

Northwestern Journal of International Law & Business

Volume 17

Issue 1 *Winter*

Winter 1997

Science and International Regulatory Convergence

Jeffery Atik

Follow this and additional works at: <http://scholarlycommons.law.northwestern.edu/njilb>



Part of the [International Law Commons](#)

Recommended Citation

Jeffery Atik, Science and International Regulatory Convergence, 17 Nw. J. Int'l L. & Bus. 736 (1996-1997)

This Symposium is brought to you for free and open access by Northwestern University School of Law Scholarly Commons. It has been accepted for inclusion in Northwestern Journal of International Law & Business by an authorized administrator of Northwestern University School of Law Scholarly Commons.

Science and International Regulatory Convergence

Jeffery Atik*

I. INTRODUCTION

National regulation is frequently premised on scientific assumptions; much of regulatory design is based on scientific findings. Consumer product, food and drug and workplace safety standards all depend on a scientific assessment of the risks faced by the public and of the efficacy of an adopted measure in addressing these risks. Building codes, waste disposal protocols and mandated immunization of school children all proceed from the technical recommendations of the scientific community.

In current Western society, a regulatory measure lacking a scientific basis will be subject to criticism and perhaps ridicule; it may be struck down as exceeding the prescriptive powers of the regulator.¹ Science identifies areas for regulatory action while limiting the field of possible responses. Not all human needs or desires can be usefully pursued through regulatory means; there is little our public institutions can do to address the eventual implosion of the sun. Science cannot at present show us how to harness nuclear fusion, predict earthquakes or prevent hair loss; it cannot cure cancer or AIDS. Where regulatory action is indicated, science operates to prohibit cer-

* Professor of Law, Suffolk University (Boston). Eric Blumenson, Stephen Hicks, Stephen McJohn, Robert Preucel, Michael Rustad and Joel Trachtman provided helpful criticism. I am most grateful for comments from the participants at the *Institutions for International Economic Integration* conference and for the research assistance of Ahmed Khan.

¹ In the United States, a regulatory measure lacking a scientific foundation may not meet the rational basis test under *United States v. Carolene Products Co.*, 305 U.S. 144 (1938). See Bruce Ackerman, *Beyond Carolene Products*, 98 HARV. L. REV. 713 (1985). The rational basis test might incorporate scrutiny for scientific validity in many regulatory settings. In practice, courts have rarely found a measure to fail the rational basis test. See *American Textile Mfr.'s Inst. v. Donovan*, 452 U.S. 490 (1981).

tain responses and to guide the decision-maker to value some responses more than others.

Still, regulatory design and implementation is much more than a technical exercise.² Notwithstanding the movement to transform rulemaking into a scientific discipline,³ real-world regulatory determinations remain political.⁴ Where the dominant politics are national in scope, particularized national regulatory outcomes can be expected even where the scientific foundation for regulatory action is identical across nations. National polities addressing similar concerns are likely to choose a variety of regulatory approaches in response to the local variation in the distribution of power. In global economic politics, new and complex dynamics have emerged to test national regulatory outcomes. As global concerns challenge the national interests in more and more fields of regulatory endeavor, powerful transboundary political forces are exerted on national decision-making.⁵

The WTO accords and the NAFTA now require that health regulations have a scientific basis and result from a risk assessment. If a health measure is founded on scientific principles, there is little other countries can do to challenge it; if there is no scientific basis for the measure, it will be subject to attack. Thus an important body of international economic law now hinges on what science, and scientists, have to say. A test for scientific support for a national regulatory position, no doubt, held a particular allure for international trade negotiators. Science is held to be universal knowledge, grounded in physical experience, valid for all and neutral in its prescriptions. While risk assessment involves frankly political choices, it pretends to be a rational and testable methodology.⁶ The hope for using scientific justification and risk assessment as touchstones may well have been to reduce international contentiousness and to provide clear scope for national regulatory freedom-of-motion. Science should tell us un-

² Congress has recently imposed a requirement that all federal regulation be accompanied by a cost-benefit analysis. See Unfunded Mandates Reform Act of 1995, 2 U.S.C.A. § 1551 (West Supp. 1996). There may be an implicit test for a scientific basis in asserting that a proposed regulation produces a certain benefit.

³ Public policy analysis is taught as a quasi-scientific discipline at major U.S. universities. Cost-benefit analysis is the dominant methodology within public policy analysis, which purports to signal where regulatory action is warranted and to permit unambiguous rankings of possible regulatory responses.

⁴ This assertion is axiomatic within the science of public-choice theory.

⁵ See Alfred C. Aman, Jr., *A Global Perspective on Current Regulatory Reforms: Rejection, Relocation, or Reinvention*, 2 INDIANA J. GLOBAL LEGAL STUD. 429 (1995).

⁶ For a discussion of risk assessment and risk management, see David A. Wirth, *The Role of Science in the Uruguay Round and NAFTA Trade Disciplines*, 27 CORNELL INT'L L.J. 817, 833-37 (1994).

equivocally whether a U.K. requirement that all imported UHT milk be repackaged is or is not justified to protect the public health.⁷ The answer science gives should be as equally persuasive to the British health authority as to the French dairy.

Science, more than religion, more than traditional ways, is unassailable within its domain.⁸ And science is more than mere reason; it is also experience built upon a continuing interaction with the physical world in a progressive, historical process. Science enjoys an enormous prestige built on its vast material successes since the Enlightenment. White coats inspire awe even among the powerful.⁹

A review of the sociology of science casts significant doubt on science's ability to play a useful role in depoliticizing international trade disputes.¹⁰ Scientific knowledge, one finds, is hardly universal. What is true and certain within one scientific community constitutes baseless conjecture in another. Science is also intrinsically historical; it is science-of-the-moment. Even relatively recent scientific belief can appear absurd when exposed to contemporary light. Early 20th Century primatology reveals more about the ape-watchers than about the apes. Moreover, science is socially constructed.¹¹ In asserting this, I do not repeat Alan Sokal's claim (in parody) that the physical universe does not exist and that science is a pure cultural artifact.¹²

⁷ The Court of Justice reached the conclusion that the British regulations could not be justified under the article 36 exception to the Treaty of Rome for "protection of health and life of humans, animals or plants." Case 124/81, *Commission v. United Kingdom*, 1983 E.C.R. 203.

⁸ Michael Reisman has written about "a single, inclusive industrial and science-based civilization" which has exerted "great stress on traditional moral and religious doctrines and on those for whom these ideas are central struts of their existence." W. Michael Reisman, *Designing Law Curricula for a Transnational Industrial and Science-Based Civilization*, 46 J. LEGAL EDUC. 322 (1996).

⁹ Alan Sokal has speculated that one of the reasons he was able to perpetrate the SOCIAL TEXT hoax was his standing as a hard scientist. The SOCIAL TEXT editors, according to Sokal, may have been "more deferent to the so-called 'cultural authority of technoscience' that they would care to admit." Alan D. Sokal, *A Physicist Experiments with Cultural Studies*, 46 LINGUA FRANCA 62-64 (1996). See the discussion of the SOCIAL TEXT affair *infra* note 48 and accompanying text.

¹⁰ See DAVID BLOOR, *KNOWLEDGE AND SOCIAL IMAGERY* (2d ed. 1991). There is a strong feminist critique of scientific neutrality. See, e.g., SANDRA HARDING, *THE SCIENCE QUESTION IN FEMINISM* (1986).

¹¹ See BLOOR, *supra* note 10. In certain notorious cases, a particularized local science served local political ends. Examples include Nazi racial studies and Lysenko's genetics within the Soviet Union.

¹² I hope to avoid "the style and intellectual approach of the standard mediocre progressive post-structuralist paper available cheap over every academic counter these days" decried in Gary Kamiya's essay on the SOCIAL TEXT affair. Gary Kamiya, *Transgressing the Transgressors: Toward a Transformative Hermeneutics of Total Bullshit*, SALON, May 17, 1996; see *Salon Daily Clicks: Media Circus* <<http://www.salon1999.com/media/media960517.html>>.

Rather, for purposes of this essay, I need only suggest that culture is a sufficiently powerful determinant to generate multiple scientific consensus which are varied across nations; more local than universal.

If we permit our imaginations to conceive of variegated science, differing in important features as distributed around the world, science's soundness as a regulatory anchor is surely disturbed. I propose in this essay a "geography" of science which in turn will generate odd territories of regulatory convergence. Competing sciences may produce varied regulatory solutions, any one of which may be legitimately adopted under the new WTO and NAFTA standards regimes. Some regulatory solutions will sharply diverge; other approaches will be shared across certain national boundaries. Regulatory convergence (economic integration) driven by something other than economic considerations is a likely result of a science-driven discipline.

In this essay, I advance three principal arguments:

1. The new science-based regimes for disciplining health regulation represent a substantial restoration of rulemaking authority to national institutions. Unlike other approaches, such as the least-trade restrictive means test and the principle of proportionality, which weigh national interests against those of the larger world trade community, this new recognition of national regulatory autonomy is categorical.

2. Science is variegated. Multiple sciences will generate multiple regulatory approaches, most of which will survive trade challenge.

3. Science may promote the development of economic integration, but in ways very different from trade-dominated approaches aimed at regulatory convergence. Both the NAFTA and the WTO are marked by an absence of a rule-making body with power to set regulatory limits; it is within this institutional gap that scientific justification will operate to generate norms and rules. Centers of scientific authority will exercise influence on the patterns of regulatory design. This structure of influence necessarily invokes a discussion of power.

II. SCIENCE AND NATIONAL REGULATORY AUTONOMY

Regulatory standards have long been recognized to be potential impediments to international trade even when justified by legitimate national concerns. The proliferation of technical standards, particularly in the fields of consumer protection, environmental protection and health and safety, has led to concerns about their restrictive effect on foreign-sourced goods and services. The world trade system's response to technical standards has been to label these regulations

"non-tariff barriers" and so condemn them.¹³ This hostility to distinctive national standards, revealed in a number of trade disputes, has led, in turn, to arguable overstepping of national sensibilities.¹⁴ The reaction, on many fronts, has been a reassertion of national regulatory prerogative.

Science will play an enhanced role in mediating tensions between national regulatory concerns and the demands of the international community. This can be immediately seen within the new technical standards regimes established by the post-Uruguay round GATT/WTO and the NAFTA.¹⁵ Within certain defined categories of regulation, "scientific justification" and "risk assessment" pre-empt free-trade notions, such as the least-trade restrictive means tests or the principle of proportionality, as the mark against which national measures are tested.¹⁶ Health regulations, generally speaking, where supported by a scientific justification and resulting from a risk assessment, will be substantially immune from free-trade challenge. The new science-based standards disciplines represent a pendulum-swing back towards greater national discretion and a move away from the monolithic prescriptions of the world trading system.

The broad area of health regulation is unique for the moment in its explicit invocation of scientific and quasi-scientific notions, such as risk assessment, as the identifying markers for a presumption of regulatory correctness. In the future, scientific tests for regulatory validity may move into new substantive areas, operating as a general check on supranational discipline as analagous to the rational basis test in U.S. constitutional law in defining the general limits of substantive due process.

The current special treatment of health regulation may imply that national regulatory freedom-of-action is *diminished* in other areas.

¹³ See Jack I. Garvey, *Current Development: Trade Law and Quality of Life—Dispute Resolution under the NAFTA Side Accords on Labor and the Environment*, 89 AM. J. INT'L L. 439, 441 (1995). See also Thomas J. Schoenbaum, *Free International Trade and Protection of the Environment: Irreconcilable Conflict?*, 86 AM. J. INT'L L. 700 (1992).

¹⁴ The *Tuna-Dolphin* case is often cited as an example of GATT's inability to integrate non-trade aspects of an international regulatory dispute. See, e.g., John H. Jackson, *Dolphins and Hormones: GATT and the Legal Environment for International Trade After the Uruguay Round*, 14 U. ARK. LITTLE ROCK L.J. 429 (1992); Ted L. McDorman, *The GATT Consistency of U.S. Fish Import Embargoes to Stop Driftnet Fishing and Save Whales, Dolphins and Turtles*, 24 GEO. WASH. J. INT'L L. & ECON. 477, 525 (1991).

¹⁵ See Wirth, *supra* note 6.

¹⁶ See John J. Barceló III, *Product Standards to Protect the Local Environment—the GATT and the Uruguay Round Sanitary and Phytosanitary Agreement*, 27 CORNELL INT'L L.J. 755 (1994).

Non-favored areas of national regulation may now be more exposed to challenge under the WTO or the NAFTA free trade principles. As such, it may represent part of an overall strengthening of the world trading system rather than a retreat, notwithstanding these new and explicit concessions to national autonomy.

Prior to the Uruguay Round, so-called technical barriers to trade (TBT) had been addressed in the 1979 TBT Agreement,¹⁷ a GATT "code" or side agreement. The 1979 TBT Agreement had limited effect in eliminating disparate technical standards due in part to the restricted number of GATT contracting parties who subscribed to it and to weaknesses in the GATT dispute resolution mechanism.¹⁸ The GATT Article XX(b)¹⁹ and its 1979 TBT Agreement counterpart²⁰ generally operated to exempt national regulations promoting public health from GATT scrutiny. So long as a health regulation was necessary²¹ and did not constitute a "means of arbitrary or unjustifiable discrimination" or "pose a disguised restriction on international trade,"²² it would be upheld in GATT dispute resolution proceedings.

During the Uruguay Round, the 1979 TBT Agreement was revised and extended, resulting in the "WTO TBT Agreement."²³ Further, the WTO TBT Agreement was augmented by a specific agreement on so-called sanitary and phytosanitary (SPS) measures,²⁴ covering regulation by the WTO members premised on human, animal and plant health concerns.²⁵ It is this second agreement, the

¹⁷ See Agreement on Technical Barriers to Trade, Apr. 12, 1979, 31 U.S.T. 405; 1186 U.N.T.S. 276 [hereinafter TBT Code].

¹⁸ See Jacques Nusbaumer, *The GATT Standards Code in Operation*, 18 J. WORLD TRADE L. 542 (1984).

¹⁹ Article XX(b) grants national measures justified by public health considerations an exception to normal GATT rules against trade restrictions. General Agreement on Tariffs and Trade, Oct. 30, 1947, art. XX(b), 2 U.S.T. 1700, 55 U.N.T.S. 194 [hereinafter GATT].

²⁰ See TBT Code, *supra* note 17, art. 2.2.

²¹ See GATT, *supra* note 19, art. XX(b). See, e.g., Thailand-Restrictions on Importation of and Internal Taxes on Cigarettes, Nov. 7, 1990, GATT B.I.S.D. (37th Supp.) at 200, paras. 74-81 (1991).

²² These phrases are contained in the *chapeau* or overall heading to Article XX, and limit the availability of Article XX's various exceptions to GATT's requirements. See generally Barceló, *supra* note 16, at 771.

²³ See Agreement on Technical Barriers to Trade, GATT Doc. MTN/FA II-A1A-6 (Dec. 15, 1993) [hereinafter WTO TBT Agreement].

²⁴ See Agreement on the Application of Sanitary and Phytosanitary Measures, GATT Doc. MTN/FA II-A1A-4 (Dec. 15, 1993) [hereinafter WTO SPS Agreement]. See also Julie Cromer, *Sanitary and Phytosanitary Measures: What They Could Mean for Health and Safety Regulations Under GATT*, 36 HARV. INT'L L. J. 557 (1995).

²⁵ The WTO SPS Agreement defines sanitary and phytosanitary measures. See WTO SPS Agreement, *supra* note 24, Annex A § 1. See generally *Understanding the World Agreement on*

WTO SPS Agreement, which most directly invokes the scientific basis test to determine if a WTO member's SPS regulations may prevail.

A special regime for SPS measures has also been incorporated in NAFTA.²⁶ Non-SPS measures within NAFTA are governed by the chapter on "Standards-Related Measures."²⁷ NAFTA provides for SPS measures in a separate chapter titled "Agriculture and Sanitary and Phytosanitary Measures."²⁸ Like the WTO SPS Agreement, NAFTA's SPS provisions create a presumption of national autonomy which can be challenged by a showing that a measure lacks a scientific basis.²⁹

This special treatment for SPS measures within the WTO and NAFTA recognizes the heightened concerns of national and local interests in matters pertaining to health. Science plays an important role in setting regulatory standards generally and a particularly enhanced role in SPS standards where human, animal and plant life are implicated. The regulatory objective in SPS measures is always, at least in part, the promotion of "health," which is partly a scientific construct.³⁰ Health is not, however, the unitary objective of sanitary and phytosanitary regulation; there remains room for other significant considerations, such as culture, economic efficiency, etc. in generating SPS rules.

Sanitary and phytosanitary standards have been, for the most part, established at the national or subnational level. States have enjoyed autonomy and wide discretion in setting regulatory standards

the Application of Sanitary and Phytosanitary Measures (visited Feb. 25, 1997) <<http://www.wto.org/agric/spsagr.htm>>.

²⁶ See North American Free Trade Agreement, Dec. 8-17, 1992, ch. 7, 32 I.L.M. 289, 368 [hereinafter NAFTA]. While the NAFTA preceded the closure of the Uruguay Round negotiations, NAFTA's incorporation of SPS provisions was based on draft language under consideration at the GATT. Thus, NAFTA's SPS provisions in some sense follow and in some sense precede the WTO TBT Agreement and the WTO SPS Agreement.

²⁷ NAFTA, *supra* note 26, ch. 9, at 386.

²⁸ NAFTA, *supra* note 26, ch. 7(b), at 368.

²⁹ See NAFTA, *supra* note 26, art. 712(3). NAFTA art 712(3) provides:

Each Party shall ensure that any sanitary or phytosanitary measure that it adopts, maintains or applies is: (a) based on scientific principles, taking into account relevant factors, including, where appropriate, different geographic conditions; (b) not maintained where there is no longer a scientific basis for it; and (c) based on a risk assessment, as appropriate to the circumstances.

³⁰ The World Health Organization has adopted a definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." CONSTITUTION OF THE WORLD HEALTH ORGANIZATION, preamble. See also Jill Maben & Jill M. Clark, *Health Promotion: A Concept Analysis*, 22 J. ADV. NURS. 1158 (1995); James S. Larson, *The Weighting of an International Health Status Index*, 31 SOC. INDICATORS RES. 265 (1994). For a rejection of a uniform, as opposed to national, definition of health, see Carl E. Taylor, *Ethical Issues Influencing Health for All Beyond the Year 2000*, 9 INFECTION DIS. CLIN. N. AM. 223 (1995).

concerning human, animal and plant health. Similarly they have freely imposed labor and environmental regulation, a reality acknowledged by the existence of the two specialized NAFTA side agreements. National standard-makers have been able to take into account regulatory costs, the state of economic development, peculiar national exigencies and general regulatory philosophy in deciding where and how to act. The WTO standards agreements³¹ and the NAFTA³² explicitly uphold the right of each signatory to set its own standards in the health field. This explicit reservation of national autonomy is consistent with the deference to national invocation of scientific justification and risk assessment under the SPS provisions of each agreement.

The new standard regimes created by the WTO and the NAFTA insist on the presence of a scientific justification for regulation in the sanitary and phytosanitary arenas. Absent scientific justification, these measures are open to trade attack. Both the WTO SPS Agreement and the NAFTA's SPS provisions require that SPS measures have a scientific basis and that standards result from a process of risk assessment.³³ The requirement of a scientific justification may be seen as a limit on regulatory arbitrariness; all possible regulatory responses are no longer permitted. For the test to have meaning, there must be the possibility of a dispute panel finding the *absence* of a scientific justification.

Thus the new regimes operate in tandem with other notions as to the vertical distribution of regulatory competence,³⁴ such as the EU's notion of subsidiarity.³⁵ Unlike subsidiarity, which is sensitive to the particular regulatory case, the science-based SPS regimes categorically empower the nations to regulate in the SPS sphere. In contrast with the U.S. commerce clause, which categorically distributes competence upward to the federal government, the SPS regimes distribute competence downward to the nations.³⁶ Even where a showing can be made that a regional or global regulatory treatment is optimal, harmonization cannot be compelled. And there is no weighing of benefits to

³¹ See WTO SPS Agreement, *supra* note 24, pmb. para. 6, paras. 11, 14, 18, 19, 20, 21, 29, 32, 41, and Annex B, para. 2.1(c).

³² See NAFTA, *supra* note 26, art. 712, paras. 1, 2, at 377-78. See generally Jeffery Atik, *Environmental Standards Within NAFTA: Difference by Design and the Retreat from Harmonization*, 3 INDIANA J. GLOBAL L. STUD. 81 (1995).

³³ See Wirth, *supra* note 6, at 826-28, 830-31.

³⁴ See Joel P. Trachtman, *International Regulatory Competition, Externalization, and Jurisdiction*, 34 HARV. INT'L L.J. 47 (1993).

³⁵ See Joel P. Trachtman, *L'Etat, C'est Nous: Sovereignty, Economic Integration and Subsidiarity*, 33 HARV. INT'L L.J. 459, 468-72 (1992).

³⁶ The U.S. constitutional analogue may be the Tenth Amendment.

local health and safety against costs to the global economy. SPS regulation is a field of nearly unrestricted national prerogative.

A showing of scientific justification under either the WTO SPS Agreement or the NAFTA's SPS provisions provides substantial, but not absolute, immunity against a trade-challenge. Both the WTO SPS Agreement and the NAFTA condemn an SPS measure that constitutes a "disguised restraint on trade," even if found to be based on scientific validity and resulting from a risk assessment. Some have argued that the requirement for scientific basis will be an important check on any abuse of this national privilege and represents a limitation from the freedom GATT members enjoyed under the Article XX(b) exception.³⁷

Those national measures which are consistent with generally accepted international standards enjoy greater immunity. A nation which imposes a different, and particularly "higher," standard is more vulnerable to pressure by its trading partners, formal and otherwise.³⁸ Even where attack may be precluded within formal dispute resolution, political arenas remain where harmonization may be coerced. A departure from an international standard will be subject to greater visibility, and perhaps this exposure will be exploited on the political front to induce harmonization.

The presumption of regulatory correctness that attaches to international standards makes the setting of these standards increasingly important. Power is likely to be distributed quite differently within an international standard-making body than within a general economic organization such as the WTO or the NAFTA. Certain interests are unlikely to be represented;³⁹ others (particularly producers) may well exercise inordinate influence on outcomes.

The requirement of risk assessment poses a new procedural requirement into national law-making. In order for an SPS measure to be upheld, it must result from a risk assessment; both the WTO SPS Agreement and the NAFTA's SPS provisions grant nearly complete discretion to legislatures to enact SPS measures where risk assessment

³⁷ See Cromer, *supra* note 24, at 563.

³⁸ WTO TBT Agreement, *supra* note 23, art. 2, para. 5, provides that:

Whenever a technical regulation is prepared, adopted or applied for one of the legitimate objectives explicitly mentioned in paragraph 2 of Article 2 [including national security requirements; prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or the environment] and is in accordance with relevant international standards, it shall be rebuttably presumed not to create an unnecessary obstacle to international trade.

³⁹ The absence of women's voices in debates on the regulation of birth control measures has often been noted.

has been performed. There is considerable elasticity in this requirement. Where weighting of risks remain unspecified, mere identification of risks may be adequate to satisfy a test for risk assessment. A rulemaker that notes that a substance has been shown, to any degree, to cause cancer in laboratory animals may have performed adequate risk assessment for purposes of staving off a trade challenge advanced by a trading partner to an import restriction. Taken seriously then, these new regimes will significantly impact the process of national standard-making. National administrative law will take defensive measures to foreclose a WTO attack premised on the procedural failure to conduct risk assessment. WTO-type risk assessment may become as much a matter of course as environmental impact studies, and scientific justifications for regulatory measures will be recited as custom.

The new standards regimes demand risk assessment, but where there is a scientific basis for regulation and where risk assessment has been undertaken, SPS measures will be allowed to stand. Masked within this facially rational methodology is the potential for considerable irrational policy. Nations can maintain SPS measures, even when risks to health and safety are demonstrably minute. For example, a 1 in 500 million probability of causing cancer may still justify the United States banning a good, even though its harm, statistically speaking, might not affect more than one or two U.S. persons. Risks of such magnitude are considerably smaller than risks assumed in normal life, such as airline travel, driving cars, sunning oneself at the beach or drinking tap water.

The requirement that a SPS measure be premised on a scientific basis represents a middle-ground between a more searching cost-benefit analysis that introduces international economic values and the quite liberating rational relationship test.⁴⁰ A requirement of a scientific basis would seem to apply to both the regulatory objective as well as the means chosen to achieve it. A legislature could not merely find that, say, ultra-high frequency radiation is harmful, and then prescribe that computer monitors be shielded; science would have to support both the threat to health and the efficacy of the responsive measure. Cost-benefit would go beyond this, of course, and insist that the benefit of avoiding the harm caused by the radiation outweigh the regulatory cost. Rational relationship, on the other hand, might be satisfied by a mere probability of regulatory efficacy.

⁴⁰ See Barceló, *supra* note 16, at 768-74 (discussing the Cost-Benefit Balancing Test of the WTO SPS Agreement).

III. VARIEGATED SCIENCE AND INTERNATIONAL ECONOMIC LAW

Within the academy, scientific disciplines have been most resistant to the challenges of multiculturalism and relativism. Indeed, most scientists would assert that it is precisely the universality of a particular discipline that defines it as a science. Some fields are less yielding than others; the notion of a relativist physics (as opposed to a physics of relativity!) is anathema. While rival claimants of a physical truths are acceptable, on a provisional or tentative basis, each claimant asserts universality. The "hardness" of a hard science refers in part to the degree of systemization it enjoys and in part to the universality of its core claims. Biology is generally conceded to be "softer" than mathematics, physics or chemistry, and so may be more open to the operation of relativity. Human biology is likely "softer" still, given the complexity of its subject and the undeniable influence of self-consciousness and intentionality.

Certain writers on science describe bodies of knowledge such as astrology, numerology, pyramid-power and the like as "superstition" or "anti-science."⁴¹ Indeed there is a movement among traditional scientists to denounce and suppress anti-science.⁴² While the targets tend to be both intellectually defenseless and silly, these attacks by traditional scientists reveal a self-conception of a priesthood holding certain and incontestable knowledge.

The law has often embraced a relatively uncritical view of science's claims of universal truth. Peter Huber has introduced the notion of an instrumental "junk science"⁴³ and contrasted it with "good science"⁴⁴ produced by mainstream institutional scientists. Michael Rustad and Thomas Koenig have decried the presentation of misleading and dubious social science methodologies in *amicus* briefs. The now repudiated *Frye* rule would have limited expert testimony to evidence that was "generally accepted" by the scientific community.⁴⁵

⁴¹ See GELL-MANN, *THE QUARK AND THE JAGUAR: ADVENTURES IN THE SIMPLE AND THE COMPLEX* 275-90 (1994). See also GERALD HOLTON, *SCIENCE AND ANTI-SCIENCE* (1993).

⁴² See GELL-MANN, *supra* note 41, at 287 (describing Gell-Mann's decision to join the Committee for Scientific Investigation of Claims of the Paranormal, which publishes the journal *SKEPTICAL INQUIRER*.)

⁴³ PETER HUBER, *GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM* 2 (1991). See also Michael Rustad & Thomas Koenig, *The Supreme Court and Junk Social Science: Selective Distortion in Amicus Briefs*, 72 N.C. L. REV. 91 (1993).

⁴⁴ Huber writes that the best test of certainty that courts have is "good science-the science of publication, replication, and verification, the science of consensus and peer review." HUBER, *supra* note 43.

⁴⁵ The Supreme Court held that scientific assertions presented by experts would be governed by the ordinary Federal Rules of Evidence. *Daubert v. Merrell Dow Pharmaceutical, Inc.*, 113 S.

Problems of appropriate inference from scientific knowledge compounds the difficulties proposed here. Scientific norms resist being shoehorned into legal categories.⁴⁶

There are philosophers and sociologists of science who purport to demonstrate that very little of science, including “hard” science, can claim universality and that science is largely a social construct. Even mathematics, it has been claimed, is contingent.⁴⁷ The recent *Social Text* hoax brought out hard science’s uncomfortable co-existence with relativism. In 1996 Alan Sokal, a New York University physics professor, published a piece in *Social Text*, a leading cultural studies journal, which argued that “physical ‘reality’ . . . is at bottom a social and linguistic construct.”⁴⁸ The special issue of *Social Text* which contained Sokal’s piece was titled “Science Wars” and was “to question the foundations of scientific thinking” by invoking “social constructivism.”⁴⁹ Upon publication of the “Science Wars” issue, Sokal revealed his article was a parody,⁵⁰ intentionally written “so that any competent physicist or mathematician (or undergraduate physics or math major) would realize it is a spoof.” Sokal remains committed to certain common-sense universal claims, such as the existence of gravity.⁵¹ The *Social Text* controversy has largely devolved into a debate about academic honesty.⁵²

The degree to which science is constructed need not be resolved for purposes of this essay. And, for purposes of this argument, the hardest of the sciences can be permitted to stand. In general, the science which underlies regulation, including SPS regulation, is science

Ct. 2786 (1993). See the discussion of *Daubert* and *Frye* in Rustad & Koenig, *supra* note 43, at 97-99, nn. 31-32, and in Linda Simard & William G. Young, *Daubert's Gatekeeper: The Role of the District Judge in Admitting Expert Testimony*, 68 TUL. L. REV. 1457 (1994).

⁴⁶ See Charles Kester, *The Language of Law, the Sociology of Science and the Troubles of Translation: Defining the Proper Role for Scientific Evidence of Causation*, 74 NEB. L. REV. 529 (1995). Rustad and Keonig have proposed the establishment of “social science courts” which would be more adept technically at making appropriate inferences. Rustad & Koenig, *supra* note 43, at 159-60.

⁴⁷ See BLOOR, *supra* note 10, at 107-30.

⁴⁸ Alan D. Sokal, *Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity*, 46-47 SOC. TEXT 217 (1996).

⁴⁹ See Christina Stock, *Parody Gives Duke Press Unsettling Dose of Reality*, RALEIGH NEWS & OBSERV., May 18, 1996, at 2-3, available in 1996 WL 2879662.

⁵⁰ Sokal, *supra* note 9. See also Alan D. Sokal, *Transgressing the Boundaries: An Afterword*, 43 DISSENT 93 (1996).

⁵¹ According to Sokal, “Anyone who believes that the laws of physics are mere social conventions is invited to try transgressing those conventions from the window of my apartment (I live on the 21st floor).” Reprinted in Stock, *supra* note 49, at 3.

⁵² According to SOCIAL TEXT’s editor Andrew Ross, Sokal’s act was “an adolescent male prank . . . We thought he was writing in good faith, but he wasn’t.” Stock, *supra* note 49, at 4.

applied to immense complexity. The human body, the ecology of a particular locale and the interplay of social factors are all enormously complex systems, about which strong scientific assertion breaks down. Heuristics (rules-of-thumb) replace direct observation and synthesis in guiding the formation of scientific consensus and introduce the possibility of multiple outcomes.

In some ways, the SPS regimes project a more critical outlook on science than does science itself. Specifically, the SPS disciplines do not insist on justification premised on the "best" or "truest" science and admit, at least implicitly, the possibility of multiple, mutually-exclusive, sciences. The call for *a scientific basis* may be satisfied by one of several rival claimants for universal truth. A claim may be considered scientifically sound if a minimal consensus has formed around it. Imagine that a group of scientists shares the conclusion that pasteurization impairs the nutritive value of beer.⁵³ They may not constitute more than a handful of the world-wide scientific community concerned with the matter and may further be concentrated in a particular locale. Their notion may not have overwhelmed rival propositional claims to achieve a status of *the* dominant scientific consensus. But it may well be adequately shared to constitute *a* scientific view, tentatively admitted as such, until definitively rejected by a triumphant alternative propositional claim.⁵⁴

The SPS regimes expect nationality to emerge as a fairly strong determinative factor in the formation of rival scientific consensus. This is not a surprising view, given the national organization of academies, research bureaus, learned societies and the like. We can anticipate many cases where scientific consensus is split along national lines. Beef hormones may be such an example; we need not reach the cynical view that one group of scientists (say, the Europeans) is corrupted by the economic interest of its country to account for the division of opinion.

In the recent "mad cow disease" affair, the United Kingdom had maintained that the European Union's ban on exports of British beef was entirely without scientific justification. Even if this were so, the EU might offer a "precautionary principle" justification for the ban: given the coincidence of the mad cow disease and a related disease in

⁵³ This seemed to be the view of German authorities in arguing for the traditional beer purity law. Case 178/84, *Commission v. Germany*, [1988] 1 C.M.L.R. 780.

⁵⁴ I am not here describing the process of the scientific revolutions advanced by Kuhn. Rather, the contests among minor propositions supporting a regulatory stance occur within Kuhnian "normal science," where basic paradigms are accepted. See the discussion *infra*.

humans, and despite the showing of a link between the two, a ban is an appropriate regulatory response pending further inquiry. The lesson of mad cow disease, however, is that "real" scientific linkage is often not as important as popular perception.

The SPS regimes would support national regulation premised on minority views within scientific communities. One could imagine a food and drug law premised on Chinese herbalism, where imports of certain products deemed healthful by Western scientific consensus are restricted. The Chinese health authorities would maintain that the exclusion was appropriately based on risk assessment and had a scientific basis. Chinese science might astound us with its prescriptions. Recently an authority on *feng shui*, a Chinese science of spatial relationships, warned of the ill effects caused by several Boston landmarks, including I.M. Pei's John Hancock Tower in Copley Square.

Both the WTO SPS Agreement and NAFTA's SPS provisions invoke science but provide little guidance as to what science is. Sociologists of science describe science in a variety of ways: as a community, as a dialogue and as a consensus, for examples. We can know with certainty, however, that science is not fixed, either in time or in space. There is, however, a geography of science; scientific opinion, whatever that might mean, is concentrated in centers chiefly located in the United States, Europe and Japan. These centers of scientific authority correspond, not accidentally, to the major players in the world trading system.

It is not clear to what extent nations removed from the scientific centers of authority can obtain the science they need to support desired regulatory outcomes. Poorer nations may not be able to afford to sponsor studies necessary to resist challenges as to the scientific basis for chosen regulatory responses. "Borrowed" science may not only be irrelevant; it may be antagonistic.⁵⁵ Science is a received tradition in many parts of the world; a tradition that may systematically underweigh local values. Those nations hosting scientific centers may more easily meet the burden of demonstrating a scientific basis to their regulatory stances. For these nations, science is more proximate and is more embedded in their social-cultural-political milieu. And

⁵⁵ *Thai Cigarettes* may be an example of the pitfalls faced by a country seeking to justify a measure based on off-the-rack science. Thailand was unable to demonstrate a health-risk differential between Thai cigarettes and imported ones. The panel heard a report provided by the World Health Organization which generally focused on the public health risks of smoking. Thailand - Restrictions on Importation of and Internal Taxes on Cigarettes, GATT, B.I.S.D. (37th Supp.) at 200; 30 I.L.M. 1122 (1991). See the discussion in Wirth, *supra* note 6, at 848-49.

science can be bought, at least in the sense that funding can direct scientific inquiry to questions posed by the regulating state.

Sociologists have observed the construction of science, and see it an ordinary case of human activity. Scientists receive a tremendous amount of framework before embarking on investigation, which colors all they observe. Some of this conditioning is comprised of settled assertions learned by rote. Much of scientific teaching involves a recounting of the establishment of basic propositions in a field, which typically remain unchallenged during a scientist's career. Conditioning also results from the dominant paradigms into which observations are fitted and reconciled. A quantum physicist will note phenomena that a Newtonian physicist will miss (and perhaps vice versa); a *shaman* may observe spirits that are invisible to contemporary Westerners.

Instrumentation and protocols are important vehicles for conditioning scientific observation.⁵⁶ An ordinary scientific instrument used in an experiment transports a vast amount of consensus. A scientist who uses nuclear magnetic resonance to analyze a compound trusts implicitly in the physics, electronics and cybernetics that cause the instrument to operate and give meaning to its data output, just as a dowser trusts a divining rod to sense the presence of water.

As scientific activity is dispersed across a greater number of societies, a multiplicity of scientific views can be expected. More and more regulatory positions will be defensible by colorable claims of a scientific basis.

Karl Popper emphasized the fundamental nature of scientific activity as not saying what is true, but rather as usefully identifying which statements are false.⁵⁷ Hypotheses can never be established; certain "wrong" hypotheses may, however, be dismissed in light of experience. Knowledge is tentative, and the scientific project is skeptical, destructive and eliminatory. Popper's view would suggest that an assertion of scientific justification for a measure rings hollow. Rather, a claim of scientific basis should be understood to mean that scientific investigation has simply not been able to disprove a particular assertion to date, no more and no less. Indeed, the only scientific certainty to be found is where a hypothesis fails, which corresponds to finding the absence of scientific justification for a measure. The irony

⁵⁶ BRUNO LATOUR, *LABORATORY LIFE*.

⁵⁷ KARL R. POPPER, *THE LOGIC OF SCIENTIFIC DISCOVERY* (1962). See discussion in *CAN THEORIES BE REFUTED? - ESSAYS ON THE DUHEM-QUINE THESIS* (SANDRA G. HARDING ed., 1976).

here is that a nation can act affirmatively only in situations where it is ignorant; that is, it can only assert a "scientific basis" for a regulatory move where science has not yet worked its falsifying power!

Popper's view would characterize the regulatory field-of-action as one where there is an absence of scientific certainty of any kind. This interpretation is a particularly expansive one. The untested may greatly exceed the stock of proven falsehoods. Scientific progress, of Popper's kind, would reduce the scope for regulation over time, as fewer tentative assertions of scientific basis would be left standing.

Popper's view of science does in fact capture the residual power of the science-based regulatory regimes. Nations can attack the regulatory positions of trading partners by demonstrating that a position *lacks* a scientific foundation (and therefore constitutes an unjustified restraint on trade). This is all that science can do and is precisely the nature of the claims permitted under the WTO SPS Agreement.

Thomas Kuhn's view of the scientific program focuses on radical shifts in world-view, the so-called paradigm changes, as marking scientific progress.⁵⁸ Paradigm shifts are infrequent, and most of which we know as science, what Kuhn calls "normal science," involves testing hypotheses within the then dominant paradigm. Except for the special conditions of paradigm substitution, constructs which do not comport with the dominant paradigm are dismissed. This is a process of interpretation, not of observation, and as such, not particularly rooted in experience. Kuhn's view of normal science is a search for consistency, as opposed to a search for truth.

The conclusion that a particular SPS measure has a scientific basis is an assertion that the understanding of the operation of the physical world implicit within the regulatory design is consistent with the dominant Kuhnian paradigm. Understandings outside of the paradigm will fail. Kuhn's paradigms, of course, are not ultimate truth, but rather provisional systems to be dismissed when overcome by a rival paradigm in a scientific revolution. Kuhn's analysis points out the contingency of the scientific basis test, as being more based on received constructions than on either pure observation (which Kuhn would argue is not a meaningful concept) or an ultimate truth.

⁵⁸ THOMAS S. KUHN, *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* (2d ed. 1970). Kuhn introduced the notion of a scientific paradigm, an overall framework received by most scientists into which observations are fitted.

IV. SCIENCE AND REGULATORY GEOGRAPHY

The formation of scientific consensus will have strong and transparent regulatory implications under the new standards regimes, raising the stakes and influence of a scientific project. To assert the presence or absence of a scientific basis for a proposition will become a political act with international significance. A political-economic analogy of the Heisenberg uncertainty principle would assert that the presence of strong regulatory consequences will inevitably distort the creation of science, rendering any claim of "truth" for scientific observations doubtful. Cross-border flows of scientific consensus will become an important mode through which regulatory harmonization proceeds. A scientific consensus which takes the form of a skeptical negative assertion, that no scientific basis lies for a particular proposition, will be most powerful, as it opens a ground for a regulatory challenge.

The dynamics of globalization often, but not always, urge regulatory convergence. Harmonizing standards encourages the development, production and exchange of goods and services across borders. Where standards are consistent, greater economics of scale are available to producers, some of which are passed on to consumers. From the point of view of free trade, diverging regulation creates an economic drag.

Convergence of regulatory standards may result from various forces. Supranational institutions, quasi-legislative or quasi-judicial, may compel nations to adopt harmonization.⁵⁹ A nation which joins the European Union understands that it must revamp much of its regulatory program to meet existing European harmonized standards or face censure in the Court of Justice. The European Council promulgates standards which are binding on all EU members. While dispute resolution panels under either the WTO or the NAFTA lack the power of the EU's Court of Justice to command compliance, they may nonetheless motivate harmonization by isolating instances of regulatory variation and testing them for justification.

Harmonized standards may result from parallel regulatory enactment by nations even where supranational institutions are lacking. Where efficiency gains from harmonization are substantial and where the gains are distributed somewhat evenly, noncoerced convergence will result. These may well be dynamic or path-dependent effects in

⁵⁹ Regulatory convergence always benefits some countries at other countries' expense. Convergence, where compelled, is an artifact of power, and effects a wealth transfer between nations. See discussion in Atik, *supra* note 32, at 94.

play: nations may race to establish favorable regulatory standards that follower nations will be constrained to accept. Notwithstanding these kinds of strategic opportunities, international regulatory harmonization as a kind of noninstitutional cooperation can result under particular conditions.

Convergence may be a matter of little choice to a smaller nation, which is likely to be a "regulation taker." A country with few economies of scale and lacking market power is unlikely to be able to impose a diverging regulatory standard without bearing a disproportionate cost. Further, effective standards may be "voluntarily" adopted by producer groups without state compulsion. Voluntary self-regulation may be engaged to preempt more restrictive formal regulation.⁶⁰ Cooperating producers desiring harmonization may similarly seek to preempt the introduction of diverging standards by self-regulating. A formal standard in one country may be echoed by harmonized custom in another. Product standards established by major market authorities may be indirectly "imported" into other jurisdictions; standard-complying goods may pass into standard-free territories, physically transmitting nation-of-origin regulatory results.⁶¹ Minor markets often choose to rely on regulation imposed by other jurisdictions as assurance of public health and safety concerns in lieu of direct regulation.

An interesting example of regulatory standard migration can be found in U.S. interstate commerce experience. The Commonwealth of Pennsylvania has for years maintained an elaborate system of bakery regulation; producers of bread and cereal products wishing to sell into Pennsylvania are subject to inspection. The remaining 49 states largely defer to Pennsylvania's regulatory scheme, free-riding in a sense on regulatory costs borne by Pennsylvania, but ceding substantive regulatory authority to Pennsylvania's notions.

Wide divergences in SPS regulatory approaches are often observed, at times resulting in contradictory prescriptions. An example is the European Union *muesli* case. Sandoz produced muesli break-

⁶⁰ Cigarette manufacturers "volunteered" to cease advertising their products on US television broadcasts. This move successfully avoided more general advertising restrictions on cigarettes and the prospect of government-sponsored counter advertising. Recently U.S. distilleries agreed to revoke their voluntary ban on hard liquor broadcast advertising. See Stuart Elliott, *Liquor Industry Ends Its Ad Ban in Broadcasting*, N.Y. TIMES, Nov. 8, 1996, at A1.

⁶¹ Automobile day-time running lights are required in Sweden. Volvo and SAAB automobiles, which are manufactured in Sweden, are equipped with running lights even when imported into the United States. See, e.g., Nina Paddgett, *Daytime Lights-on Driving Coming to U.S. Roads Soon*, CHI. SUN TIMES, Aug. 5, 1996.

fast cereal treated with vitamins A and D, a move many would view as conducive to good health and permitted under German and Belgian food laws. The Netherlands sought to ban the import of the vitamin-enhanced *muesli* from Germany and Belgium as *harmful* to human health, on the theory that it might lead to overconsumption of fat-soluble vitamins.⁶² Such regulatory variation may be a sign of political health and provides useful test cases in control techniques that benefit all nations facing similar problems.

This is not to say that there is an absence of harmonizing norms at the international level. For example, Codex Alimentarius indirectly sets standards for foodstuffs for human consumption.⁶³ Regional institutions, such as the EU Commission, have been active in harmonizing health and safety standards. And both the NAFTA and the WTO standards agreements privilege national measures that are consistent with international standards-making bodies.

While scientific validity may serve to justify regulatory differences, it may also serve as a basis for shared regulatory approaches. Shared science may generate new regulatory geographies, corresponding to the influence exerted by particular scientific centers of authority. There is a geography of science, or more particularly, of sciences. Science, if measured by factors such as research expenditures, published papers or number of doctorates, is largely centered in Europe, the United States and Japan. India has an important presence in certain fields as well. Analyzing specific scientific disciplines reveals more geographic texture; the Italians, for example, are prominent vulcanologists.

Physicians and epidemiologists trained in the United States are likely to share a similar vision even when exercising their professions in other countries.⁶⁴ Even regional differences arise in response to training; a recent study has shown that radically different approaches in recommended treatment are taken by East Coast-trained cardiologists than by their West Coast-trained colleagues.⁶⁵

⁶² Case 174/82, Criminal Proceedings Against Sandoz BV, 1983 E.C.R. 2445.

⁶³ See the extensive discussion of Codex Alimentarius in Wirth, *supra* note 6, at 825 n. 29. Similarly, L'Office International des Epizooties and the Secretariat of the International Plant Protection Convention have been active in setting standards with respect to animal and plant disease. See *Understanding the World Trade Organization Agreement on Sanitary and Phytosanitary Measures*, *supra* note 25.

⁶⁴ Indeed they may speak with more authority in foreign countries on account of their U.S. scientific training than they would in the United States.

⁶⁵ G. Langley et al., *Use of Written Cases to Study Factors Associated with Regional Variations in Referral Rates*, 44 J. CLIN. EPIDEMIOL. 391 (1991).

Scientific traditions may promote regulatory convergence based not on trade efficiencies but on the happenstance of received scientific traditions. Universities and research institutes may grow as determinative institutions for economic integration. Many prominent members of recent Mexican governments, including Presidents Salinas and Zedillo, completed U.S. doctoral programs in economics. This shared scientific vision helped precipitate the marked shift in Mexican economic policy away from import substitution and toward economic integration with the United States. Stephen Zamora has noted the changes exerted on Mexican law by the increasing presence of Mexican lawyers trained in U.S. law schools.⁶⁶

Scientific determinations may serve as an alternate source of lawmaking within institutional accords such as the WTO and the NAFTA, both of which lack formal lawmaking institutions. Assuming a flow of dispute resolution decisions under the WTO and the NAFTA, there may come to be a "common law" of scientific determinations. A regulatory measure upheld by a WTO or the NAFTA dispute panel may likely be immune from further challenge, and might well be adopted by other nations with a high degree of confidence. Thus, over time there may be a cumulative growth of permitted trade restrictions. Once blessed as supported by scientific justification, a trade restriction may be replicated and become thereby an effective standard for a larger territory. Should a NAFTA panel find a Canadian health regulation justified with respect to a U.S. product, Mexico might feel invited to impose a parallel restriction, premised on a kind of *stare decisis*. And so too might a WTO member, anticipating that a DSU panel might well give weight to the prior determination of the NAFTA panel upholding the regulation.

This precedential pattern may work with respect to negative findings as well. Once a panel, established either under the WTO's DSU or NAFTA, finds a purported health regulation to be without scientific foundation, such a measure will likely no longer be supportable by either the party to the dispute or by any other nation.⁶⁷

⁶⁶ See Stephen Zamora, *NAFTA and the Harmonization of Domestic Legal Systems: The Side Effects of Free Trade*, 12 ARIZ. J. INT'L & COMP. L. 401, 424 (1995). For an overview of formal and informal U.S. influences on Mexican domestic law, see Stephen Zamora, *The Americanization of Mexican Law: Non-Trade Issues in the North American Free Trade Agreement*, 24 LAW & POL'Y INT'L BUS. 391 (1993).

⁶⁷ When an allegedly scientifically-unfounded SPS measure is maintained by a number of countries, it might make strategic sense to initiate dispute resolution against the weakest country, and then use the resulting finding against the remaining countries applying the measure.

A more serious concern arises where risks are found acceptable with respect to a domestic product, but are banned with respect to an arguably comparable import. Disputes over pesticide residues often fit this pattern. Higher tolerances for pesticides are permitted for locally-grown produce than are tolerated in partly-substitutable foreign produce.⁶⁸ The most difficult case, and perhaps a special one, results from tobacco products, which are legal in most places. Were the risk from smoking deemed "tolerable" for the broad public, many SPS measures would be wiped away, as they address less substantial risks. Perhaps risk assessment breaks down in the case of addiction, much as does ordinary economics.

The new standards regimes do not satisfactorily resolve the situation of "battling science," typified by the U.S.-European beef hormone dispute. One would suppose that the Europeans would argue that "science" supports the ban against hormone-stimulated beef whereas the United States would argue that science proves the beef's harmlessness.⁶⁹ In cases such as these, the regulating authority and the challenging nation assert scientific justification for their respective positions. One nation will offer the affirmative position; the other, the negative. In the beef hormones dispute, EU scientists would make an affirmative argument: that science supports the existence of a risk to consumers of hormone-stimulated beef. United States scientists would make the negative argument: that there is no proof that the hormone-stimulated beef poses a risk to human health.

The proof argued may simply be the absence of a positive finding. This can only be persuasive where there are a host of studies testing a link but finding none. We cannot prove that caffeine is harmless; we can only point to a large number of studies testing caffeine usage against various pathologies that fail to find meaningful association. Institutional science will make such negative pronouncements where the regulatory stakes are high enough. Recently the National Research Council presented a study concluding that there was no convincing evidence that exposure to radiation from power lines poses a

⁶⁸ See, e.g., Case 94/83, Criminal Proceedings Against Albert Heijn, 1984 E.C.R. 3263.

⁶⁹ Note that the U.S. position is not that hormone-treated beef has a low-probability of risk; rather the U.S. argues that as the beef itself lacks the hormones, it is physically identical to non-treated beef, and therefore, as a scientific certainty, poses no marginal threat to human health. See Jackson, *supra* note 14, at 435. See generally Michael B. Froman, *International Trade-The United States-European Community Hormone Treated Beef Conflict*, 30 HARV. INT'L L.J. 549 (1989); Adrián Rafael Halpern, *The U.S.-EC Hormone Beef Controversy and the Standards Code: Implications for the Application of Health Regulations to Agricultural Trade*, 14 N.C.J. INT'L L. & COM. REG. 135 (1989).

health hazard. The Council reached this conclusion while noting the existence of studies showing a statistically significant risk for leukemia in children living near power lines.⁷⁰

Negative arguments of this type can rarely resolve disputes. That no study has shown a risk does not preclude the risk's existence. More powerful are negative arguments based on a lack of a scientific basis: that the dominant paradigms do not permit assertions of causality that underlies a particular regulatory response.

Even more challenging would be cases, such as *muesli*, where affirmative scientific justifications can be argued both for the regulation and for its removal. These cases may involve disputes about inference within a dominant paradigm, or may reflect the existence of two rival paradigms, neither of which has attained dominance. SPS measures present many of these difficult cases.⁷¹

In resolving disputes, both WTO SPS Agreement and NAFTA permit the charging of "experts" to advise dispute resolution panels on scientific matters. While appointment of such experts is not mandatory, it is likely, particularly given criticism of past GATT dispute panels for encroaching on scientific determinations.⁷² "Experts" are likely to behave differently than do ordinary dispute panelists.⁷³ They are more likely to recognize the presence of a scientific justification for a challenged measure where the scientific assertion is recognized in the specific community to which they belong.

V. CONCLUSION

With the Uruguay Round amendments to the GATT system now set, the standards regime has been substantially universalized. Both the WTO TBT Agreement and the WTO SPS Agreement are included among the WTO's "Multilateral Trade Agreements." As such, both of these agreements are mandatorily binding on the entire WTO membership. Under the WTO arrangements, national technical stan-

⁷⁰ See Warren Leary, *Panel Says Electric Fields Pose No Known Hazard*, N.Y. TIMES, Nov. 1, 1996.

⁷¹ Many pharmaceutical products have both harmful and healthful effects, depending on individual characteristics, dosage and length of application. Birth control pills may increase risks of certain cancers, but also reduce other risks. Under the SPS regimes, a country could ban a product having a mixed effect, premised on a risk assessment of a particular effect, even when its benefits arguably outweigh these risks.

⁷² In the fish landing dispute with Canada, a GATT dispute panel found the Canadian requirement that 100 percent of the catch be off-loaded in Canada to be unsupported by science. Wirth, *supra* note 6, at 845-47 & nn.106 & 119. This report has been sharply criticized for not deferring to Canadian scientific expertise. *Id.* at 847.

⁷³ See *id.* at 852-53.

dards, including important SPS measures, are now subject to international scrutiny. As a general proposition, national regulatory discretion is circumscribed within all WTO members. For the first time, most of the world's nations must potentially answer to dispute resolution panels about the appropriateness of their national regulation. However, the express reservation of national prerogative in SPS rulemaking and the cloaking effect of the scientific basis test will cause SPS measures to be less open to trade challenge. Where scientific justification is present, national competence to regulate is hardly diminished. Both WTO SPS Agreement and NAFTA's SPS provisions permit countries to freely make risk assessment, setting standards as high or low as they see fit.⁷⁴ The science-based disciplines create new premises for the maintenance of national prerogatives in the face of globalizing regulatory power.

Science is a much challenged notion in contemporary thinking; as such, it promises little hope as a source for neutral principles to resolve economic disputes among nations. Science is a product of what questions are asked of it: a system that requires scientific bases for self-interested positions is likely to find them. Science is hardly as universal as one might first imagine; the history of trade disputes already has demonstrated the possibility of rival scientific positions urging contrary regulatory stances. Scientific consensus is geographically distributed and flows from centers of influence. A science-based regulatory scheme will reveal patterns of convergence that differ markedly from patterns generated by trade volumes and geographic proximity.

Science may, however, lead to a new kind of international discourse, where certain moves are excluded. Acceptance of certain lines of scientific reasoning by international dispute panels may have precedential effect. The validation of certain "scientific voices" will further exacerbate the democracy problem affecting trade pacts generally, and will effect internal allocations of power and influence. Nations commanding resources for the establishment of scientific consensus will be able to exert important influence on the look of national regulation throughout the world. Science risks losing its prestige as it falls into instrumentalized use, another politicized ideology explicitly directed by money and power.

⁷⁴ The notion of "high" and "low" standards has multiple interpretations. They may describe a nation's standards relative to others, or they may capture the implicit valuation of the avoided harm. See Atik, *supra* note 32, at 94.