in many of the developed countries may yet accomplish similar results elsewhere.

If human population will really go through an inflection point and level off in a few decades, both globally and in most regions of the globe, not only is that a historical process of the greatest importance, but the timing of it and the size of the resulting numbers are likely to be of critical importance as well. It seems overwhelmingly probable that population growth encourages environmental degradation, whether through the huge consumption rates of the wealthy or through the desperate struggle of the poor to survive at whatever cost to the future.

The Technological Transition

Many of us pointed out decades ago that it is useful to measure environmental impact, say in a given geographical area, by three numbers multiplied together: population, conventionally defined "prosperity" per person, and environmental impact per person and per unit of "prosperity." The last factor is the one that particularly depends on technology. It is technological change that has permitted today's enormous human population to exist at all, and while there are billions of people who are desperately poor, there are quite a few who live in reasonable comfort. The environmental costs have been huge, but nowhere near as great as they may be in the future if we don't watch out. For a given environmental impact, how much the second factor ("prosperity" per person) can be improved, especially for the very poor, depends to a considerable extent on how much is squandered on the first factor, mere numbers of people. But technology, if properly harnessed, can work to keep the third one as small as possible.

Even simple technological fixes can end up being extremely complex, as in the example of eradicating malaria in human beings: Draining swamps destroys wetlands; DDT sprayed on mosquitoes gets into the food chain; DDT resistance develops; the rural poor in tropical climates can't sit under mosquito nets when they need to work at dawn and dusk; even bioenvironmental controls of mosquitoes or eventual vaccines against malaria might open up for development critical habitats that had hitherto been too dangerous for humans. But ultimately the technological transition has the capacity to lower environmental impact in industrial production, in the extraction of minerals, in food production, in energy generation, and so forth.

The Economic Transition

If the air or the water is treated as a free good in economic transactions, then polluting it—using up its quality—costs nothing, and economic activity is carried on by stealing from the environment, or stealing from the future. There have been attempts for centuries to deal with such problems with prohibitions and fines, but they were often ineffective. Today regulation is attempted on a massive scale in some places, and there are some successes. Presumably the most efficient way to treat such problems is to charge for the cost of restoring the quality. Economists refer to this as internalizing externalities. Regulation, with its fines and other punishments, is a form of charging, but regulators usually require specific actions, whereas internalizing just means paying to restore quality or avoiding the degradation in the first place by whatever means is cheapest. Attempting to charge real costs is a principal element in the economic transition from living in great part on nature's capital to living mainly on nature's income. Charging is *probably* better than regulation, but charging is *certainly* much better than exhortation. For one thing, it reduces ambiguities.

Suppose you are in the business of awarding green seals to products sold in supermarkets for their low environmental impact. After a while you encounter a problem. A particular detergent may be lower in phosphates and produce less eutrophication in lakes, but it requires higher energy use because it needs hotter water in the wash. Soon you find more trade-offs. How do you balance one consideration against another? If there is at least a crude attempt to charge for the eutrophication and if the cost of the energy needed is clearly marked on the product, then a consumer can just use price to make decisions. He or she doesn't need a green seal or even a conscience.

Another topic to mention here is accounting. Do national account systems include the depletion of nature's capital? Usually not. If, as president of a tropical country, I contract to have a large chunk of primary forest cut down for a low price and a small bribe to me, the national accounts show the price as part of the national income (and maybe even the bribe if I spend it at home instead of sending it to a Swiss bank), but the depletion of the forests does not appear as a corresponding loss. And it is not always tropical countries that sell their forests at a loss; look at what is happening to the temperate rainforest in Alaska.

But what most clearly reflects the level of concern over living on nature's capital is the

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discount rate. I understand that the World Bank, in financing projects with large environmental impacts, still applies a discount rate of 10 percent per year to the future. If that is true, it means that the loss of some great natural asset 30 years in the future is discounted by a factor of 20, down to 5 percent, if it is counted at all. The discount rate, used in this way, is a measure of what is called intergenerational equity, which is crucial to the notion of sustainable quality. If we discount the future too steeply, we are stealing from the future. If we generalize the idea of discount rate somewhat, we can say that in many ways it embodies much of what we mean by sustainability.

Economists make much of the possible trade-offs between intergenerational equity and intragenerational equity, that is, the competition between concern for the future and concern for those who are very poor today. Today's poor need to exploit some resources in order to live, even if precious value is lost to the future in the process. In fact, some of the degradation of the biosphere today is carried out by the very poor scabbling for a living, just as some of it comes from the wealthy squandering resources on frills. But a great deal is connected with large projects that are supposed to help the rural poor of a developing country, but in fact often do so rather inefficiently and destructively. Large numbers of smaller efforts, such as microlending, often work better. In this process an institution lends very small amounts to local entrepreneurs, many of them women, to start small enterprises that provide a living locally to a number of people. Many of these offer comparatively nondestructive employment, and contribute to intragenerational equity.

The Social Transition

While we can view the economic transition as accomplishing a gradual transformation from growth in quantity to growth in quality, it is hard to see how we can speak of quality of life if there are still large numbers of people starving, lacking shelter, or dying young of disease, when a more comfortable existence is attained by billions of other people. Clearly, moves in the direction of intragenerational equity are needed for sustainability. And it may be that there is more synergy than conflict between intergenerational and intragenerational equity; the policies that really help the rural poor in developing countries may not be so much in conflict with those that preserve nature. Also, the policies that help the urban poor may not conflict so much with the

avoidance of urban environmental catastrophes, nor with the resolution of environmental and land-tenure problems in the countryside (and problems of domestic urban subsidies or foreign agricultural subsidies) that are producing large-scale migration to the cities, many of them already swollen to such proportions as to be almost unmanageable under present conditions. In fact, the social transition must include solutions to some of the problems of the mega-cities.

The Institutional Transition

The desire to participate actively in the emerging world economy is strongly motivating the actions of governments and businesses in many parts of the world. Taken along with rapid transport, global communications, and global environmental effects, it renders essential a greater degree of global cooperation to deal with the serious and interlocking issues that face us all. That is the institutional or governance transition. Here a great many considerations come together. The need for regional and global cooperation is hardly restricted to environmental matters, or even environmental and economic matters. The maintenance of peace, so-called international security, is at least as important. Recently, with the changes in the former Soviet bloc and a certain lack of opposition from China, it has become possible for the United Nations to function more effectively than in the past. It is even a routine matter now for the UN to sponsor negotiations to end civil wars and to sponsor the monitoring of elections. But there are many other ways in which transnational cooperation is taking place, and indeed the role of the national state is necessarily weakened in a world where so many important phenomena increasingly transcend national boundaries.

In many spheres, we have had for a long time transnational and even universal or nearly universal institutions, formal or informal. Now there are many more. Typically, they channel competition into sustainable patterns and temper it with cooperation. They range from WHO, UNICEF, and the IMF to Interpol, the Convention on Broadcast Frequencies, migratory-bird treaties, ICSU, and PEN. Some are more important than others, but they are all of some significance.

More and more, we are beginning to come to grips on a global basis with some of the problems of management of the biosphere and our activities in it. The recent willingness of Eastern Europe and China to play a role in making world institutions and practices work is extremely encouraging. It results in the probability of near-univer-

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sality for numerous activities for which there was little hope of it before. Negotiations are also beginning on the “global commons”—those aspects of the biosphere that are not recognized as belonging to anyone and that therefore belong to all, and where selfish exploitation without cooperation can only lead to results unfortunate for everyone. Often these negotiations are based on what Harlan Cleveland calls the “planetary bargain,” in which resource transfers from wealthier countries to poorer ones carry an obligation for the poorer ones to make contributions to global sustainability, such as protection of forests or avoiding nuclear proliferation.

But the problem of what we may call generalized tribalism, the sharp and often violent competition among peoples of different language, religion, race, nation, or whatever, has come into even sharper focus than usual in the last few years, with the lifting of some of the lids that had been put on these competitions by authoritarian regimes. The world is experiencing simultaneously trends toward unity and toward fragmentation.

The Informational Transition

The operation of local, national, and transnational mechanisms for tackling environmental, economic, and security issues, and others, as well as the strong interactions among all of these, requires a transition in knowledge and understanding, and in the dissemination of that knowledge and understanding, that we can call the informational transition. Here natural science,

technology, behavioral science, and professions such as law, medicine, teaching, diplomacy, and so on, must play important roles. Only if there is a higher degree of knowledge and understanding, among elite groups and even among ordinary people, of the complex issues facing us do we have any hope of achieving sustainable quality. And it is not sufficient for that knowledge and understanding to be specialized. Of course, specialization is essential today, but so is the integration of specialized understanding to make a coherent whole. Excellence is cultivated and recognized in specialties, yet leaders are expected to make decisions that take into account not only numerous factors but also the complex interactions among them.

It is in the nature of complex, nonlinear systems that one cannot properly predict their behavior by analyzing pieces or aspects of them separately on a predetermined basis and then putting together those pieces in an attempt to try to grasp the whole. It is essential, therefore, that we assign a higher value than we have been accustomed to do to integrative studies that try to study all the features at once, with their interactions, by a kind of rough modeling or simulation. Some early examples of such attempts to take a crude look at the whole have been discredited because the results were released too early and because too much has been made of them. That should not deter us from trying again, but with appropriately tentative and modest descriptions of what will necessarily be very approximate results.

The Ideological Transition

Finally, there is the ideological transition, comprising the transformations of our ways of thinking that may be required if we are to achieve the sustainability of quality. We don't know to what extent some of our attitudes toward other people and toward our fellow organisms are governed by inherited tendencies. It may be that some of our propensity to form groups that don't get along with one another and some of our propensity to wreak unnecessary destruction on the environment have hard-wired origins—biologically evolved tendencies that were perhaps once adaptive but are so no longer in a world of interdependence, destructive weapons, and greatly increased capacity to degrade the biosphere.

Still, we know that cultural evolution, which is much more rapid, can modify biological propensities. Sociobiology teaches us that we must inherit a tendency to protect ourselves and

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our close relatives so that we and they can survive to procreate and pass on some of our genetic patterns. But in human beings that kind of tendency is profoundly transformed by culture. Tribal cultures can treat relatives who are very distant as brothers, mothers, fathers, and so on. Perhaps the tribespeople jump into rivers to save them much as they would their really close relatives. And, in fact, this kind of so-called "altruistic" behavior extends, in some measure, to the whole tribe.

At a level of greater complexity, this sort of altruism can apply under certain conditions to an entire nation. In this way, the concept of "us" has grown and grown. Can it now grow, on a short time scale, to encompass the whole of humanity and also, in some measure, the other organisms and the ecological systems in the biosphere that we all share? Can family consciousness evolve to planetary consciousness fast enough? Let us hope so, because the future depends greatly on it.

Human cultural diversity and the multiplicity of ideologies characterize our ways of thinking across the globe. Some of those ways of looking at the world, ways of viewing the good life, life styles if you like, may be especially conducive to sustainable quality. Can they become more widespread?

One of the greatest challenges is to achieve unity in diversity. Often, when unity has come in the past, it has come in the form of conquest, sometimes including the attempt to wipe out cultural diversity. In today's world, we have the need, if we are to have sustainable quality, for cultural evolution to accommodate unity in diversity, with the diverse traditions evolving so as to permit cooperation and the other transitions we have discussed. Community is essential to human activity, but the communities have to be motivated to work together, or the future is not hopeful. If our long-outdated proclivities toward what I call generalized tribalism are excessively indulged, we will have military competitions,

breeding competitions, competitions for resources, and so forth at a level that will make the sustainability of quality difficult or impossible.

Our distinguished participants will try to give partial answers to some of these questions. How can these transitions toward sustainable quality be accomplished, if at all, during the next 50 to 100 years? How can we hope to understand, even crudely, the complex interactions among the transitions and their delicate relative and absolute timing? Are there other transitions, or other ways of looking at the whole set of issues, that are just as important? These questions concern the middle range of time.

In the longer range, what kind of dynamic global situation might exist in the middle of the next century in which the sustainability of quality would be approached? What are our visions of such an unfolding situation? What would we see and hear and feel if we were there? How would such a sustainable world adapt to opportunities and to threats of disaster?

Let us really try to envision it, especially a world with growth in quality rather than growth in quantity. Let us imagine a world in which the State of the World Report and the World Resources Report do not look worse every year. And let us also ask what kinds of surprises, technological or otherwise, could make that fairly distant future totally different from what we might imagine.

In the short term, what kinds of policies and activities in the immediate future can contribute to the possibility of approaching sustainable quality later on? What kinds of policies can we advocate, and what can we do in our own lives? Here the issue of preaching versus practice necessarily comes up. Are we ourselves working toward an appreciation of more sustainable life styles? Are we ourselves behaving in a more sustainable manner? It is time for us all to pay serious attention to envisioning a sustainable world. □

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