moved to declassify a recent cable stating that body counts in El Salvador are unreliable and probably much higher than publicly acknowledged. Expanding on the issue, Schieffer of CBS News wondered whether the vulnerabilities of the Pentagon's "enormously expensive" M-1 tank would have been revealed if the new secrecy order had been in effect.

More than one witness also noted that the proposed order would probably be counterproductive because bureaucrats would more often leak classified information they felt was vital to informed public debate.

Criticism of the proposed order was recently noted by Meese, who told a meeting of the National Newspaper Association that the proposal was the result of an "overzealous bureaucracy" and that the Administration's actual position "is to decrease the number of classified documents." The current draft, he said, "is being corrected." His sincerity on this point is open to doubt, however. A 23 December draft of the order was signed by Meese himself.

It has been said, perhaps most eloquently by Victor Marchetti in *The CIA and the Cult of Intelligence*, that "among the dangers faced by a democratic society in fighting totalitarian systems, such as fascism and communism, is that the democratic government runs the risk of imitating its enemies' methods and, thereby, destroying the very democracy that it is seeking to defend." Perhaps the Reagan Administration, with its proposal to greatly expand powers of secrecy, is falling into just that trap.—WILLIAM J. BROAD

David Dickson to Join *Science* News Staff

David Dickson, Washington editor of *Nature* since 1978, has left that post and in June will become European correspondent for *Science*, based in Paris. In the interim, Dickson will be a science policy fellow at the University of Linköping, Sweden.

Spotlight on Pest Reflects on Pesticide

Use of ethylene dibromide in Medfly quarantine has impact on regulatory process, other side effects

The Reagan Administration entered the regulatory arena a year ago with the emphatically stated purpose of ensuring that the costs of regulation were fully weighed against its benefits. One of the decisions facing it involved a chemical called ethylene dibromide (EDB), which has been at the center of a regulatory battle since the mid-1970's and gained special notice last year during the Medfly crisis in California. EDB is the kind of compound offering both high risks and high benefits that can render such decisions hard to make.

EDB is one of the most effective and widely used pesticidal fumigants for fruits and vegetables. It is also highly controversial because animal tests have indicated that EDB is a carcinogen and mutagen and causes reproductive problems. Both the federal Environmental Protection Agency (EPA) and the Occupational Health and Safety Administration (OSHA) have proposed stricter regulation of EDB. The EPA, in fact, in 1980 proposed suspending the use of EDB as a fumigant for grain immediately and for citrus fruit in mid-1983.

USDA

Still life with Medflies

A major difficulty in dealing with EDB is that no ready alternative is available. EPA's proposal to ban EDB in 1983 as a fumigant for citrus fruit is based on the assumption that irradiation of produce with gamma rays will be scientifically and commercially feasible by then. However, despite recent developments that appear to markedly improve prospects for wider use of gamma irradiation in the United States, EPA's upbeat view on timing has been widely questioned.

Although the regulatory tussle over EDB began in the mid-1970's, it received little public attention until last year, when EDB was used as a citrus fumigant in California to counter the Mediterranean fruit fly. That action, which was taken to comply with federal Medfly quarantine restrictions, raised the economic and political stakes in the EDB case, prompted an interstate wrangle over shipments of fumigated fruit, and dealt a serious setback to the lucrative export of

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California produce to Japan (see box below). Use of EDB in California also led to a sharp public dispute between an EPA scientist and agency officials over the degree of hazard posed by EDB. Such differences can be difficult to resolve under existing law.

EDB is a synthetic organic chemical (1,2-dibromoethane) used primarily in an antiknock additive to gasoline. Other uses, besides treatment of produce, include fumigation of stored grain, preplanting treatment of soil to protect against nematodes, and treatment of stored logs and flour mill machinery. Only about 10 percent of the EDB manufactured is used in pesticides.

As a pesticide, EDB is regulated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Since 1972, when strengthening amendments were added, pesticides already on the market must be deemed safe to win "reregistration." The lawyerly name for the registration process is Rebuttable Presumption Against Registration (RPAR), which provides opportunities for comment from both sides at each major stage.

The first challenge to EDB came from the Environmental Defense Fund, which in the mid-1970's petitioned to have EDB's registration as a pesticide canceled mainly on the grounds of a National Cancer Institute (NCI) study showing that the chemical was a cancer-causing agent.

The 1977 study showed a statistically significant increase in squamous cancer cells in the forestomach of rats and mice

EDB Causes a Regulatory Ripple Effect

The controversy over ethylene dibromide (EDB) was carried to California on the wings of the Mediterranean fruit fly. A regulatory ripple effect began last summer when the state Air Resources Board expressed concern about the containment and recovery of gases that would be produced in a massive EDB fumigation program required by a Medfly quarantine. California's Occupational Safety and Health Administration (Cal OSHA) responded in September by proposing a drastic tightening of standards for EDB vapor in ambient air to 15 parts per billion (ppb) from the prevailing federal OSHA standard of 20 parts per million.

Cal OSHA's proposal, which did not bear a specific scientific rationale, was parried by the state Office of Administrative Law, which acts as a watchdog agency on regulatory matters, and a less rigorous standard of 130 ppb was set. This accorded with a 1977 recommendation emanating from the National Institute for Occupational Health and Safety.

Cal OSHA, meanwhile, had circularized employers and workers about the dangers of EDB; one result was that longshoremen refused to load fumigated fruit being exported to Japan. News of the EDB controversy also reached Japan, where dockworkers refused to handle fumigated fruit arriving in their country until Cal OSHA exposure standards were adopted. They were. The Japanese government, however, was concerned to keep out the Medfly and insisted on EDB fumigation of all fruit from California, not simply from the quarantined area.

Citrus exports to Japan are important to California agriculture since they total about $100 million a year; exports of lemons account for about two thirds. The lemon crop was heavily affected since the bulk of lemon exports to Japan are shipped in late summer and autumn when the new restrictions took effect. Losses are estimated at more than $16 million last year.

The Cal OSHA standards also had consequences closer to home. The new restrictions inspired a boycott in California of produce shipped in from Texas and Florida, both of which have their own EDB fumigation programs. High EDB residues were not the main bogey. The new Cal OSHA rules specified that work areas in which EDB vapors might be present must be placarded with warnings of the dangers of exposure. California supermarket chains apparently decided that such placards would alarm workers and customers and, conceivably, if the placards were missing, open the way to lawsuits. To avoid the problem, the chains decided simply not to handle the produce from out of state.

Events in California also had an impact on the federal Occupational Health and Safety Administration. Last September the International Brotherhood of Teamsters filed a petition asking for an emergency temporary standard reducing the permissible EDB exposure level to 15 ppb for an 8-hour day. This sparked a federal OSHA review of EDB.

OSHA often takes cues on determination of hazards from EPA, but operates its own parallel regulatory process since it is responsible for setting ambient air standards to protect workers who come into contact with pesticides on the job. On 18 December, OSHA announced that the results of studies on experimental animals "indicated that present permissible exposure levels for EDB of 20 parts per million (ppm) as an 8 hour average . . . exposure does not provide exposed workers adequate protection against cancer and other health effects." OSHA asked for comments to be submitted by the end of February and then on 26 February extended the deadline to 31 March. As for the original Teamsters petition for a temporary standard, however, OSHA denied the request on grounds that very little information was available about the nature and extent of employee exposure to EDB on a nationwide basis.

The EDB controversy had received national attention, however, and a high-level interagency task force was formed last autumn under the aegis of the White House Office of Science and Technology Policy to look at the problem. The task force ended its labors without making any direct recommendation on regulatory issues, but it did inspire some specific studies to determine actual exposure levels, including efforts to follow fumigated fruits cross-country and measure the persistence of EDB residues in trucks, warehouses, stores, docks, and ships. The results should help narrow the information gap and be taken into account in the final EPA decision.

On the export fruit, negotiations with the Japanese early this year apparently alleviated difficulties somewhat. The Japanese agreed to allow cold treatment of citrus fruit on the passage to Japan. Lemons from outside the regulated areas in California will be allowed into Japan unfumigated until 10 April, when the matter will be reviewed. That is about the time a new generation of Medflies will be emerging—if they have survived the spraying campaign and the winter—to begin a new chapter for the Medfly and EDB.—J.W.

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that had been fed on the compound. Later studies by Midwest Research Institute and NCI demonstrated that inhalation of EDB increased tumors in several sites in experimental animals. Evidence of the mutagenic potency of EDB and of reproductive disorders in bulls and rats induced by EDB were also cited.

Cancellation of registration for a pesticide requires a determination that the pesticide "no longer satisfies the statutory standard for registration." According to FIFRA language, that occurs when there is "an unreasonable risk to a man or the environment, taking into account the economic, social and environmental costs and benefits of the use of any pesticide." In other words, the law clearly states that the benefits of continued use must be weighed against the potential hazards.

The FIFRA standard is obviously much less clear-cut than that set by the Food, Drug, and Cosmetic Act which, through the so-called Delaney clause, forbids the presence of any element that is shown to cause cancer in animals regardless of level of exposure.

In December 1977, EPA published a notice that it was starting the RPAR process for EDB and invited interested persons to submit rebuttals or other information on hazards. Three years later, in December 1980, the agency took the next major step by announcing the availability of a "position document" setting forth EPA's review of the evidence.

The EPA notice said "the Agency has concluded that the presumptions for oncogenicity, mutagenicity and reproductive disorders have not been rebutted." Also announced was a "preliminary decision" to cancel use of EDB on stored grain immediately and on citrus and tropical fruits effective 1 July 1983. Other uses would be continued but on a restricted basis.

There is little disagreement that more information on EDB residue levels is needed or that workers could be better protected. Nor, in fact, is anyone really arguing that EDB is a benign chemical. The 1980 EPA notice says flatly, "It should be emphasized that the Agency believes that, in the long run, measures short of outright cancellation will not reduce the risks sufficiently to alter the conclusion that the use of EDB for quarantine fumigation of citrus, tropical fruits, and vegetables poses unreasonable adverse effects on the environment."

What to do in the short run, however, is the issue. Both the Secretary of Agriculture and the FIFRA scientific advisory panel, whose comments are formally required in the RPAR process, last spring recommended continued use of EDB on citrus. In both cases, lack of an acceptable alternative was cited as the major reason.

The advisory panel's statement notes the difficulty in evaluating the feasibility of using irradiation as an alternative to EDB and says no other alternative has been "demonstrated to be efficient, practical, and feasible from a cost standpoint."

Robert Metcalf of the University of Illinois, a member of the advisory panel when it made its recommendations on EDB, said that the committee agreed that the substance is a carcinogen and a mutagen and that it produces adverse reproductive effects. He says that EDB is chemically very like dibromochloropropane (DBCP) which was canceled by

Nonproliferation Post Vacant

The State Department official who had been expected to take the lead in putting the Reagan Administration stamp on U.S. nuclear nonproliferation policy has been relieved of that responsibility. James L. Malone will continue to head the U.S. delegation to the Law of the Sea negotiations, which are now in progress, but will be replaced in the sub-Cabinet post of assistant secretary for Oceans and International Environment and Scientific Affairs (OES).

No successor to Malone has been named and his removal leaves in question the direction of U.S. policy for nonproliferation and reopens the chronic question of the status of science and technology in U.S. diplomacy.

Assignment of Malone full-time to Law of the Sea duties was attributed by a State Department spokesman to the need for the negotiations to have the "full and undivided attention of the senior U.S. official." Sources at State say that the decision to move Malone was made after President Reagan's announcement on 29 January that the Administration was determined to see negotiation of an "acceptable treaty" from the U.S. point of view (*Science*, 19 March, p. 1480).

State Department spokesman Dean Fisher on 9 March rejected outright a Washington *Post* report on the previous day that Malone had been removed from the OES post because he had not succeeded in increasing exports of U.S. nuclear technology.

Malone has been identified with proposals to consolidate in the State Department authority over nuclear exports which is now shared with the Nuclear Regulatory Commission (NRC). Malone was a member of the Reagan transition team for the State Department and Arms Control and Disarmament Agency and is said to be the author of the team report that put emphasis on more vigorous promotion of nuclear trade. Since his confirmation to the OES post last May, Malone has been the most active Administration spokesman on nonproliferation policy.

As to who will exercise principal influence in nonproliferation affairs at State in future, speculation centers on Under Secretary for Management Richard T. Kennedy. A former NRC commissioner, Kennedy is known to be interested in nonproliferation issues. He was ceded general oversight of nonproliferation issues early in the Administration and has worn an additional hat as ambassador to the International Atomic Energy Agency in Vienna, which deals with nuclear safeguards. But his chief duty, managing operations of the department, was thought to leave him little time to devote to making nonproliferation policy.

There is some irony in the timing of Malone's reassignment since it occurred just as three appointees to staff positions with key responsibilities in nonproliferation matters had joined OES after long delays.

OES is formally responsible for a wide range of issues involving science and technology and foreign policy. But Malone's early departure and the preoccupation of the office with Law of the Sea and nonproliferation issues in the first year of the Administration has rekindled long-term concerns about the capacity of OES to play an effective role for the United States in behalf of science and technology in international affairs.

—JOHN WALSH

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voluntary action of industry except for minor use on pineapples in Hawaii. Metcalf said the committee assumed that the similar uses of EDB would be canceled. But, says Metcalf, "the alternatives are as bad or worse" and the committee reluctantly recommended EDB's continued use during a phaseout. Metcalf says the committee was "very concerned about worker protection," meanwhile, and urged requirements for "better protective clothing and for EDB application by remote control technology."

Defenders of EDB have pointed to the lack of convincing epidemiological data demonstrating that EDB poses a hazard to humans and they suggest that this vitiates the animal studies. In response, the panel's statement includes this comment:

> The Panel notes that it will be very difficult to conduct epidemiological studies that will enable EPA to ignore the results of animal studies. Such epidemiological studies which have been conducted thus far do not provide convincing evidence that animal tests do not accurately predict potential human hazards in the area of oncogenicity and reproductive effects. Therefore, it is necessary to regulate on the basis of animal studies alone.

The FIFRA scientific advisory panel has not been active in the recent period of mounting controversy over EDB. Last spring the new Administration decided to dissolve the panel and replace its members with appointees of their own choosing. A list of nominees was published in the *Federal Register* to invite public comment, but a new panel has not yet been named.

The 1980 EPA notice called for comments on the proposals to restrict use of the pesticide. Now, more than a year later, the books are still open on EDB.

EPA moved against EDB during the last days of the Carter Administration, and it is not surprising that the new Administration took no immediate action on the pesticide. Then last summer the Administration's first public pronouncement on EDB appeared to downplay the hazards associated with its use. This pronouncement, in the form of a "note to correspondents," focused on exposure hazards and was issued last August in the midst of media attention to the controversy in California over the safety of EDB fumigation.

Attributed to John Todhunter, then acting administrator for pesticides and toxic substances and later confirmed to the post, the notice said that "if the fumigated fruit is allowed to stand in storage or transit for a sufficient time (4 to 8 days usually), the risk is minimal."

This comment and the rationale supporting it triggered objections from EPA senior scientist Adrian M. Gross, who was then working in the hazards evaluation division. Gross made public a ten-page memo to EPA Administrator Anne M. Gorsuch in which he argued that the cancer risk from short-term exposure to EDB is very high. Basing his attack on NCI studies, Gross criticized as unsound a risk model favored by Todhunter that was based on an assumption that risk levels decay exponentially as exposure time is reduced.

The impending decision on EDB is not solely a scientific one; rather it is a risk-benefit determination that FIFRA requires but gives little guidance in making. Steven Jellinek, the EPA assistant administrator with responsibilities for pesticide regulation in the Carter Administration, says EDB is unquestionably a "hot chemical." There are "not a lot of equivocal studies" that put pathologists and toxicologists at odds. Still, EDB presents real difficulties in terms of "complexity and uncertainties of decision-making." The "toughest decision," says Jellinek is "how heavily to weight the benefits from citrus fumigation," particularly in view of the importance of exports to Japan.

The most difficult issue in pesticide regulation, says Jellinek, is "how do you decide on a risk-benefit evaluation of a

NAE Elects New Members

The National Academy of Engineering has elected 49 engineers and 6 foreign associates. This brings the total U.S. membership to 1109, with 97 foreign associates. Following is a list of the new members and foreign associates:

Jan D. Achenbach, Technological Institute, Northwestern University; **Mihran Agbabian**, Agbabian Associates, Engineers and Consultants, El Segundo, Calif.; **Gilbert Y. Chin**, Bell Laboratories, Murray Hill, N.J.; **William C. Dietz**, General Dynamics Corp., Convair Division, San Diego; **Floyd Dunn**, University of Illinois, Urbana; **Peter S. Eagleson**, Ralph M. Parsons Laboratory, Massachusetts Institute of Technology; **John E. Flipse**, Texas A & M University; **Fred W. Garry**, General Electric Co., Fairfield, Conn.; **H. Joseph Gerber**, Gerber Scientific, Inc., South Windsor, Conn.; **Bernard Gold**, Lincoln Laboratory, MIT; **Kent F. Hansen**, MIT; **Kenneth E. Haughton**, San Jose Development, IBM Corp., Calif.; **Robert A. Henle**, IBM Corp., Yorktown Heights, N.Y.

R. Richard Heppe, Lockheed-California Co., Burbank; **Donald R. Herriott**, Bell Laboratories; **Irwin M. Jacobs**, LINKABIT Corp., San Diego, Calif.; **Trevor O. Jones**, TRW, Inc., Solon, Ohio; **Joseph Kestin**, Center for Energy Studies, Brown University; **Milo S. Ketchum**, Ketchum, Konkel, Barrett, Nickel, Austin, Consulting Engineers; **James N. Krebs**, General Electric Co., Lynn, Mass.; **John E. Kunzler**, Bell Laboratories; **Emmett N. Leith**, University of Michigan; **George Leitmann**, College of Engineering, University of California, Berkeley; **William E. Leonhard**, The Parsons Corp., Pasadena, Calif.; **Hudson Matlock**, ERTEC, Consulting Engineers and Geologists, Long Beach, Calif.; **Keith W. McHenry, Jr.**, Amoco Oil Co., Naperville, Ill.; **James R. Melcher**, High Voltage Research Laboratory, MIT; **Douglas C. Moorhouse**, Woodward-Clyde Consultants, San Francisco; **William R. Opie**, AMAX Base Metals Research and Development, Inc., Carteret, N.J.; **Malin K. Oshman**, ROLM Corp., Santa Clara, Calif.

Walter L. Robb, General Electric Co., Milwaukee, Wis.; **Stanley T. Rolfe**, University of Kansas, Lawrence; **James F. Roth**, Air Products and Chemicals, Inc., Allentown, Pa.; **Donald G. Russell**, Shell Oil Co., Houston; **William R. Schowalter**, Princeton University; **Judith A. Schwan**, Eastman Kodak Co., Rochester, N.Y.; **John W. Scott**, Chevron Research Co., Richmond, Calif.; **Willard F. Searle, Jr.**, Searle Consortium, Ltd., Alexandria, Va.; **John H. Seinfeld**, California Institute of Technology; **John B. Slaughter**, National Science Foundation, Washington, D.C.; **Victor Szebehely**, University of Texas, Austin; **Julian Szekely**, MIT; **Gareth Thomas**, National Center for Electron Microscopy, Lawrence Berkeley Laboratories, Calif.; **Allyn C. Vine**, Woods Hole Oceanographic Institution, Mass.; **An Wang**, Wang Laboratories, Inc., Lowell, Mass.; **Paul Weidlinger**, Weidlinger Associates, Consulting Engineers, New York City; **Warren E. Winsche**, Brookhaven National Laboratory, Upton, N.Y.

Theodore Y. Wu, California Institute of Technology; **Dante C. Youla**, Polytechnic Institute of New York.

Foreign Associates are: **Gunnar Fant**, Royal Institute of Technology, Stockholm; **Fritz H. B. Ingerslev**, Technical University of Denmark, Lyngby; **Benjamin Levich** (Israel), City College, City University of New York; **Yi-Sheng T. E. Mao**, Railways Research Institute, Beijing, The People's Republic of China; **Zenji Nishiyama**, Nippon Steel Corp., Yokohama, Kanagawa, Japan; **Klaus Oswatitsch**, Technical University, Vienna, Austria.

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pesticide?" Perhaps because of the formidable scientific, political, and economic factors involved, the issue has been stuck in a "backwater" as far as policy attention is concerned. Nevertheless, a decision on EDB will have to be made. EPA staff expect that the agency's office of pesticide programs will send its recommendations on EDB forward this spring and that a final decision will be reached by the Administrator this summer. The environmental stance of the new management of EPA will be tested by how it handles what is ultimately a judgment call.—JOHN WALSH

NRC Reviews Brittle Reactor Hazard

The staff would take some precautionary steps this summer, but the industry sees "no near term" risk at all

Although the United States generally leads the world in setting standards for nuclear safety, it has not been the first to act on the hazard known as pressurized thermal shock. This came to light during a review this March before the Nuclear Regulatory Commission (NRC), which must decide what to do about thermal shock, a problem that has received a lot of notice in the press.

The danger is essentially this: the steel vessel that contains the hot fuel and water in a pressurized water reactor is designed so that it should never crack during its expected 40-year lifetime. However, under high stresses, a vessel could burst apart, creating a severe leak of radioactive water. The possibility of this happening is remote, but recent discoveries make it seem less so. The most important new information is that the welds in certain vessels made of steel plates contain impurities, and these are causing the welds, in the presence of high neutron radiation, to become more brittle than the plates which they hold together. If cooled too rapidly, a flawed weld might crack. The original safety codes assumed that the welds would age at the same rate as the steel plates, but now it appears that welded vessels may have a shorter lifetime than anticipated.

Nunzio Palladino, chairman of the NRC, ordered a review of the thermal shock hazard last year. On 9 March, he and the other commissioners listened to two briefings on the problem, one prepared by the NRC staff and the other by industry spokesmen. Palladino asked, among other things, whether foreign governments were worried about reactor cracking. The staff briefers gave little information; the industry spokesmen, less. But one NRC employee in the audience said that West Germany has changed the way fuel is loaded in at least two reactors to reduce the risk of a thermal shock accident.

NRC chairman Nunzio Palladino

According to an engineer at the Oak Ridge National Laboratory, West Germany decided in 1975 that all reactor vessels would be made of forged steel cylinders with a steel cap at each end. The new design was intended to make vessels built after 1975 stronger, would require fewer welds, and the welds would not be near the middle of the vessel, where damaging neutron radiation is most intense.

Like the United States, West Germany operates some older reactors made of welded steel plates. In two of these, at Stade and Obrigheim, the Germans have reduced the amount of neutron radiation that reaches the walls of the vessel. Fuel bundles have been rearranged in the core with "dummy" elements near the outer edge to absorb neutrons moving from the center toward the steel walls. This has slowed the process of embrittlement.

Finland also has decided to shield the walls of a reactor at Lovisa, even though this vessel is made of forged steel. Apparently the Finns discovered that the radiation was so intense that it was weakening the steel to a hazardous degree.

The NRC has studied the problem of steel embrittlement with growing intensity for about a decade. The industry, too, has poured several million dollars into structural analysis during the last 5 years. And in the past year, stimulated by the NRC's concern, several plant owners have changed the way fuel is handled to reduce the neutron bombardment of the vessel walls. They have changed the fueling schedules so that fuel is used longer in the reactor, and more depleted fuel bundles are placed at the outer edge of the core to lower radiation levels near the wall. But no U.S. group has gone as far as the Germans in revamping construction or fueling procedures.

The NRC has not required any major change in vessel construction, except to raise the standard for weld quality. The NRC has not ordered a change in fuel arrangement, although the staff expects some new rules may be issued later this year, perhaps in June. Until now, the government has been reluctant to impose new requirements in this area, chiefly because the problem is ill defined. Meanwhile, the industry claims that safety procedures being considered now are unnecessary and expensive.

At the 9 March briefing, the industry was represented by Clark Gibbs, vice president of Middle South Services and chairman of the Atomic Industrial Forum's committee on reactor licensing and safety. He told the NRC that a recent Oak Ridge study on vessel cracking exaggerated the risks. The study reported that some vessels might be in danger of cracking within a few years. In fact, Gibbs said, the industry's own calculations made in December and January show "that there is no significant near-term safety concern" about vessel cracking. Gibbs said that "many utilities have instituted low [neutron] leakage fuel load designs which may reduce the overall rate of vessel embrittlement."

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