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Labeling, Trade and Genetically Modified Organisms (GMOs):

A Proposed Solution

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C. Ford Runge and Lee Ann Jackson**

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ABSTRACT

The purpose of this brief article is to assess the current controversy over Genetically Modified Organisms (GMOs) in agriculture and its potential implications for the global trading system. More importantly, it offers a solution to the serious potential for injury to this system, to be developed below. The remainder of this article is divided into three sections. The next section will discuss labeling of GMO agricultural products, distinguishing between issues of food products and those affecting seed. Next, it will argue in favor of a particular type of "negative" label ("this product contains no GMOs") as distinct from a "positive" label ("this product may contain GMOs"). This proposal draws on the U.S. experience in the dairy sector with milk from cows treated with recombinant bovine somatotropin, or rBST. Finally, it concludes with a discussion of issues which are left unresolved by the labeling proposal, and some of the remaining challenges posed by GMOs for the global food and agricultural system.

Labeling, Trade and Genetically Modified Organisms (GMOs):

A Proposed Solution

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> "Consumers have a right to choose whether to eat genetically modified foods or not."
>
> Rockefeller Foundation Statement (cited in Kilman, 1999)

Introduction and Overview: Genetically Modified Organisms in Agriculture and Trade

The purpose of this brief article is to assess the current controversy over Genetically Modified Organisms (GMOs) in agriculture and its potential implications for the global trading system. More importantly, it offers a solution to the serious potential for injury to this system, to be developed below, based on the idea of a "no-GMO" label for food products and seed.

GMOs burst onto the scene in 1996 with the rapid commercial introduction in the United States of genetically-engineered corn (maize), cotton, and soybeans, although genetically-engineered horticultural crops, such as tomatoes, had been approved as early as 1992. By 1998, more than 500 genetically modified plant varieties were available in the United States, accounting for 28 percent of the areas (2.57 million hectares) planted to maize, soybeans and cotton. Argentina and Canada had each planted an additional 100,000 hectares to GMOs and other countries (South Africa, Spain, France, Mexico, China, Australia, Brazil) had planted less than 100,000 hectares each (James, 1999). Perhaps more significant to consumers, these crops rapidly entered the supply chain for processed foods using

corn, soybean, or cotton seed oils, with some estimating that between 70-100 percent of processed foods now contain GMOs (*Economist*, 1999a).

These genetically modified plant varieties are the result of two different scientific processes: genetic engineering and more traditional plant breeding. Genetic engineering involves the transfer of genetic information from one organism to another to achieve traits such as insect or herbicide resistence. However, the genetic information must be combined with an adapted crop variety through plant breeding to create a commercially attractive seed type (Traxler, et al., 1999). These two steps may not occur in the same place, time or under the same commercial or regulatory control. Monsanto, for example, has been among the leading genetic engineering firms, but has until recently acquired germplasm from seed firms under subsidiary or licensing agreements. Rapid merger and acquisition activity has, however, accompanied the breakout of GMOs, such as Monsanto's acquisition of Holden Seeds, the merger of Dupont and Pioneer-Hybrid and the consolidation of the Swiss giant Novartis (see Rausser, et al., 1999).

These developments have given pause to consumer advocates and a wide range of environmental and food safety groups, who have mounted an active campaign against "Frankenstein Foods." Opposition, centered largely in Europe at first, has spread to other countries, and will be increasingly public in the U.S. in the next year and beyond (Cohen, 1999). A variety of concerns have been publicized by these groups, including the possibility that GMO's insect or herbicide resistant traits will spread to other, less desirable, plant varieties (Baskin, 1999). GMOs are also argued to pose unknown risks to human health, such as the transfer of allergens or carcinogens (*Economist*, 1999b, 1999c). A third concern is that because marker genes are used to identify certain plants by their

resistence to ampicillin, consuming them might lead to antibiotic resistence (Kinsey, 1999; James, 1998).

Apart from food safety and environmental opposition, there are also concerns over the consolidation of control over GMOs by a relatively small number of "Gene Giants," and the possible implications for consumers and small-scale agricultural producers, especially in developing countries (see Falck-Zepeda, et al. 1999). According to a recent report five of these firms (Astra-Zeneca, Dupont, Monsanto, Novartis and Aventis) now account for about 60 percent of the global pesticide market, 23 percent of the global seed market, and nearly 100 percent of the market for genetically modified seeds. Of particular concern to less developed countries has been the controversy over Monsanto's alleged intention to market a "terminator" gene which, when combined with its GMO corn, soybeans, or cotton, would prevent farmers from saving seeds from the previous year's crop by rendering them sterile. The company now denies this intention (Kilman, 1999). Concerns have also been raised over intellectual property rights, and the fear of enclosure by these firms of the "genetic commons" (Herdt, 1999).

In the European Union, and increasingly in other countries, governments and private companies have signaled disapproval of GMOs, which are interpreted as yet another example of unbridled American business expansion. In May, 1999, major food chains in England (Sainsbury, Tesco, Marks and Spencer, Burger King, McDonalds) announced their intention to avoid GMO ingredients. In Spain, Pryca, which had been the largest importer of soy-based GMOs and a producer of GMO corn, announced it would no longer use GMO ingredients in its branded products. The French food company Carrefour instituted a similar policy. In Switzerland, Nestlé announced a temporary halt on

GMO product use, and Russia announced that after July 1, 1999, any imported GMO product would require testing and licensing (Kinsey, 1999). Most recently, U.S. food companies including Archer Daniels Midland and ConAgra have signaled their farmer suppliers of the possible future need to segregate GMO crops from conventional varieties, indicating the possibility of segregated product streams as well.

While opposition to GMOs has been most vocal in relation to food products, the seed industry may be the first to be seriously injured. In response to indications of consumer resistance, farmers may elect to reduce plantings to GMOs in the next year, balancing their planting decisions between non-GMO and GMO crops as a hedge against uncertainty (this will also require further segregation in harvesting, storage and delivery if the two types are to be isolated). Yet the inventory of the seed industry is already heavily weighted toward GMO varieties, with some seed sales inventories approaching 75 percent GMOs. If these inventories fail to clear, and a premium goes to non-GMO seed, it will reduce profits by raising the carrying costs of the GMO seed stock, increasing the relative price of non-GMO seeds, and putting downward pressure on the "technology fees" charged for GMO seed.

The larger context of these controversies, and the main subject of this article, is the impact of GMOs on the world trading system in agriculture and beyond. U.S. farmers, food processors and the seed industry clearly have important commercial interests in maintaining access to markets for agricultural exports, including GMO products (National Corn Growers Association, 1999). Use of GMOs has reduced costs for weed and insect control, resulting in cleaner and higher grade corn, soybeans and cotton. James (1998) estimated that in 1997 alone, the second year of their introduction,

U.S. farmers saved $119 million from GMO corn, $109 million from GMO soybeans and $81 million from cotton. In the U.S. and Canada together, total savings from GMO seeds were estimated at $465 million. In part as a result of these savings, adoption rates by U.S. farmers have been very rapid. By 1998, nearly 40 percent of the U.S. soybean crop was genetically modified (mainly herbicide resistant), together with 25 percent of corn and 95 percent of cotton (both mainly insect resistant).

The increasing reliance of U.S. farmers on these crops places them at risk of increased costs if segregation is required by purchasers, and reduced market share if access is denied by importers (Petersen, 1999). Yet the stakes for the trading system are larger than the agriculture and food interests of exporters such as the U.S., Canada, Australia, Argentina and Brazil. By leading to potential disruption of trade flows in agriculture, conflicts over GMOs also raise problems for food importing countries seeking to maintain adequate supplies, and for less developed countries exploring the still largely unrealized potential of the crops for enhanced food production, compromising global food security at a time when growing population/food imbalances are seen as increasingly likely in the next Century. Moreover, many opponents of GMOs have a wider agenda opposing more liberal trade under the GATT/WTO system or regional trade agreements such as NAFTA. In GMOs, these groups have found an issue which resonates well beyond agriculture, helping to mobilize and align consumer, environmental and health advocates in opposition to further trade liberalization.

For these reasons, it is in the interest not only of agricultural interests, but the global trading system, to find some resolution to the current controversies, or to risk further damage to agricultural markets, threats to food security, and disruptions of the global trading system as a whole. These tensions will be especially evident at the Ministerial trade meeting in Seattle to be held in late

November, 1999, a precursor to the next Millennium Round of trade negotiations in the GATT/WTO.

The remainder of this article is divided into three sections. The next section will discuss labeling of GMO agricultural products, distinguishing between issues of food products and those affecting seed. Next, it will argue in favor of a particular type of "negative" label ("this product contains no GMOs") as distinct from a "positive" label ("this product may contain GMOs"). This proposal draws on the U.S. experience in the dairy sector with milk from cows treated with recombinant bovine somatotropin, or rBST. Finally, it concludes with a discussion of issues which are left unresolved by the labeling proposal, and some of the remaining challenges posed by GMOs for the global food and agricultural system.

Food Labeling Options

Numerous parties to the debate over GMOs have proposed labeling food products containing genetically modified material and/or segregating seeds or GMO products in supply streams allowing "identity preserved" products. Labeling has particular appeal to those who believe that consumers, once informed of the presence of GMOs in food or seed, will choose to purchase (or not to purchase) them based on this information. In this respect, labeling is a "market based" alternative which requires no new regulatory authority, or trade restrictions, apart from a mechanism to insure that the labels are accurate. Labels might, in fact, result wholly from voluntary decisions by firms to offer such information to consumers. However, for a variety of reasons, notably those of uniformity and coordination across both private firms and national regulatory regimes, it is probable that some international standards or norms will be necessary. Before considering the appropriate institutional arrangement for such standards, and other issues of implementation, enforcement and finance, we will examine the case for

and against two different approaches to labeling, which we will designate "positive" and "negative" labels, based on the type of information conveyed.

Positive Labels

Positive labels would involve the statement: "This product may contain GMOs." Given the extent to which GMOs have already entered the food and fiber chain, such a label would convey relatively little information. It is arguably less informative than the statement (also a positive label — if not a positive message) that "Cigarette smoking may be harmful to your health." In the case of cigarette labels, the action performed in connection with the product (smoking cigarettes) carries with it known health risks, to which the label refers. In the case of GMOs, the action performed in connection with the product (eating processed food or buying seed) carries with it unknown (if any) risks. Moreover, it is unclear from such a label how much GMO content is implied or whether the GMOs in question are specifically identified (as, for example, B_t corn or Round-Up Ready® soybeans). Since it is now possible (as noted above) that as much as 70-100 percent of processed food would require such a label, the label might as well read: "This product is part of reality." As Kinsey (1999) noted in a recent survey of GMO issues, positive labels are "almost as misleading as having no label at all." The main reason, she notes, is that they do "not provide the type of information needed in order to select or reject the food" (p. 488). The same would hold true for seed products.

Nonetheless, some advocates of positive labels persist in the view that they would help steer consumers (or, in the case of seed, farmers) away from GMO products. Since this would now include the vast majority of processed food products (and a large share of the seed market) their motivation for

positive labels may lie in a desire to reduce consumption of and trade in these products, and thus the revenues of their manufacturers, large or small. In addition, it is possible (but in our view, highly unlikely), that the threat of such a label, or the label itself, would lead investments in research and marketing into GMOs and their products to wither and eventually to die. In short, the motivation for positive labels can be interpreted as an attack on food manufacturers, seed companies, and the research and development put into GMOs in both the private and public sector over several decades. This attack is supported, erroneously in our view, in the name of consumer choice, and would be far more likely to lead to further confusion.

Negative Labels

In contrast, a negative label would read: "This product (or seed) contains no GMOs." Such a label has numerous advantages, although it also has certain requirements. One requirement is to define "no." As in the case of food and alimentary standards allowing X amount of foreign material per unit volume, or seed containing Y amount of such matter, "no" would necessarily imply a minimum threshold approaching zero. Once agreement on such a threshold is reached, it would need to apply across firms and national boundaries, so that it meant the same thing in Mexico as in Canada.

Of course, the details of the standard setting process will be critical. The European Union is currently floating a "1 percent" threshold for "no GMOs." But one percent of what? How will such a threshold be measured and determined? GMO opponents have argued in favor of a lower .1 percent threshold, without answering the same questions (Benbrook, 1999). At some point, however, such debate masks the basic point: that negative labels have distinct advantages to consumers over positive

ones, and that technical thresholds are measurable in practice as well as in principle.

Another requirement would be to define "GMO," so that the products of conventional plant breeding would be excluded, leaving only "transgenics" in which some form of gene "splicing" had occurred. Assuming such agreement could be reached, the effect of such a label (which would presumably be relatively rare on processed food today) would be to create niche markets for those choosing to purchase, process, segregate and sell no-GMO food or seed products. Each action will likely entail additional costs or effort at some point in the food or seed supply chain. In the case of food products, purchasing no-GMO ingredients will entail monitoring inputs closely, and requiring farmers and suppliers to conform to no-GMO practices. Processing would need to be in separate lots, or even separate facilities, to guarantee against co-mingling. Segregation will thus be required, either internal to a firm producing both GMO and no-GMO products, or between two firms one of which will produce a no-GMO product, and another that will not. In the case of seed, similar restrictions would apply to growing, processing, segregating and selling no-GMO varieties. Assuming these extra costs are not prohibitive, firms will bear them if the market for no-GMO products or seed is perceived to be large enough, and the price elasticity of demand adequate to support product or seed prices sufficient to cover the variable costs of production.

There is already evidence that such markets are perceived to be worth the effort to segregate product and processing methods. Apart from the examples of large food companies noted above, several less visible instances suggest the emergence of market opportunity for products carrying a no-GMO identity. Natural Products Inc., a Grinnell, Iowa company that processes unmodified soybeans (sold to Ben and Jerry's Homemade Inc. for use in its ice cream products), expects sales to triple in

2000 to about $10 million. The Hain Food Group of Uniondale, New York, is labeling its organic snacks as nonbiotech, notwithstanding an earlier, controversial decision by USDA and the U.S. Food and Drug Administration that "organic" necessarily implies the absence of GMOs. Hain's method, for the moment, is to switch from frying the snacks in corn oil to safflower oil, which has not yet been genetically engineered (Kilman, 1999).

Among the most active producers of no-GMO products are American Growers Foods, of Embarrass, Minnesota. The company promotes its foods as chemical and GMO free. It independently tests and certifies a variety of breakfast cereals, snack foods, and baked goods as organically grown and containing no GMOs (American Growers Foods, 1998).

However, it may be necessary in the short run to assist firms and national regulatory systems to assign, define and enforce such a label. One of the primary concerns of those firms considering such a no-GMO designation are the costs of assuring such assignation, definition, and enforcement, which may be argued in part to be public goods. For this reason, we argue that national governments should be prepared to share responsibility for enforcing a uniform set of label standards, in cooperation with the food and alimentary standard-setting process undertaken by the Food and Agriculture Organization (FAO) of the United Nations. These standards, known as the *Codex Alimentarius*, provide a natural forum for establishing a harmonized labeling approach, and coordinating this activity within the GATT/WTO system.

An important issue for the FAO's *Codex* experts will be to determine how the labeling issue can be expedited by its new Intergovernmental Task Force on Biotechnology, whose initial findings will be issued in a 2001 report. At the same time, it will need to determine whether GMOs require

separate standards apart from labels. If GMOs are found not to constitute "different" products, and that methods of production (or "production and processing methods — PPMs — in trade jargon) are not relevant to product characteristics, then such standards may not be necessary, and labels may well suffice. The focus of this debate will likely turn on the question: "How different is different?" (Josling, 1999, p. 69).

In addition, we argue that food processing and seed firms of all sizes should contribute to a common fund for the purpose of assuring compliance with no-GMO standards and conducting research on GMOs in food and seed. We would propose that a research fund be established in cooperation with the FAO based on proportionate contributions by firms involved in the sale, transport and processing of GMOs, with proportionately larger contributions for larger firms. While firms with no interest in the no-GMO markets might object to such a contribution, we submit that it would be a small price to assure a market free of the disruptions currently and potentially associated with a continuation of current confusion.

Negative Labels: The U.S. Experience with rBST and Dairy Foods

Insight into the process of establishing a set of negative labels can be gained from the U.S. experience of rBST and milk. Recombinant Bovine Somatotropin (rBST) is a genetically-engineered version of a naturally-occurring growth hormone (BST or BGH) in dairy cattle. Beginning in 1994, Monsanto began to market Posilac®, an rBST produced through genetic engineering, and sold as an injection kit to farmers to increase milk production (see Dobson, 1996). While many milk producers adopted and still use the product, consumer groups and some farmers objected to its use, arguing that it posed risks (in part to humans, but mainly to the lactating cattle). These groups demanded that a

system of labels establish a separate product stream for milk from cows that had not been treated with the rBST injections.

At first, the dairy industry demurred, asserting that the labels were unnecessary because BST was safe and had been subject to scientific review by the U.S. Food and Drug Administration and other scientific panels. In 1992, FDA had established the regulatory principle that GMOs and conventional products would be treated the same, so that a genetically engineered soybean is just a soybean. The only exception was when inventors changed a crop's composition by adding a vitamin or introducing a protein known to trigger an allergic reaction in some people (Kilman, 1999).

An example of such initial reluctance to adopt labels (a reluctance currently widespread in the food industry regarding GMOs in general) was the response of the Arden Hills, Minnesota-based Land O'Lakes, a cooperatively owned and managed Upper Midwest fluid milk processor and food company. However, within a few months, Land O'Lakes elected to adopt a negative label for its "original" fluid milk, which states, "Milk from cows not treated with rBST/rBGH." In addition, the label reads, "The federal government has determined that rBST/rBGH milk is safe for humans and cows, and that no significant difference has been shown between milk from rBST/rBGH treated or non-rBST/rBGH treated cows." The sales of this product accounted in 1999 for 18 percent of Land O'Lakes total fluid milk sales, a substantial "niche." Overall, the rBST controversy seems to have affected aggregate milk sales in the U.S. little if at all (Aldrich and Blisard, 1998).

Notwithstanding the adoption of such a label by some fluid milk processors, the issue involved numerous legal and regulatory subtleties. At the domestic level, the federal regulatory response led the U.S. Food and Drug Administration (FDA) to post interim guidance on the labeling of milk and milk

products regarding the use of rBST. This guidance left primary enforcement responsibility to the states, but derived its authority from the interstate commerce clause of the U.S. Constitution and the Food, Drug and Cosmetic Act (USCA 21, Section 301, et seq. 1994), thus indicating clear concerns over possible barriers to trade that might result from particular labeling schemes. For example, under Sections 4031(a) and 201 of the Act, a food is mislabeled if statements are made that are false or misleading, including the absence of information the effect of which may be to mislead (Centner and Londhe, 1995). In particular, since BST occurs naturally in all milk, a label saying that milk is "BST-free" would be false and misleading. Hence a truthful label would say that the milk comes "from cows not treated with rBST." Secondly, since this statement, standing alone, might imply that milk from cows treated with rBST might be less safe, the FDA suggested an accompanying statement that "no significant difference has been shown between milk derived from rBST-treated and non-rBST-treated cows." It also suggested a state record keeping and certification program to regulate the segregation of milk flows and the validity of labels.

U.S. state governments responded with a variety of different approaches, requiring milk producers to comply with their particular state regulation. Most states simply accepted the federal guidelines, but three precluded any labeling. Nevada, Illinois and Texas all concluded that such labeling might lower milk consumption, and/or could mislead consumers. Vermont, in contrast, mandated labeling in 1994, but implementation was delayed by regulatory and legal actions, including a suit filed by the International Dairy Foods Association (IDFA). The IDFA suit asserted that mandatory labels violated free speech, interstate commerce, and the supremacy of federal laws under the U.S. Constitution. Nine states delineated additional labeling guidance in the mid-1990s, and eight of these

developed substantiation and verification requirements, including recordkeeping, certification, and the like. In response to this somewhat diverse set of state responses, two careful analysts of the process observed that:

> "The diverse regulations of the state-by-state regulatory approach and regulatory costs of any labeling directives raise the question whether further federal preemption may be desirable (Centner and Londhe, 1995, p. 15).

At the international level, meanwhile, the European Union established a moratorium on rBST use until the year 2000, although strong political pressure exists to extend it (Blythman, 1998). This moratorium has become entwined with the general opposition to GMOs in many European countries, and helped to make GMOs a front-burner issue for the upcoming global trade talks.

What lessons can be learned from the rBST experience? Several stand out. First, the adoption of negative labels has created significant niche markets, as evidenced by the Land O'Lakes experience, although U.S. national milk sales appear largely unaffected in the aggregate. Second, unlike milk, GMOs in crops and GMO seeds are distinctly differentiable from no-GMO varieties, obviating the problems of naturally occurring BST in milk. Even so, a no-GMO label might be interpreted as implying that nonlabeled foods are harmful. Our own view is that it is unnecessary (and untrue) to state in addition that "no significant difference has been shown between foods (or seeds) with and without GMOs." They clearly are different, or a market for them would not exist. Their risks, while largely conjectural, require further research. In the meantime, those averse to these perceived risks would be free to purchase based on the no-GMO label. Third, and most significant, the U.S. experience indicates the importance of some degree of uniformity in establishing a negative label across jurisdictions in order to avoid a crazy-quilt of regulations. This is especially true for GMO crops and seeds which,

unlike milk, have global rather than local or regional markets. As we have argued, the natural counterpart to federal authority at the U.S. level is the Food and Agriculture Organization's *Codex Alimentarius* (see Victor, 1999). This coordination and harmonization would be largely advisory, in the sense of the FDA, and would allow individual nations and states to pursue their own enforcement and certification approaches. However, countries which refused to accept such harmonized labels on a reciprocal and nondiscriminatory basis, and/or used this refusal to deny market access, would likely run afoul of global trade rules. Finally, to the extent that such a set of harmonized labels were put in place, the niche markets created would expand from local to global market opportunities for no-GMO products, allowing growth in these markets to proceed in tandem with those for GMO-containing food and seed. If the contribution scheme outlined in the previous section accompanied the harmonized labels, further insight could soon be gained into the additional risks and opportunities posed by the GMO revolution.

Issues and Challenges

The negative labeling scheme outlined above responds jointly to global consumers' right to eat foods or to use seeds that contain no GMOs, whilst preventing such labels from becoming disguised barriers to trade and food security. However, it does not respond, except indirectly, to some of the remaining issues and challenges posed by GMO crops and seeds. The larger purpose of the fund established under FAO guidance would be to respond to these issues, which fall into three categories.

First, there are a variety of unknown environmental impacts of GMO adoption. These appear to fall largely into questions of "genetic drift" from species that have been genetically engineered to close relatives, resulting in plants which absorb herbicide or pest resistance, for example, through natural

cross-pollination. The consequences of this process are not well-understood, and require substantial study (see Baskin, 1999). Second, the insect-resistant varieties of GMOs pose the same problem faced by other pest-reducing technologies (such as pesticides) i.e., resistance by pests through natural selection. The resulting need is for the creation of "refugia" to allow non-resistant pests to survive. However, the best configuration of these refugia and their optimal size is unknown, and also merits considerable study (Hyde, et al., 1999).

Second, there is a legitimate need to conduct monitoring and research to assure the safety of GMO foods, notwithstanding claims to the contrary. While care should be taken to avoid alarmist approaches to GMOs, consumers will not be reassured, and market growth will be slowed, by an entirely laissez-faire approach. Unfortunately, even scientific evidence confirming food safety will not prevent controversy if the motivations of opponents are simply founded in technological pessimism.

Third, there is an important stake in the debate over GMOs for developing countries, from the perspectives of technology development, market access, genetic property rights, and food security. Technology based in GMOs may prove powerful in reducing crop losses due to a variety of pests in the Third World. These countries are also increasingly affected by the global trading system, and access to it. Any trade disputes which have the effect of closing off this access will harm their interests. In particular, GMO technology may be based in important ways on genetic information which is the province, and arguably the property, of developing countries, such as resistence traits in traditional maize. Taken together, these issues will define in key ways prospects for global food security in the next century. It is in part for these reasons that we argue that the Food and Agricultural Organization (FAO) of the U.N. is the appropriate base for a contributory research fund.

Conclusion

The purpose of this brief article was to propose a negative labeling scheme as a partial solution to the current impasse over GMOs in the world trading system. We would be the first to admit that harmonized negative labels are not a cure-all. However, we believe that they can advance consumer choice, and the creation of new markets, for both no-GMO and GMO products and seeds, and create the basis for further study of these remarkable new technologies. In these ways, we believe that it is both realistic and constructive, distinguishing it from the largely unrealistic and destructive debate to date.

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