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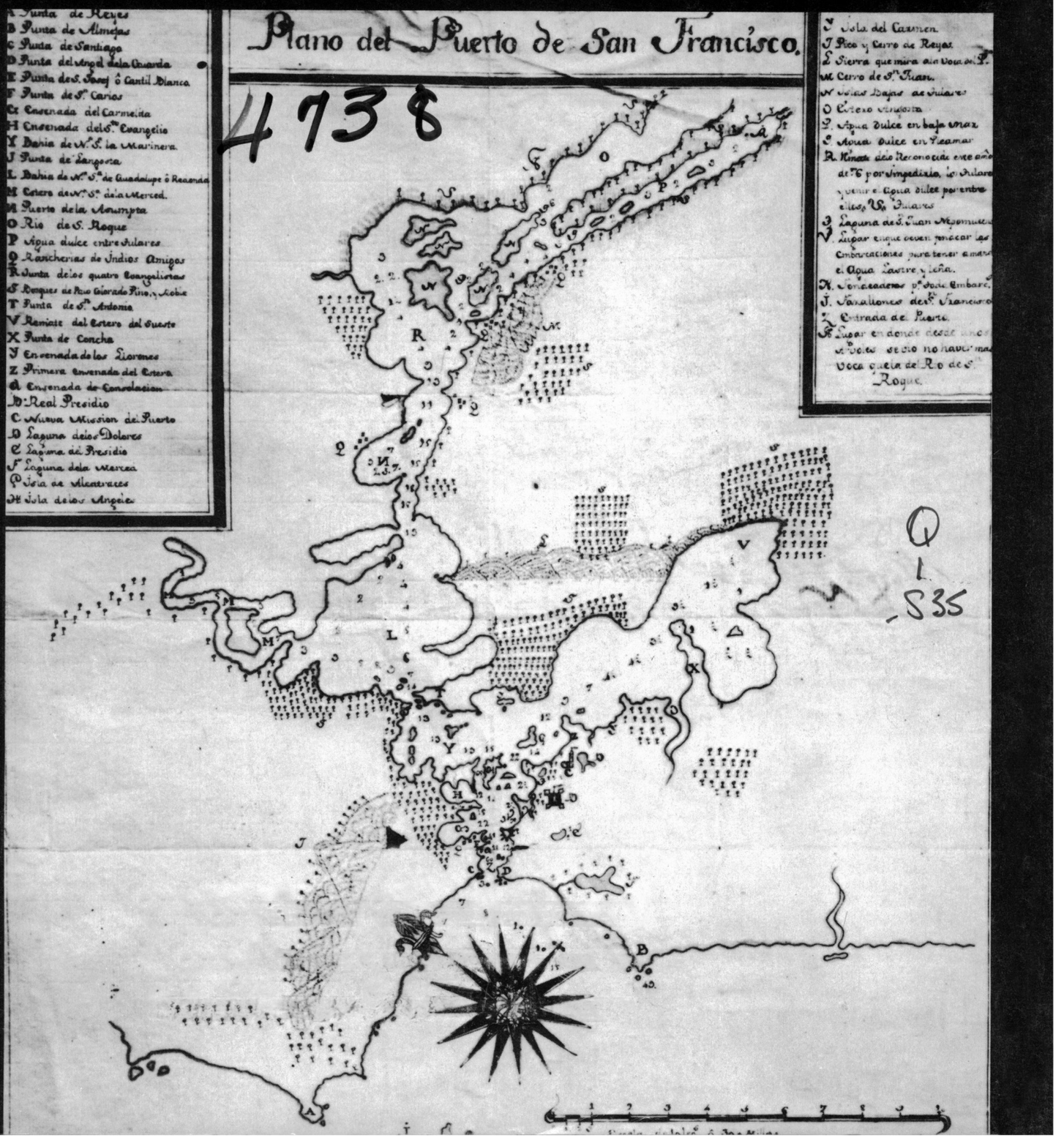

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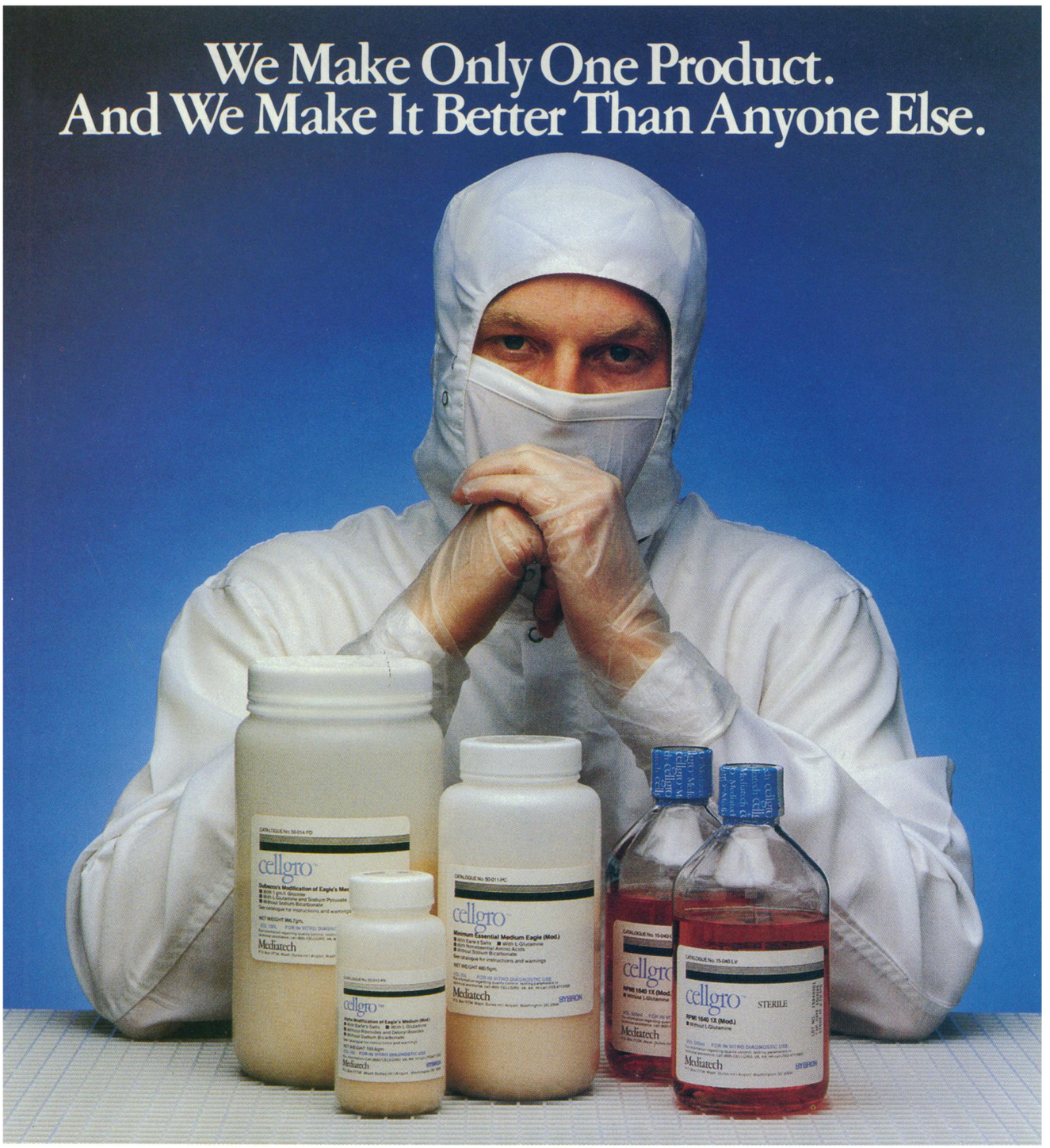

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COVER Chart of San Francisco Bay drawn following the bay's discovery in 1769 by Spanish colonizers. The region remained isolated until the discovery of gold in 1848 ushered California and its largest estuary into a century of rapid change. See page 567. [From manuscript map in Ministerio de Guerra Archives, Madrid, by José de Cañizares, pilot of the Spanish vessel *San Carlos*, 1776. Photo courtesy of Bancroft Library, University of California, Berkeley 94720]

From our local star to the ends of the universe . . . . . .

ASTRONOMY & ASTROPHYSICS

This volume contains 24 articles published in *Science* between 1982–84, ranging from the solar system to the pulsars at the very edge of the observable universe. Research techniques and instruments described cover such diverse topics as proton decay, the Very Large Array, and the planned Space Station as a platform for future experiments.

Each article is self-contained, yet as a whole, the volume reveals a broad, coherent, and contemporary picture of our astronomical universe. Selected for their depth of coverage and breadth of topics by Morton S. Roberts, Director of the National Radio Astronomy Observatory, these articles are of interest to the entire scientific community.

Contents

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Golden gateway tarnished

Since Gold Rush days, major changes have taken place in the San Francisco Bay (cover) estuary where the Sacramento and San Joaquin rivers meet the Pacific Ocean (page 567). Settlers moving to San Francisco in the mid-1800's increased the city's population from 400 to 25,000 people in just 2 years; settlements also flourished in the Sierra Nevada foothills and the Central Valley. Early on, the gold-mining industry choked the river system with debris, and the farmers diverted water for irrigation (a practice that continues today on a larger scale). In time, these and other factors contributed to dramatic changes in the interacting physical, chemical, and biological processes of the estuary. Nichols *et al.* evaluate the changing ecology of the system, the disturbances to the food web, and the deleterious consequences of a declining percentage of freshwater mixing with seawater in the estuary, of domestic and industrial waste dumping, and of land reclamation projects. Information on causal relations has produced some positive outcomes: for instance, construction of a drain project was stopped when deaths and deformities in birds were linked to leaching and concentration of selenium by irrigation water. But the future well-being of the estuary will depend on continuing awareness of the balance between exploitation and preservation of this invaluable resource.

Evolution of earth's climate

Dramatic changes in earth's climate during the last 100 million years, including the formation of permanent ice caps at the poles, may have resulted from seasonal temperature changes rather than from major year-round cooling or warming of the planet (page 579). Temperatures today are strongly affected by the distributions of land masses and oceans; ancient temperatures may also have depended on the land-sea configuration. Crowley *et al.* developed a model for defining isotherms (lines connecting regions of equal temperatures around the globe), simulated the current seasonal cycles with contemporary data, and then simulated summer temperatures tens of millions of years ago. Around 60 million years ago, as the breakup of the supercontinent Pangaea progressed and smaller continents drifted poleward, Greenland became isolated from other land masses, and its summer temperature dropped by more than 10°C in a 20-million-year interval. The surrounding marine environment helped stabilize conditions over the land so that summers were not warm enough to melt the winter snow and ice. Simulations for Antarctica before and after its separation from Australia showed a summer temperature drop of 5° to 8°C. Cooling during this period is documented in both marine and land records, further narrowing the beginnings of the formation of the ice caps to about 40 million years ago. At other times during its evolution, the earth may have been ice-free, not because of an overall warming trend but because there was sufficient summer heat to melt winter ice and snow.

Strain accumulation and earthquake predictions

Earthquakes occur frequently in the region where Alaska arcs into the Aleutian Islands (page 585). There, the Pacific plate is slipping under the North American plate, and such subduction sets off earthquakes throughout the chain of volcanic islands. Two locations along the arc, the Yakataga and Shumagin seismic gaps, are considered prime candidates for future ruptures because no great earthquakes have occurred at either gap since the beginning of this century. Savage *et al.* measured strain accumulation in these regions and found that at the Yakataga gap the accumulation rate indicates that a great earthquake is possible in the future. At Shumagin gap, the rate of strain accumulation was unexpectedly low. Either subduction in that zone has changed and will no longer be accompanied by great earthquakes as in the past, or subduction and strain accumulation are episodic rather than cumulative; in either case, buildup of strain apparently cannot be used in earthquake prediction.

Herbivores orchestrate algal rhythms

Minnesota's Pleasant Pond contains a community of algae with reproductive and mortality rates that are affected by a prey-predator relation with the crustacean herbivore, *Daphnia pulex* (page 605). Sterner found that although the mortality rate of the algae was directly related to herbivore density, the herbivores also enriched the pond water. By providing nitrogen (an otherwise limiting resource) to the pond, the herbivores enhanced the reproductive rate of the algae. Thus, in more than one way, the actions of the grazers affect the population dynamics in this aquatic food web.

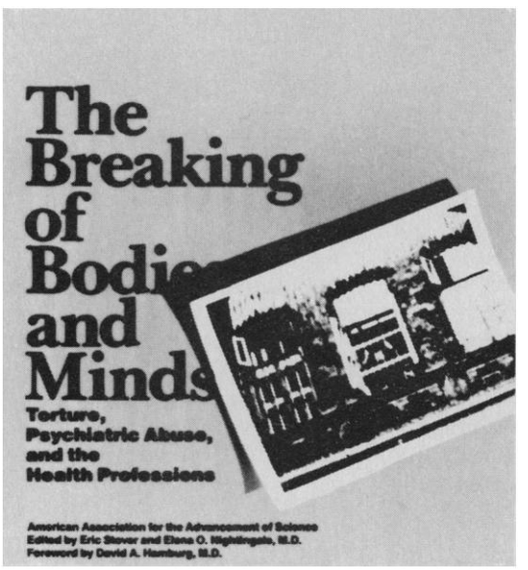
Plant tumor induction

In two biosynthetic steps, simple amino acids can be converted to powerful hormones that promote tumor growth in plants (page 616). Cells of the plant tumors called crown galls grow well in tissue culture without addition of hormones, in contrast to normal plant cells that must be regularly supplemented. The soil bacterium *Agrobacterium tumefaciens* causes crown galls by transferring to the plant cell a piece of DNA that contains several genes, two of which have been shown to promote gall cell growth in culture. The protein produced by one of the genes is known to convert a precursor molecule to an auxin, a natural plant hormone. Using genetic engineering techniques, Thomashow *et al.* have now shown that the product of the other gene can catalyze synthesis of the auxin precursor from a simple amino acid, L-tryptophan. Expression of the two genes in plant cells thus apparently contributes to altered cell proliferation and maturation through hormonal activities, and the result is tumor development.

The Breaking of Bodies and Minds

Torture, Psychiatric Abuse, and the Health Professions

A documentation of systematic use and effects of physical and mental torture throughout the world



Edited by Eric Stover and Elena O. Nightingale

With a Foreword by David A. Hamburg

This eye-opening book brings together for the first time writings on the role of medical personnel in cases of torture and psychiatric abuse. Through analyses and case histories, psychiatrists and other health care professionals, political scientists, ethicists, and other writers discuss the systematic use and effects of physical and mental torture in the Soviet Union, Latin America, and other parts of the world.

The book also details the complicity of an alarming number of medical personnel in torture and psychiatric abuse and examines the ways in which governments use a medical rationale to seek legitimacy for human destruction. Finally, it describes efforts by medical and other associations both to combat offensive practices and treat victims.

Contents

The Breaking of Bodies and Minds is important reading for anyone concerned with the preservation of basic human rights.

1985 352 pages

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SCIENCE

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New Risks of Prejudice, Ethnocentrism, and Violence

The world is now, as it has been for a long time, awash in a sea of ethnocentrism, prejudice, and violent conflict. The worldwide historical record is full of hateful and destructive indulgences based on religious, racial, and other distinctions—holy wars of one sort or another. What is new is the destructive power of our weaponry: nuclear, enhanced conventional, chemical, and biological. Moreover, the worldwide spread of technical capability, the miniaturization of weapons, the widely broadcast justifications for violence, and the upsurge of fanatical behavior are occurring in ways that can readily provide the stuff of very deadly conflicts. To be blunt, we have a rapidly growing capacity to make life everywhere absolutely miserable and disastrous.

Centuries ago, it was common for military conquerors to put captives to the sword or to reduce them to slavery. By the end of the 19th century, it was widely believed that we had achieved a sufficiently civilized status to make such horrors impossible. Yet the world since then has seen near extermination of peoples, massacres, and massive deportations. We have learned and are continuing to learn how great the horrors can be when supposedly civilized nations set about destroying depreciated people.

In a world full of hatred, repression, terrorism, small wars, and preparation for immense wars, human conflict is a subject that deserves the most careful and searching inquiry. The stakes are now so high that there is an urgent need for cooperative engagement with these problems over a wide range of inquiry involving the physical, biological, behavioral, and social sciences. There is no royal road to truth, no single perspective that offers overriding promise. Just as the sources and manifestations of human conflict are immensely varied, so too are there many useful approaches to understanding, preventing, and resolving conflict.

Conflict and its prevention or resolution have not been major subjects for scholarly inquiry until quite recently, and even now they attract only marginal interest in many of the world's great research institutions. Nevertheless, some interesting and useful work is being done, including research on biological evolution and mechanisms of aggressive behavior; deep inquiry into the origin and resolution of past conflicts and study of contemporary conflicts; formulation of fundamental concepts pertinent to a wide range of conflicts; experimental research on simulated conflicts; the study of negotiations, both in real-life circumstances and in simulated ones; the study of various intergroup and international institutions as they affect conflict; research specifically focusing on issues of war and peace; and the study of conflicts at various levels of organization, such as families, communities, and nations, in the search for common factors and principles, so that discoveries at one level may illuminate issues at another level. The strengthening of both experimental and observational research, keeping in mind actual conflict and real-world decision-makers, could probably lead to major contributions in the next decade.

It is certainly not beyond human ingenuity to move this subject higher on the world's agenda. Strong organizations covering wide sectors of science, technology, and education can take a more active role in coping with this critical issue. The scientific community is the closest approximation we now have to a truly international community, sharing certain fundamental interests, values, and standards as well as certain basic curiosities about the nature of matter, life, behavior, and the universe. The shared quest for understanding is one that knows no national boundaries, no inherent prejudices, no necessary ethnocentrism, and no barriers to the free play of information and ideas. To some extent, the scientific community can provide a model for human relations that might transcend some of the barriers that have long plagued us and have now become so dangerous.

In a fundamental way, the modern world is the creation of science and technology in all of its aspects—those we relish and those we fear. The time is ripe for the scientific community to provide worldwide leadership in addressing the ubiquity of prejudice, the profound and pervasive impact of ethnocentrism, and the greatly enhanced risks of these ancient orientations in the rapidly changing world of the late 20th century.—DAVID A. HAMBURG, President, Carnegie Corporation of New York, New York 10022

11th AAAS R&D Colloquium
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Registration fees include all sessions and publications; meals are included only with payment of full registration fee. All registrants receive *AAAS Report XI: Research and Development, FY 1987* before or at the Colloquium, published *Proceedings* after the meeting, and a supplementary report, *Congressional Action on R&D in the FY 1987 Budget,* in the fall.

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