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in the Humanities & Social Sciences

N. Patrick Peritore, Ana Karina Galve-Peritore. *Biotechnology in Latin America: Politics, Impacts, and Risks (Latin American Silhouettes).* Wilmington, Del.: SR Books, 1995. $65.00 (cloth), ISBN 978-0-8420-2556-0; $17.95 (paper), ISBN 978-0-8420-2557-7.

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Published on H-LatAm (October, 1995)

This compelling volume is unlike its predecessors in the series in that its focus is upon a topic current in the applied biological sciences. Readers familiar with the Latin American Silhouettes: Studies in History and Culture volumes (edited by William H. Beezley and Judith Ewell), may recall that this series has consistently included important works on Latin American history and political science. Among these are *The Mexican Revolution in Puebla* (David G. LaFrance, 1989), *Slaves, Sugar, and Colonial Society: Travel Accounts of Cuba, 1801-1899* (Louis A. P=82rez, ed., 1992), and *Doing Business With the Dictators: A Political History of the United Fruit in Guatemala, 1899-1944* (Paul J. Dosal, 1993). In the main, the volumes in the series have been country-specific, so that *Biotechnology in Latin America* is an exception because it not only presents case studies from Mexico, Cuba, and Colombia, but also contains essays which focus upon multinational biological science and concurrent political and socioeconomic ethical perspectives.

The volume's editors argue that the current decade is a crucial period of transition in which many societies are in the process of changing from industrial mass production and consumption economies with welfare states to postmodern knowledge-based economies with the decentralization of government, and corporate structures and regional economies that transcend nation-state boundaries. Recently developed technologies such as artificial intelligence, supercomputing, satellite technology, telecommunication, robotics, microengineering, advanced materials science, and biotechnology hold great promise for humankind and, yet, are a Pandora's Box. Genetic therapies for congential disease, new forms of natural and synthetic pharmaceuticals, biopesticides and bioherbicides, and larger and healthier agriflora and fauna loom large, but so do risks to the human genome, the environment, and the future of humankind on our planet. Relevant contemporary examples include Chernobyl, Bopal, Ebola, hantaviruses, the greenhouse effect, and the modification of our atmospheric ozone by industrial pollutants and fluorocarbons.

This slim volume considers the methods, opportunities, and risks of biotechnology, and anticipates that humankind can learn to cope and benefit from this dangerous and wondrous recently developed technology. The worst-case scenario is the mass extinction of our planet's biota, the loss of biodiversity, and the modification of the human genome. Biotechnology may be defined as a set of methodologies drawn from microbiology, genetics, and biochemistry, which enables scientists to manipulate and recombine the genetic codes of viruses, bacteria, plants, and animals in order to create products which have commercial value. Transnational corporations and regional markets play significant roles in the development of this new, exciting and provocative scientific endeavor.

The nine original contributions thematically consider a newly developed set of techniques drawn from the biological sciences that have compelling impacts upon the future of humankind and the cultural, biological, and physical environments created and/or modified by our species. The editors have taken great pains to assemble authoratative essays that minimize biological and technical jargon yet retain the essence of the data and cogent arguments. These essays shed light on a variety of problems which are important to Latin America, yet the sociocultural and ecological challenges and impacts are similar to those faced in other regions of the economically underdeveloped world such as Subsaharan Africa and portions of the Pacific Rim, particularly Southeast Asia and the archipelagos and islands of the southwest Pacific. For social scientists and humanities scholars, a majority of the contributions may be difficult to follow because of scientific terminology and the use of acronyms. The authors provide a list of 125 abbreviations and acronyms, some in English, Spanish, or Portuguese (pp. xiii-xvi)) that appear with great frequency in the nine essays. I found it useful to photocopy these pages and have them at hand during my reading.

The volume begins with brief biographies of the contributors, provides the aforementioned list of abbreviations and acronyms, and includes an illuminating editorial introduction. A ten-page glossary (111 items) and a 19-page bibliography (containing 416 citations in English, Spanish, Portuguese, or French) are appended. This comprehensive bibliography –rather than works cited – is divided into five sections which include government documents (38); unpublished documents and conferences (33); books (146); journals and articles (218); and newspapers, speeches, and e-mail (11). Each chapter has its own endnote references and the volume has no index.

I shall review each chapter and provide relevant background about the individual authors, most of whom come from non-humanities disciplines, and comment about the volume itself.

The editorial introduction written by Peritore and Galve-Peritore sets the stage for the nine essays that follow. Patrick Peritore, Ph.D., is an associate professor of political science at the University of Missouri-Columbia and has conducted field research in India, China, and Latin America (Cuba, Nicaragua, and Mexico), on left politics, liberation theology, and the environment. Ana Karina Galve-Peritore, Ph.D., is a former professor at the University of Mexico and analyst at the Foreign Relations Secretariat in Mexico, D.F., has conducted research in Mexico and Brazil, and is *Mexican linkages coordinator* at the University of Missouri-Columbia.

The editors define biotechnology and provide examples, emphasize the roles of the new technologies and relationships to regional markets and transnational corporations. They also stress that corporate biotechnology potentially threatens biodiversity and ecosystem integrity despite the fact that transnational corporations (especially agricultural and pharmaceutical) and national governments embrace biotechnology as a strategic good. Nonethless, the editors argue that biotechnology ultimately enhances the economic inequities between developed and developing nations. They also note that it tends to produce genetically engineered monocultures in the developing world, increasing genetic erosion in these sensitive centers of biodiversity. However, although they predict that most biotechnology will prove to be benign, but observe that genetic drift has made genetic engineering even more risky than initially assumed. Therefore, native species and other species, genera, or families of organisms are being affected – witness superpests and superweeds. Even one or two percent risk can have potentially unknown catastrophic effects on the environment. The lack of large-scale studies of baseline ecology and a paucity, to date, of legal responses to these risks and the need for the formulation of regulatory controls are clear. In sum, the editors sound a sobering warning and suggest that a uniform framework of national and international regulations, modeled after the Law of the Sea treaty regime is needed.

The initial three chapters of this work offer an overview of biotechnology in general but with specific references to Latin America. In Chapter One, "Biotechnology: Political Economy and Environmental Impacts," Patrick Peritore examines corporate and government interests in biotechnology and contends that while the science may revolutionize industry, medicine, and agriculture, we do not yet understand the potential long-term effects genetically engineered organisms can have on native ecosystems and human populations. Transnational corporations and government elites are interested in the immense profits and world-market shares that appear inevitable in agrobusiness and pharmaceuticals, and these conflict with genetic property rights. He postulates that less-developed countries will be unable to defend themselves from the technological and commercial assaults of biotechnology because of political and economic instability (inflation and debt). As a result, Peritore concludes that problems of overpopulation, social decay, ecological degradation, and chronic conflict or civil strife may develop. The profit motive and new technologies serve the elite nations while the less-developed countries become marginalized although they are sources of biological raw materials, markets, cheap labor, and waste dumps. At the same time, engineered organisms may have unknown effects upon ecologies, populations, and genomes.

In Chapter Two, "Third World Biotechnology, Latin American Development, and the Foreign Debt Problem," Daniel J. Goldstein, M.D., critiques the capacity of Latin American technostructures to develop biotechnology. He is a professor of biology at the University of Buenos Aires, and best known for his research on immunoglobulin crystallography, renin-angiotensin systems, and mast cell histamine in drinking behavior. Goldstein challenges the view that the eradication of malnutrition, the elimination of endemic parasitic diseases, and socioeconomic improvements among Latin American farmers are unrealistic and mistaken goals. He suggests that the region's foreign debt must be converted into an instrument of development and proposes the renegotiation of Latin America's foreign debt and an alternative model of international cooperation financed by debt-equity swaps. A partnership of creditor banks in the industrialized world, debtor countries, and Latin American venture capitalists is counseled. An ultimate goal would be the upgrading of

higher education and science in Latin America. Macroeconomists will undoubtedly challenge some of the propositions advanced in this chapter.

Jose de Sousa Silva is the author of Chapter Three, "Plant Intellectual Property Rights: The Rise of Nature as a Commodity." He holds a Ph.D. in sociology from the University of Kentucky and is the head of the secretariat for Strategic Administration of EMBRAPA (Empresa Brasileria de Pesquisas Agropecuarias). In his view, biotechnology is a mediator between the raw material of plant genes and agriculture as a socioeconomic activity, thereby necessitating policy and regulatory considerations. He believes that social problems will be reduced to technical problems with limited ranges of solutions, and that social goals would potentially become subordinate to private and political gains. Likewise, he predicts that ecological differences between tropical and temperate agriculture will be overcome and that a large part of food and fiber production would be dislocated from the former to the latter. The result would be the collapse of tropical markets and regional economies, and the centers of biodiversity will decrease and the resulting monocultures will be increasingly vulnerable to pests, weeds, and plagues.

Chapters Four through Six are specific case studies, beginning with Patrick and Anna Karina Peritore's "Mexican Biotechnology Policy and Decision Makers' Attitudes toward Technology Policy." They conducted 66 interviews with scientists, government administrators, and business executives engaged in biotechnology in several Mexican cities and constructed a Q-Method attitude modeling protocol to apply to 40 prominent decision makers. Interview questions related to three phases of biotechnology (theory, policy, and decision-maker attitudes); three theories and associated policy options were discerned: neoliberal market integration, neomercantile strategic trade, and dependency theory with import substitution. They conclude that the national government is not playing a significant role in funding research nor is the market driving the development of Mexican science. The authors predict that the lack of government promotion of university-business/industry linkages will ultimately expose Mexican biotechnology to probable absorption by United States and Canadian transnational corporations. In sum, Mexico –like Brazil, a major world center of biodiversity – will donate its native cultivars and germplasms to developed-nation transnational corporations and will then have to purchase from these companies highly protected, high-cost agrobiotechnological and pharmaceutical products made from its own genetic resources. The potential agroeconomic problems that may occur under NAFTA are notable.

Chapter Six, "Cuban Biotechnology: The Strategic Success and Commercial Limits of a First World Approach to Development," is written by Julie M. Feinsilver, Ph.D., a Washington-based consultant to international organizations. She holds affiliations at American University and the Council on Hemispheric Affairs, and is a specialist on Cuba. Feinsilver profiles Cuba's highly successful biotechnology industry, and evaluates the positive and negative impacts of Fidel Castro's high-technology strategy of development. Scientific development in Cuba began during the 1960s, had some achievements in the following decade, but had a tremendous quantitative and qualitative leap forward in the mid-1980s with the establishment of the scientific-industrial complex based around the campus of the Centro de Ingeneria Genetica y Biotecnologia. In 1990 Castro designated three sectors –food production, tourism, and biotechnology/medicine – for top-priority investment despite severe economic problems. The author wonders if Cuba *can continue to maintain a highly privileged scientific sector, in a country that in many areas is rapidly returning to the preindustrial era...* (p. 120). Nonetheless, although Cuban biotechnology was developed to meet domestic needs, it produces growth factors, hepatitis B vaccine, interferons, endonucleases, and recombinant streptokinase for sale in Latin America, Europe, Russia, and China. Feinsilver concludes that if Cuba can enter the North American market, billion-dollar sales can be projected.

Gustavo Hernandez-Boada, Ph.D., authored Chapter Six, "Colombia and the Challenge of Biotechnology." He holds degrees in veterinary science, genetics, and animal breeding, and headed cattle breeding programs for the Colombian Institute of Agriculture and is a consultant to the Instituto Interamericano de Cooperacion Agricola in Montevideo. The author, a recognized expert on the genetics and cattle breeding in subtropical areas, considers how Latin America can benefit from biotechnology and be affected by it. He notes that the Amazon rain forest contains fully one-third of the planet's biodiversity and that Colombia's share of the Amazonian ecosystem gives it access to over ten percent of the world's biodiversity. The Colombian biotechnology industry, typical of many middle-sized Latin American countries, is discussed and evaluated. Raising agricultural productivity, increasing arable lands, and supplementing low-input agricultural techniques are seen as benefits, but these can be balanced by the diminution of major export markets, control of agriculture by transnational corporations, and an increase in the concentration of agricultural lands (latifundios). He predicts that Colombian biotechnology will

pursue commercial rather than ecological or social agendas.

Chapter Seven, "Recombinant Growth Hormone: A Challenge for Latin America," by Ramon Aboytes-Torres, Ph.D., examines the costs and benefits of bovine-growth hormone in the production of meat and milk. He is a senior researcher in bovine anaplasmosis at the National Center for Specialized Investigation in Veterinary Parasitology, Instituto Nacional de Investigaciones Forestales y Agropecuarias, Secretariat of Agriculture and Hydraulic Resources. The author notes that technology is a two-sided phenomenon and raises concerns about the lack of proper ethical decision-making by policymakers and government officials, a lack of knowledge about the short- and long-term risks of the commercialization of modern biotechnologies, and the paucity of regulatory controls. He points out that certain recombinant somatotropic hormones banned in the United States are widely used in Latin America to increase dairy production, but that the effects of this use are unknown.

Jose Juan Hernandez-Ledezma and Valantine Solyman-Golpashini, the coauthors of Chapter Eight, "Manipulation of Gametes and Embryos in Animal Biotechnology's Impact on Livestock Production in Latin America," examine new reproductive biotechnologies. Among these are multiple ovulation, embryo transfer, embryo cloning, the production of stem cell lines, and transgenetic animals. The senior author holds a Ph.D. in reproductive physiology and embryology and is a research associate at the University of Missouri-Columbia. He is a specialist on the molecular biology of in-vitro-produced bovine embryos and consults with laboratories providing reproductive technologies to infertile couples. Valantine Solyman-Golpashini, a graduate student at the University of Missouri-Columbia, holds degrees in agronomy and agricultural economics, and has done research on dairy production in Mexico. The authors do not anticipate the widespread use of artificial insemination or embryo transfer in Latin America, and conclude that simpler alternatives must be explored before embarking upon the importation of expensive technologies that may not produce the desired results.

In Chapter Nine, "National, Regional, and International Regimes and the Regulation of Biotechnology," Patrick Peritore summarizes a number of strands proposed by other authors and raises important issues about human health, environmental risks, socioeconomic impacts, and legal and ethical concerns. He criticizes neoliberal regulation and, borrowing from the strategy used to develop the Law of the Sea, outlines a possible international treaty regulating biotechnology.

Biotechnology in Latin America is a signal contribution to the literature on the ethics of biotechnology and is only one of three studies on the topic in English and, the editors rightfully note, is *the only one free to take a balanced and at times critical perspective* (p. xix). Environmental problems such as overpopulation, the greenhouse effect, and the diminution of the tropical rain forests are seen in relationship to the privatizaton of biotechnology, transnational corporations, and the globalization of the economy toward a monoculture. In the main, Latin American nation-states lack access to world capital markets, expensive cutting-edge science, substantial numbers of highly-educated and trained personnel, and sophisticated government-sponsored university-business/industry linkages found in advanced nation-states. The profit motive, the concentration of transnational corporations (the opposite of the Green Revolution technology), ecological degradation, ruined agricultural lands, mutated plants and animals, malnutrition, new and resurgent diseases, and superpests are among the important topics considered. The editors' introduction and Peritore's discussion in Chapter Nine calling for an international treaty are especially worthy essays.

Although heavily imbued with biological terminology and acronyms, this book presents significant information and contains critical arguments that deserve the attention of variety of social scientists and humanities scholars as well as the scientific community of geneticists, ecologists, and animal scientists. Historians, political scientists, ethicists, jurists, economists, demographers, urban planners, and sociologists, among others, will find the essays in this book thoughtful and provocative. Anthropologists, whether working in the cultural or applied subfields, as well as human biologists, will especially find merit in this volume. The references are excellent and up-to- date, and will lead reader to some very profound literature on bioethics. *Biotechnology in Latin America* isn't *Future Shock* or *The Third Wave* but the implications of the essays go well beyond regional political geography. The book provides a firm foundation for continued study of a complex, ongoing problem and will contains sufficient information for additional dialogue between biologists and policymakers, and social scientists and scholars in the humanities.

The authors, editors, and publisher are to be congratulated for their environmental and preservation consciousnesss in preparing this *ecologically safe* volume. The recycled paper used to print the book meets the current minimum requirement of the American National Standards Institute (ANSI Standard Z39.48, 1984) for permanence of paper for printed library materials and soy ink was used in the printing process.

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Citation: Charles C. Kolb. Review of Peritore, N. Patrick; Galve-Peritore, Ana Karina, *Biotechnology in Latin America: Politics, Impacts, and Risks (Latin American Silhouettes).* H-LatAm, H-Net Reviews. October, 1995.
URL: http://www.h-net.org/reviews/showrev.php?id=195

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