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STOCKMAN HITS SHULTZ ON CLAIMING LEAD ON TELECOM WITHOUT WHITE HOUSE OKAY

Office of Management & Budget Director David Stockman has sharply criticized Secretary of State George Shultz for telling Congress that State has the undisputed lead in making policy on international telecommunications issues, asserting Shultz has caused the Administration "considerable embarassment." Without making a call on the heated turf battle between the Commerce Dept. and State over which agency advises the President on telecom policy, Stockman nonetheless told Shultz he was wrong to assert jurisdiction in letters to Congress that were not sent to OMB for the traditional interagency review process. The review ensures agency statements conform with Administration policy.

The question of which department has the lead — Commerce through the National Telecommunications & Information Administration or State through the Office of Transportation & Telecommunications

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HIGH TECH INDUSTRY SCUTTLES EAA NATIONAL SECURITY COMPROMISE PACKAGE

The high tech industry late last week played a key role in dismantling a national security compromise package developed earlier by House and Senate conferees trying to work out differences in the Export Administration Act bill. Chances of enacting an EAA this session became dimmer when the conferees failed to agree on any major differences between House and Senate bills before adjourning for three weeks. The high tech industry is demanding a "meaningful reduction" in its licensing requirements that goes beyond the tentative compromise reached by the conferees.

The EAA conferees will resume negotiations when Congress returns from its break, and there is a good chance they will discuss a new compromise that will give the high tech people part of what they want. But it may not be enough. Much of the opposition by the high tech industry to the compromise

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COMMERCE OFFICIALS SAID TO BE MOVING TO REWRITE EXPORT LICENSE PROPOSAL

The Commerce Dept. will propose in about two months a whole new set of distribution license regulations more palatable to U.S. businesses and allies, according to several informed sources outside the Commerce Dept. These sources say that Commerce officials, finally responding to criticism from all quarters, recently agreed to a new proposal that will drop a requirement for foreign company reporting of licensed exports and possibly other provisions as well.

"I have no doubt there will be new distribution license regs," said one observer closely following the issue. "They might just be restructured, but there probably will be a major rewrite." He said Commerce is between a rock and a hard spot because the existing regs are not acceptable to Commerce, and the proposed ones have been severely attacked by some 250 U.S. firms. Xerox, for example, told Commerce recently it could lose as much as $350-million a year in high tech sales if the proposal becomes final.

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IRS DEVELOPING GUIDANCE ON RDLP FINANCING EXPLOSION, CAPITAL GAINS AN ISSUE

The Internal Revenue Service tax shelter division has begun to develop guidance on a recent explosion in financing for research & development limited partnerships (RDLPs) — including making potential policy on whether profits derived from sales of patents and other rights developed in RDLPs are eligible for capital gains rather than straight income tax treatment. Informed sources call the capital gains question the central issue in the further development of RDLPs, which have been touted as a major new funding vehicle for U.S. efforts to capitalize new projects with world export potential.

The RDLP phenomenon has taken the investment community by storm, with the amount of money raised for new high tech projects expected to approach $2-billion by the end of this year from the program's launch in 1981. At that level it will eclipse the venture capital markets, the traditional source of export-rich high tech financing. The program was developed by Commerce Dept. officials in a effort to provide a "free market" approach to spur development of high tech projects. It is based on the principle that a partnership can be formed to create specific advanced technology to be sold back to a company or companies that can commercialize the projects. Observers consider it a Reagan Administration approach to industrial policy, using the capital markets rather than the federal government to pick winning

technologies to support.

But the program also has reportedly attracted the tax shelter industry, particularly because of the lucrative gains made possible through capital gains treatment of profits from the sale of patents and related technology. Thus a limited partner can take the attractive business losses of a research & development partnership but still have the opportunity for major gains if the project is successful. But sources stress the IRS has yet to rule whether RDLP architects are correct in their determination that such profits are subject to only capital gains tax (generally 50-60% less than comparable income tax rates) — making guidance in this area a key determinant of the program's future as an export incentive.

Capital gains treatment. The IRS last November issued a letter ruling that addressed a portion of the capital gains issue — asserting that capital gains do not apply to the portion of profit that equals the original deduction in the partnership. But observers point out that the letter ruling may or may not be upheld by the service and that the ruling does not address any profit beyond that corresponding to the amount of deductions taken from partnership losses. RDLP proponents assert that the profits are derived from patents and copyrights, which are real property and thus subject to only capital gains tax. IRS officials so far have been silent on this issue, but they are expected to address it in the upcoming guidance.

RDLP independence from parent company. Most RDLPs are spun off by a major executive from a company that stands to benefit from the new technology, and, sources say the IRS is concerned that RDLPs may not have an independent life from the spin-off company. This was an issue in a movie development partnership in a tax court case called *Estate of Helliwell vs. Commissioner*, and, sources assert, it may directly apply to RDLPs.

Prepayment. IRS is concerned that limited partners have too many options on which year to take the deduction for their investment in RDLPs. The service is reportedly considering a 6-month delay requirement on taking a lump sum deduction. The issue was also part of the tax bill approved in conference and voted on by Congress last week, with the House eliminating prepayments but the Senate proposing controls on all but farm syndicates.

OMB HAS DECIDED NOT TO MAKE ANY POLICY CALLS IN A KEY STUDY OF THE USE OF OFFSETS in military and other international trade deals, according to informed Administration sources, even though the study is expected to form the basis for a major congressional push to control the practice of offsets in the next congressional session. The Office of Management & Budget got the lead on developing the study as part of a House-Senate compromise on offsets contained in the Defense Production Act Amendments of 1984. The practice of offsets — where foreign purchasers of U.S. goods require companies to give up technology or to make investments in the country as a condition of the sale — has increased in controversy over the last year. U.S. officials and congressmen are becoming increasingly inclined to raise the issue as an international problem with U.S. trading partners.

Administration sources say OMB has tentatively decided to include in its report four chapters which will examine the impacts of offsets on defense preparedness, industrial competition, employment and international trade. In its first meeting with top Administration officials last month, OMB also decided to include three sections which will provide a general data base on offsets, a summary of offset agreements contained in multinational and bilateral treaties and a compilation of all offset arrangements contained in government memorandums of understanding.

The report, which is to be submitted to the Congress this September, will lack any policy prescriptions or specific recommendations, sources say. But there is a possibility that the Administration may express general views on the subject at the time the report is sent to the Congress. OMB is leading an interagency working group on the issue, which includes Treasury, U.S. Trade Representative, Defense, Labor, State, Commerce and the Federal Emergency Management Agency. The working group will not be the major policy body on the issue, OMB officials note, asserting that the Treasury-led Senior Interagency Group on International Economic Policy will likely be the "driving force" behind any effort to negotiate multilateral reductions in the use of offsets.

LACK OF GSP STATUS FOR WOOD IMPORTS FROM TAIWAN AND YUGOSLAVIA HASN'T CUT SALES in the U.S. market, the International Trade Commission said in an analysis released late last month. ITC pointed out that Taiwan lost Generalized System of Preferences status for furniture of wood other than chairs in 1980 and that Yugoslavia lost GSP eligibility for nonfolding chairs of teak in 1983. But the loss of GSP status appears to have had no impact on the level of imports from these two countries. ITC's report, Competitive Assessment of the U.S. Wood and Upholstered Household Furniture Industry, found that U.S. imports of these products increased by 154% during 1979-83, rising from a value of $312-million to $795-million. Based on the ratio of imports to consumption for wood and upholstered

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Although Administration estimates cost at $8-billion

DRAFT OTA REPORT SAYS NASA SPACE STATION COULD COST $60-BILLION

The Office of Technology & Assessment (OTA), a congressional research arm, has prepared a draft report assessing the Reagan Administration's proposal for a space station which estimates the project may cost as much as $60-billion over a 25-year period — refuting an estimate by the National Aeronautics & Space Administration (NASA) which claims the intitial project can be completed for $8-billion over a five-year period. Moreover, sources say the report concludes the U.S. could save about $25-billion if the space station was built with the cooperation of other nations in an international joint venture. It also suggests, sources say, NASA's space station proposal is nothing more than a "grandiose" project whose primary purpose is to provide a justification for continuing its $7.5-billion yearly budget. OTA's draft finding comes at a time when the White House is completing its review of a broad initiative to promote industry involvement in space commercialization.

Sources say OTA's initial conclusions have evoked hostility among some members of the House

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CANADIANS TO ASK EPA TO REDRAFT RULES BANNING ASBESTOS IN SIX PRODUCTS

The Canadian government is expected to informally ask the Environmental Protection Agency (EPA) this week to consider redrafting regulations which would ban the carcinogen asbestos in six commercial products — rules that currently are under "extended review" at the Office of Management & Budget, which in earlier meetings with EPA suggested that asbestos should be regulated by the Occupational Safety & Health Administration (OSHA). One Administration source says the EPA asbestos rule is a "serious matter that will be thoroughly reviewed by OMB."

Sources say the Canadian government will ask EPA to change its draft rule — which they say proposes to ban asbestos in roofing and flooring felt, vinyl asbestos tile, asbestos cement pipe, asbestos paper, and asbestos sheeting — to provide for "controlled use limits" of the carcinogen. Reportedly, the Canadian government also is concerned that EPA's proposed ban will adversely harm the Canadian

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60 Senate cosponsors challenge Metzenbaum's hold as

ADMINISTRATION PRESSES BAKER FOR SENATE VOTE ON JOINT R&D BILL

Secretary of Commerce Malcolm Baldrige this month telephoned Senate Majority Leader Howard Baker (R-TN) to press for action on legislation unanimously (417-0) passed by the House in May to grant joint research and development ventures qualified immunity from federal antitrust laws. Senator Howard Metzenbaum (D-OH) has so far blocked a Senate vote on the bill by threatening to filibuster the measure, and with less than 20 legislative days left in this Congress, Baker is said to be relunctant "to call his bluff." Baldrige is not alone in calling for a vote on the bill (S. 1841) which is expected to pass the Senate with only Metzenbaum casting a dissenting vote. Sources say a bipartisan contingent of prominent senators and industry officials led by Judiciary Committee Chairman Strom Thurmond (R-SC) and John Young, chairman of the President's Commission on Industrial Competitiveness, are also lobbying Baker for action. Reportedly, Baker has refrained from moving the bill under Metzenbaum's filibuster threat

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To speed commericialization

WHITE HOUSE PLANNING UNIQUE JOINT REG APPROVAL PLAN FOR BIOTECHNOLOGY

A White House working group on biotechnology is preparing to propose an unusual dual regulatory approval program for overseeing the development of the infant industry as an alternative to vesting biotechnology regulation in one agency, according to informed Administration sources. The move is part of an effort to remove commercial barriers to development of biotechnology as an export industry, these sources say, while meeting all environmental, health and safety precautions.

"We are looking for a practical, concrete mechanism through which U.S. biotechnology firms may interface effectively with the government," said a source at the Office of Science & Technology Policy (OSTP). The office chairs the working group on biotechnology of the Cabinet Council on Natural

BALDRIGE ASKS BAKER FOR FLOOR VOTE ON R&D TAX CREDIT . . . begins page 1

because there are less than 20 legislative days left in this Congress.

The bill's chief sponsor, Senate Judiciary Committee Chairman Strom Thurmond (R-NC), recently garnered over 57 cosponsors for the bill, strongly supported and authored by the Reagan Administration, which sources say is intended to send a clear signal to Metzenbaum to withdraw his filibuster threat. Sources say the Senate is also considering whether to invoke an unusual parliamentary procedure — a "cloture" vote — in which 60 Senators agree to limit an extended floor debate "if it comes to that," according to one key congressional source. Administration officials indicated last week they felt Baker would move the bill to the floor "with or without a compromise from Metzenbaum."

The Administration submitted the legislation to Congress as a means of encouraging U.S. companies to engage in joint r&d and enhance their international competitiveness. The legislation has been a top priority for the Reagan Administration and is considered to be one of the most widely supported bills in this Congress. The House passed a similar bill, H.R. 5041, sponsored by House Judiciary Committee Chairman Peter Rodino (D-NJ), by a unanimous vote of 417-0 the same week (May 1) the Senate Judiciary Committee reported Thurmond's bill out.

The Senate and House bills, while not identical, are very similar in that both: 1. exclude activities such as production, marketing, licensing and collaboration on pricing from antitrust immunity; 2. eliminate liability for treble damages in antitrust cases only for those joint r&d ventures that comply with "negative disclosure" — which requires the Dept. of Justice to be notified of planned ventures; and 3. apply the "rule of reason" analysis in reviewing joint r&d cases which allows the Justice Dept. to weigh the anticompetitive effects of joint r&d ventures against their pro-competitive effects.

The pending legislation differs in the House and Senate in one key area which has to do with how courts award attorney fees. Current antitrust law provides the court may award attorney fees to a prevailing plaintiff but not to a prevailing defendant. The House-passed measure allows the court to award attorney fees to "a prevailing litigant" while the Senate bill does not change current law on this question. Proponents of the House attorney fee provision argue it is simply "equitable treatment" but opponents say it will discourage, if not eliminate, many antitrust suits. Current law provides that if a non-profit organization (plaintiff) sues a major corporation for antitrust violation and wins, it may recover attorney fees; however, if the corporation wins it may not collect fees because it is the defendant in the case.

Metzenbaum believes the Senate bill "properly omits any provision awarding attorneys fees to prevailing defendants. However, in reducing incentives for private antitrust enforcement by eliminating treble damages, the bill as reported goes too far. . ." Senate sponsors of the bill had hoped to reach a compromise with Metzenbaum but sources close to the negotiations begun in May say efforts broke down this month when it became clear that "neither side was willing to give." Metzenbaum reportedly offered several alternative approaches to the bill's treatment of damages, including: 1. double the damages in antitrust cases (rather than limit them to single damages as the legislation does); 2. provide that liability to damages be limited to single damages for those joint r&d ventures that were lawful when they were formed but later became anticompetitive; and 3. limit liability to single damages when plaintiffs bring antitrust suits after a joint r&d venture has become successful.

CANADA TO ASK EPA TO REDRAFT ASBESTOS REGS . . . begins page 1

domestic asbestos mining industry, which now exports about 33% of its asbestos to the U.S.

Sources say Canadian research on asbestos-containing products has yielded inconclusive data on whether exposure to the products is harmful. The Canadians are also reportedly concerned that EPA is proposing the ban without considering possible substitutes. Additionally, the Canadians are concerned that the ban could harm the Canadian asbestos industry and have a negative impact on the worldwide trade of asbestos.

EPA currently plans to phase out the remaining uses of asbestos during a 10-year period in a rulemaking it will propose in November. Industry sources say EPA's more limited ban of the substance in six products will cost "in the billions" because there's currently 600,000 miles of asbestos-containing water pipe alone in the U.S. One industry source says he is "concerned" by EPA's move to ban asbestos in products when the agency has "failed to state the level at which the chemical will cause harm," adding that EPA's latest move may "set a precedent for the agency to ban substances because it's easier to do than regulating them."

Commerce Dept. sources say the proposed EPA ban is likely to distort the U.S. domestic asbestos market although they could not estimate how much the ban would cost industry.

computer scientists are more aware of the potential of the present systems and are willing to put more effort into using them, while pure scientists, for whom the computer is another tool, have a lower level of pain. If this is the case, it may be only a matter of time before everybody operates in the same mode. However, one can make the following observation: scientists, either in the laboratory or in computing, have shown that they will push their systems or tools to the limit in order to get to the results. In computing they are willing to learn to program in machine language if that gives the performance they need for a specific problem. We are now seeing physicists developing and building their own special-purpose calculating machines at a great cost in time and effort. In the laboratory it is common for scientists to take commercial instruments apart and rebuild them to improve performance, again at a great cost in time and effort.

In our laboratories, pure and applied scientists have access to the same facilities, but their patterns of collaboration are very different. It may well be that we are dealing here with subtle but strong cultural factors. It is easy to develop theories of why this is so, but it is difficult to decide one way or the other. This is a fascinating and important subject but more work, and perhaps more experience, is required to understand the reasons. Similar questions arise in connection with other fields that have proved intractable. For example, will education, that crude process in the classroom that has withstood every technical assault for the past 2000 or 3000 years, finally crumble before the impact of electronic progress? Some people think so and have projected that the interaction of computers with instruction will do it, but still we do not know. Will the availability of terminals in the home, the ability to program at home, and the ability to interact with others over wires, over glass, or possibly through satellites fundamentally change the working patterns of people? That is certainly possible, and again we do not know. Our inability to understand and predict the qualitative effects of computer technology is great. But even the straight-line projection, from what we have experienced to what we can reasonably expect to be the impact on science, is impressive.

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Protection of Plant Varieties and Parts as Intellectual Property

Sidney B. Williams, Jr.

The coming of age of the biological sciences has raised new questions about the protection of technology under the intellectual property laws. Intellectual property, as opposed to tangible property such as real estate or personal property, includes subject matter that is protected by patents, trademarks, copyrights, trade secrets, and more recently, patent-like plant variety protection for varieties reproduced by seed. The protection of intellectual property is not a new concept since its availability can be traced back to Greece as early as 200 B.C. (*1*). However, because the rewards for intellectual property have been high, the requirements for obtaining it have also been quite high. It is the question of what must be given in exchange for patent protection, together with the question of what scope should be given to such protection, that creates many problems in patent law. Nowhere is this more evident than in the protection of plant varieties and their parts.

The importance of protecting plant varieties is evidenced by the number of countries that have passed plant breeders' rights legislation and by the formation of the International Union for the Protection of Plant Varieties (UPOV) (*2*). UPOV administers the treaty that, among other things, requires member states to provide the same rights to plant breeders of other member states as it provides its own nationals.

Protecting Intellectual Property

Intellectual property is protected in two primary ways. The first is by statutory grants such as patents, trademarks, and copyrights. The second is by maintaining the subject matter a trade secret. Unlike patents, trademarks, and copyrights, which are mandated by federal statutory law, trade secret rights arise primarily from state court decisions or laws.

Trademarks are used to distinguish one's goods from those manufactured by others. They indicate the source of goods. The mark can be a word, symbol, name, device, or combination thereof. Examples include the Xerox, Coca-Cola, and Kodak brands.

Copyrights protect the manner of expression but not the ideas embodied in the expression. Examples are books, music, operas, maps. A copyright can only prevent others from copying the mode of expression. Independent creation is not an infringement of the copyright.

Utility (general) patents exclude others from making, using, or selling the invention and actually protect the embodied idea. They do not necessarily mean that the patentee can use his invention because it could be dominated by another patent. To be patentable the invention must be useful, novel, and unobvious (unobviousness requires a step that is not merely a technique within the scope of a person with ordinary skills in the art).

Plant patents provide protection for plant varieties that are reproduced asexually (by budding, grafting, tissue culture, and so on). Uncultivated and tuber-propagated plants (such as Irish potatoes and Jerusalem artichokes) are excluded from protection.

Plant variety protection provides patent-like protection for plant varieties re-

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produced by seed. Fungi, bacteria, and first-generation hybrids are excluded from protection.

Trade secret law protects against unauthorized appropriation or disclosure of the proprietary information.

The systems for granting intellectual property rights vary. The two broad classes are registration and examination systems. Protection under a registration system is easier to obtain because usually the only requirement is that of either novelty or originality. Novelty requires that the subject matter be different from existing subject matter that is known. The extent of the difference is irrelevant. Originality means that the applicant created the subject matter. In other words, the subject matter was not copied. Examples of registration systems are the U.S. copyright, trademark, and plant variety protection schemes.

Protection under an examination system is more difficult to obtain because there is generally a requirement for unobviousness or an "inventive step" as it is referred to in some foreign patent laws. Unobviousness requires a step or result that is beyond that expected of a person with ordinary skills and knowledge in the field of the invention for which protection is being sought. Examples of examination systems are the patent systems of the United States, United Kingdom, Federal Republic of Germany, the Netherlands, and Japan. Patents obtained under examination systems generally provide a broader range of protection than those obtained under registration systems.

The claims of an invention define what is protected. The claims can be analogized to a real estate deed. Instead of using distances and landmarks the claims contain works that outline the boundaries of the invention claimed. For example, Fig. 1 shows the boundaries of a claim to a group of chemical compounds. The boundaries surround any use of the compounds and any method of making them. Therefore, if someone else either discovers a new use of the compounds or a new method of making them, he will have to cross the boundary to compound A to practice the new use or method. Crossing the boundary without the owner's permission is a trespass or, in intellectual property terms, an infringement.

Protecting Plant Varieties and Their Parts

Plant varieties. It is established that plant varieties that are reproduced asexually can be protected under the Plant Patent Law, the Townsend-Purnell Act of 1930 (*3*). It is also clear that plant varieties that are reproduced by seed are protectable under the Plant Variety Protection Act of 1970 (*4*). It is not so clear, however, whether asexually or sexually reproducible plant varieties can be protected under the general patent statute. Even though patents issued under the general patent law (*5*) have covered material containing living matter, the general patent law has most often been applied to inanimate subject matter. As a matter of fact, a great body of technology in which living material was utilized to produce chemicals provided the fertilizer for the production of steroids and antibiotics. However, a great deal of controversy arose when attempts were made to claim living organisms per se. Part of this controversy culminated in the case of *Chakrabarty* v. *Diamond, Commissioner of Patents and Trademarks* (*6*), in which the U.S. Supreme Court held that the fact that the claimed invention encompassed living matter did not preclude general patent protection. Specifically the Court held that the important fact in determining whether or not subject matter is patentable subject matter is whether or not there has been human intervention. *Chakrabarty* involved claims to certain human-modified microorganisms that were capable of "eating" oil. The case did not change the criteria of patentability (usefulness, novelty, and unobviousness). The Court specifically ruled on what was patentable subject matter. In other words, before the criteria of usefulness, novelty, and unobviousness can be applied to an invention it must first meet the criteria of being patentable subject matter.

Answering the question of whether the general patent statute can be used to protect plant varieties that are also protectable under the Plant Patent Law or the Plant Variety Protection Act requires a considerable amount of statutory construction. Statutory construction is a procedure used to interpret laws. One of its objectives is to determine which law among several laws dealing with the same subject matter is applicable when the laws conflict. Although such an analysis is beyond the scope of this article (*7*), it is clear that some thought will have to be given to whether or not there should be different treatment of food crop varieties as opposed to nonfood crop plant varieties. For example, the Plant Variety Protection Act contains express provisions for research (experimental use) and crop exemptions, whereas the general patent statute contains no such provision. Since the Plant Variety Protection Act was an attempt to correct the inequity of there being no patent-like protection for seed-reproduced plant varieties and since many of the varieties reproduced by seed are food crops, did Congress, by providing expressly for a research and crop exemption, articulate a different policy for food crop varieties than other plant varieties?

Plant parts. Plant patent and plant variety protection laws provide for the protection of plant varieties, that is, whole plants. But how do we protect their parts? This question has to be analyzed from two perspectives. First, if protection of the whole plant is obtained, are parts of the plant also protected? Second, is it possible to protect parts of plants without protecting the whole plant?

The question of whether protection of plant parts is obtained when a plant patent is granted has received some attention, especially in the area of cut flowers. The problem with cut flowers is that a plant can be purchased in the United States and taken to a country where there is no plant variety protection; the variety is then reproduced and the flowers are cut and imported back into the United States. The question here is whether it is an infringement of the plant patent to so sell the import under section 337a. One view is that a plant

Summary. In view of the Supreme Court decision in *Chakrabarty* v. *Diamond, Commissioner of Patents and Trademarks*, it is possible that plant varieties can be protected under three different U.S. statutes: the Plant Variety Protection Act, the Plant Patent Law, and the General Patent Law. The Plant Variety Protection Act protects varieties that are reproduced by seed, whereas the Plant Patent Law protects varieties reproduced asexually. Varieties, irrespective of how they are reproduced, could be patentable under the General Patent Statute. It is not clear whether parts of plants can be protected by grants under the Plant Patent Law or Plant Variety Protection Act and it is possible that they will be best protected under the General Patent Statute and by maintaining them as trade secrets. Only time will show whether the existing statutes are sufficient to provide both guidance and adequate protection or whether changes in the law will be required.

ute, it is probable that the disclosure requirements can be met by depositing seeds or other reproductive material for those varieties.

The Plant Variety Protection Act. It is already a requirement of the Plant Variety Protection Act that a sample consisting of 2500 seeds of the variety to be protected be deposited at the National Seed Laboratory at Fort Collins, Colorado. However, many questions linger with respect to depositing microorganisms or seeds. If the seed or microorganism mutates, are the requirements of reproducibility met? Is the mutant itself protected? Does the claimed process include use of the mutant?

To be protectable under the Plant Variety Protection Act a variety must be novel (*13*) and the right to the variety must not be precluded by the activities set forth in the section that defines the right to plant variety protection (*14*). A variety is novel under the Act if it is distinct, uniform, and stable. If a variety differs from all prior art varieties by one or more morphological, physiological, or other characteristic then it meets the criterion of distinctness (*15*). The degree to which a characteristic must differ to be distinct has not been addressed by either the Plant Variety Protection Office (PVPO) or the courts. This question has been raised by the International Union for the Protection of New Varieties of Plants (UPOV) under the categorization of minimum distance.

A variety is uniform if its characteristics can be described and predicted and if they are commercially acceptable (*16*). In the case of *In re Waller* (*17*), PVPO had to consider an application in which the question of uniformity was involved. In reversing a denial of protection on the grounds of lack of uniformity, the secretary of agriculture held that PVPO could not deny protection for a dahlia solely on the ground that it did not have a uniform flower color "if the variations in flower color are describable, predictable and commercially acceptable" (*17*, p. 7).

The requirements of stability (*18*) are met if the variety's main and distinctive characteristics remain unchanged when it is reproduced by seed. While the definition of stability has not been specifically addressed by either PVPO or the courts, it has been addressed implicitly by PVPO because the denial of the application by PVPO in the *Waller* cases was on the ground that it did not meet the requirement of uniformity and stability (*16*).

Difference between food and nonfood crops. Both the Plant Patent Law and the Plant Variety Protection Act provide protection for food and nonfood crops. However, except for fruits and nuts, most nonfood crops have been protected under the Plant Patent Law, whereas most food crops have been protected under the Plant Variety Protection Act. This is probably more historical than by design. The flower nursery industry, whose primary concern is with ornamental varieties, was a strong proponent of the Plant Patent Law, whereas passage of the Plant Variety Protection Act was strongly supported by the seed industry.

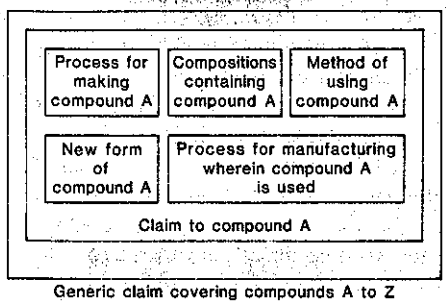

Fig. 1. Boundaries of a claim to a hypothetical group of chemical compounds. Compositions containing compound A include combination products having more than one ingredient.

As pointed out above, when the Plant Patent Law was enacted it was felt that the only way to reproduce varieties true to form was by asexual reproduction. Most ornamental plants (roses, chrysanthemums, and so forth) are reproduced asexually. They form the bulk of those plants covered by plant patents. Since most food crops are reproduced by seed, they cannot be protected by plant patents unless they are subsequently reproduced asexually. Because the technology has not yet developed to the point that most seed-produced crops can be produced more efficiently by asexual reproduction, food crops will probably continue to be protected under the Plant Variety Protection Act except when it is advantageous to attempt to do so under the general patent statute.

Protection of plant varieties under the general patent statute will raise some questions. One of the first is the question of experimental (research) use. Under the general patent statute there is no express provision for experimental use. However, a very narrow exception has evolved from case law. This exception excuses what would normally be considered infringing acts on the grounds that the acts were committed to satisfy scientific or philosophical curiosity. Acts have also been excused as being experimental on the grounds that they are considered to cause so little damage to the owner of the patent as to be meaningless. The Plant Variety Protection Act provides an express provision for a "research use" exception to infringement (*19*). Therefore, conflict could arise if a general patentee would attempt to prevent others from conducting research experiments with a protected variety. A question giving rise to the conflict is whether Congress expressed a public policy against suing researchers for infringement under the Plant Variety Protection Act that would override any rights under the general patent statute.

Another exemption that could create problems for the general patentee is the Farmers' Crop Exemption (*20*). This exemption gives a farmer who purchases a protected variety the right to use the variety to reproduce seed for production or use on his farm or to sell seed reproduced from the purchased seed. The right of a farmer to do this would appear to conflict with the provision under the General Patent Law under which the purchaser of a patented item can repair it but cannot reconstruct it. Also, at least one court has held that the Farmers' Crop Exemption does not entitle a farmer to promote or advertise the protected variety for sale (*21*).

Another difference between the General Patent Law and the Plant Variety Protection Act is that the former provides for compulsory licenses and the latter does not. Under the compulsory license provision the secretary of agriculture can permit others to produce a protected variety if he finds that to do so will be in the national interest. This difference, however, may be one of form rather than substance since the U.S. government (or a court when there has been an antitrust violation) can, under its powers of eminent domain, authorize others to use the patentee's invention. The patentee then has a remedy against the government in the U.S. Court of Claims (*22*).

Breadth of Protection

Two of the most interesting questions concerning the protection of plant varieties are (i) how different will the new variety have to be from the closest old variety in the prior art to obtain protection and (ii) how different will a variety have to be from a protected variety without infringing that variety?

The Plant Variety Protection Act. Many people in the seed industry contend that once a difference has been identified between a new variety and

sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."
6. *Chakrabarty* v. *Diamond*, 206 *U.S. Pat. Q.* 193 (U.S. Supreme Court, 1980).
7. A. Diepenbrock, C. Neagley, D. Jeffrey, *Am. Pat. Law Assoc. Sel. Leg. Pap.* 1 (No. 2), 81 (1983).
8. *American Patent Law Association Plant Variety Protection Committee Annual Report* (1981).
9. 19 *U.S. Code*, sects. 1337 and 1337a.
10. 35 *U.S. Code*, sect. 271.
11. 7 *U.S. Code*, sect. 2541.
12. *In re Argoudelis*, 168 *U.S. Pat. Q.* 99 (Court of Customs and Patent Appeals).
13. 7 *U.S. Code*, sect. 2401(a).
14. 7 *U.S. Code*, sect. 2402.
15. 7 *U.S. Code*, sect. 2401(a)(1).
16. 7 *U.S. Code*, sect. 2401(a)(2).
17. *In re Waller* (U.S. Secretary of Agriculture decision, 14 July 1981).
18. 7 *U.S. Code*, sect. 2401(a)(3).
19. 7 *U.S. Code*, sect. 2544.
20. 7 *U.S. Code*, sect. 2543.
21. *Delta and Pine Land Co.* v. *Peoples Gin Co.*, 694 *Fed. Rep.* 2nd ser. (Fifth Circuit Court, 1983).
22. 28 *U.S. Code*, sect. 1498.
23. U.S. House of Representatives, *House Rep. No. 1129* (71st Congress, Second Session, 10 April 1930; U.S. Senate, *Senate Rep. No. 315* (71st Congress, Second Session, 3 April 1930).
24. *Graver Tank & Mfg. Co.* v. *Linde Air Products Co.*, 339 *U.S. Rep.* 605 (U.S. Supreme Court, 1950).
25. *Ex parte Jackson*, 217 *U.S. Pat. Q.* 204 (Patent and Trademark Office Board of Appeals, 1982).
26. *Regnum Veg.* 22, 30 (1961).

RESEARCH ARTICLE

A Deep 6-Centimeter Radio Source Survey

E. B. Fomalont, K. I. Kellermann
J. V. Wall, D. Weistrop

Abstract. *The Very Large Array has been used to survey a small region of sky at a wavelength of 6 centimeters down to a completeness level of 60 microjanskys—about 100 times weaker than the faintest radio sources that have been detected with other instruments. The observed source count at flux densities below 100 millijanskys converges in a manner similar to the lower frequency counts, although there is some evidence for an excess of sources weaker than 100 microjanskys. The sources in the survey are preferentially identified with faint galaxies.*

The shortest wavelength at which extensive radio source surveys have been made is 6 cm. At this wavelength surveys by the National Radio Astronomy Observatory (NRAO) and Max-Planck-Institut (MPI) have covered most of the northern sky down to a limiting flux density of 600 millijanskys (mJy), while the various Parkes surveys provide complete samples of sources down to 1 Jy (*1*). Over limited regions of the sky other single-dish surveys made at NRAO and MPI are complete to 35 mJy (*2*), 20 mJy (*3*), 15 mJy (*4*), and 14 mJy (*5*). Synthesis surveys covering even smaller regions have reached levels of 4.5 mJy at Westerbork (*6*) and 0.5 mJy at the Very Large Array (VLA) (*7*). We have used the VLA to extend the surveys to sources that are as faint as 60 μJy at 6 cm, or about 100 times weaker than levels reached with other instruments at any wavelength. Source catalogs constructed from these surveys provide the basis for further studies in the radio region and in other parts of the spectrum. Further investigation is in progress on the nature of these weak radio sources, their spatial distribution and luminosity function, and how these properties change with cosmological epoch.

Counts of radio sources made at centimeter wavelengths are of particular interest since, for the stronger sources selected at this wavelength, flat-spectrum compact sources and steep-spectrum extended sources (which dominate the long-wavelength counts) are present in roughly equal numbers (*5*, *8–10*). Previous surveys made at 6 cm for relatively bright sources show that for $S > 100$ mJy (approximately the 20,000 brightest sources in the sky) the counts are closely represented by the "Euclidean" law

$$\eta_0(S) = 90\, S^{-2.5} \qquad (1)$$

where $\eta_0(S)$ is the number of sources with flux density S per unit flux density interval.

Between 10 and 100 mJy the 6-cm counts begin to decrease in a manner qualitatively similar to the long-wavelength counts of the steep-spectrum sources (*5*, *8*, *9*). However, the extended Euclidean plateau at 6 cm differs dramatically from the long-wavelength count, which is characterized by a steep rise for strong sources (the brightest 1000 or so) followed by a rapid decrease in the density of the weaker sources.

In this article we report on observations of very weak radio sources at 6 cm, and we discuss the angular size, spectra, and optical identification of these weak sources.

Observations and Reductions

In order to investigate the number density of very faint radio sources, we have mapped a small area of sky, using the VLA to detect all sources with a flux density greater than 60 μJy. These new observations include the weakest radio sources yet cataloged and reach a source density of 6×10^5 sources per steradian. Supplemental information concerning this sample of sources was obtained through (i) VLA observations at 20 cm to determine the spectral index of the sources and (ii) optical observations with the 4-m telescope at Kitt Peak National Observatory (KPNO) to aid in the identification of the sources.

The 6-cm observations were made in the D configuration of the VLA to synthesize a 700-m-diameter antenna on a field centered at right ascension (α) = $00^h15^m24^s$ and declination (δ) = 15°33′00″ (epoch 1950.0). The resolution is about 18 arc sec and no emission will be missing for sources less than 120 arc sec in size. The general area of the field

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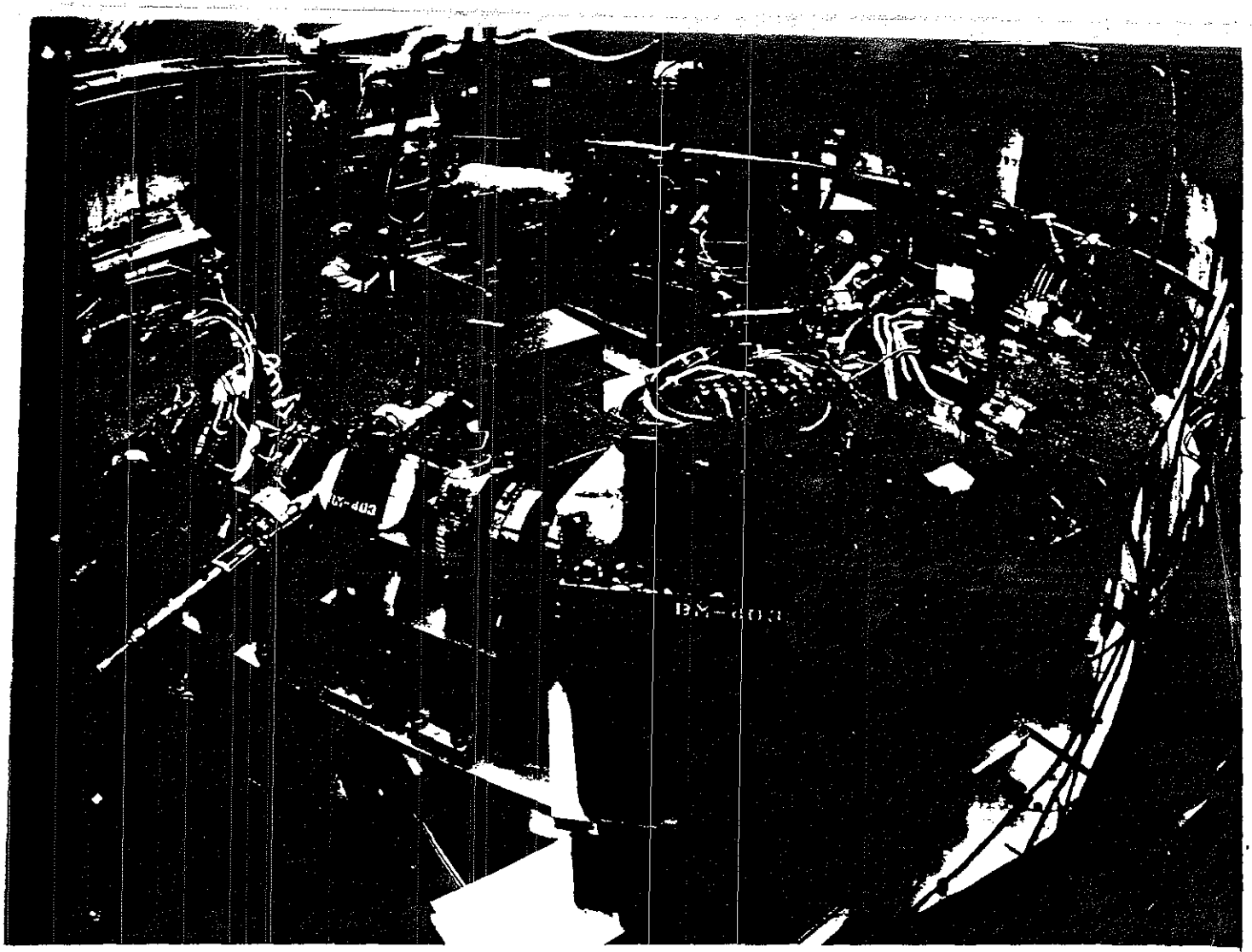


Experiments with free electron lasers are being conducted at Los Alamos. These high-power lasers, which scientists liken to an extension of microwave technology to the visible light spectrum, are an essential part of research on the Strategic Defense Initiative.

See 97.40+42

PRIVATIZATION PROTOTYPES

The National Laboratories

The Energy Department facilities are key to national defense. Can they also contribute to U.S. competitiveness in world trade?

BY CLAUDE BARFIELD

LOS ALAMOS, N.M.—Here on a high, remote mesa of the Jemez Mountains sits one of the most important resources the nation has in its continuing struggle for security in the nuclear age and for economic advantage in world trade.

Today, as 40 years ago, the Los Alamos National Laboratory is at the frontier of nuclear weapons research. Then, it developed and exploded the first atomic bomb. Now, it is among the leading institutions contributing to development of President Reagan's Strategic Defense Initiative (SDI).

Less than two hours' drive away, at the edge of the desert flats in Albuquerque, a sister institution, Sandia National Laboratory, likewise is making important contributions to SDI.

The two laboratories rank second and third among this state's employers, and the 10,000 scientists, engineers and technicians in their work force give New Mexico one of the highest per capita concentrations of technically trained workers in the country. The Energy Department (DOE), which owns both of the facilities, underwrites nearly 20 percent of the state's economy.

As important as they are to New Mexico, Los Alamos and Sandia—and the seven other multiprogram labs owned by DOE—are even more critical to prospects for key national policy priorities:

- Much of the nation's nuclear arsenal is designed at Los Alamos and then engineered into weapons at Sandia. On-going research on nuclear technology is financed by DOE but is also of critical interest to the Defense Department.
- Both labs are centrally involved in research and testing associated with verification technologies that would come into play if the United States and the Soviet Union ratify a nuclear arms control agreement. This aspect of their work is of interest to the Arms Control and Disarmament Agency, the Pentagon and others.
- Increasingly, Members of Congress and other government leaders are calling upon the labs to play major roles in nurturing technological innovation, which is among the leading public missions of the National Science Foundation and the Departments of Energy and Commerce. The labs tried, with mixed results, to push civilian technology forward during the energy crisis of the 1970s. Now they face demands for a broader innovative role—although two-thirds or more of their work is related to national security, and much of it is classified.

Thus the labs may be key players in two of the nation's most challenging dilemmas. As Siegfried Hecker, director of Los Alamos, said in an interview, "We face competition on two broad fronts: from the Russians on the military front, and from the Asians on the civilian front. Both pose formidable technological challenges, and it would be foolish to keep them on separate tracks." The DOE labs, he argued, offer an opportunity to merge the two tracks within a single set of institutions.

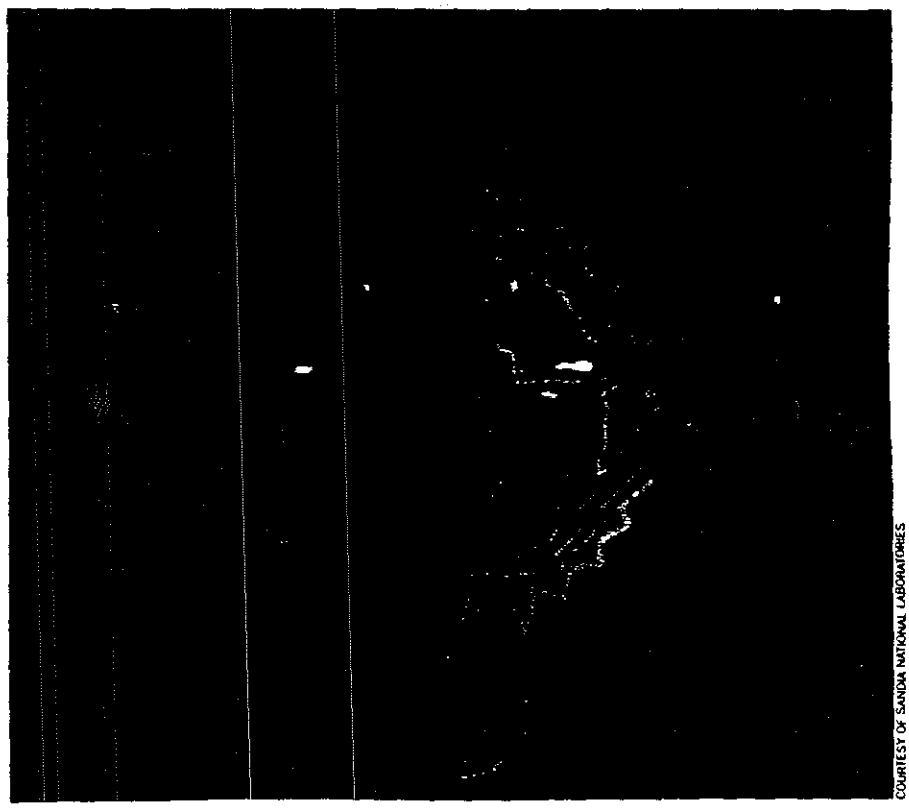
The hope that the labs could help enhance U.S. competitiveness in world trade was succinctly expressed by Sen. Pete Domenici, R-N.M. The labs are "our greatest trade secret," he said recently.

As Congress and others focus more attention on the labs' capabilities, interest will surely grow in their organizational structure. For government executives especially, the unusual, quasi-public nature of the labs is notable. From the beginning, the labs have been operated by private sector contractors that are not bound by civil service rules or pay scales, and thus they offer a long-running, if unintended, test of the privatization principles espoused by conservatives in Washington today.

As an example of the private sector's ability to manage programs for the government, the labs "have been a great success story," says James Culpepper, DOE's deputy assistant secretary for military applications.

Other close observers also attribute the labs' successes to their structure—which is known by the acronym GOCO, for "government-owned, contractor-operated." And believers in that structure argue that the GOCOs should be used in programs aimed at bolstering the nation's technological capabilities.

"There are a lot of people running around with ideas for new organizations to deal with



COURTESY OF SANDIA NATIONAL LABORATORIES

Optical holographic filters, under development at Sandia's Livermore, Calif., facility, will permit computers to recognize objects such as enemy missiles regardless of their angle of view. This computer-enhanced photo is a reconstruction of a drawing resembling a delta-wing aircraft.

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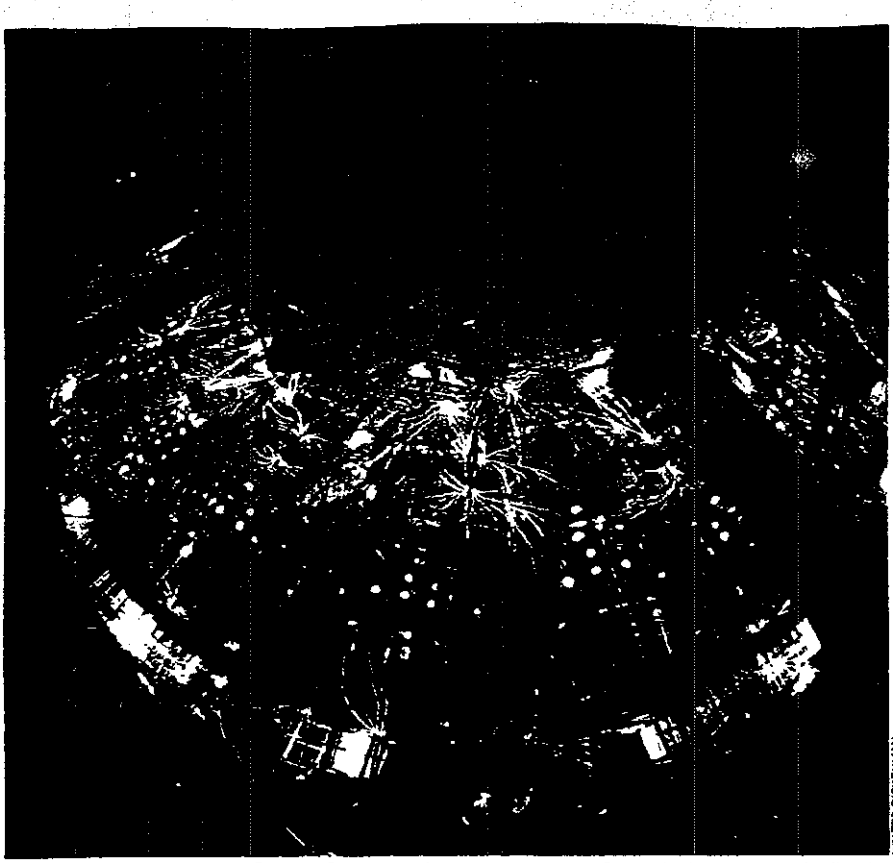

WALTER DICKENMAN

The world's most powerful particle accelerator, located in Sandia's Albuquerque facility, is used in efforts to produce a controlled fusion reaction. The 108-foot accelerator, first fired in 1985, produces at least 100 trillion watts of electricity. Experiments to implode pea-sized fusion fuel pellets should begin next year.

our competitiveness problem," said George Dacey, director of Sandia from 1981-86, in a recent interview. "But they have an excellent model right under their noses, with the GOCOs, which have responded superbly to technological challenges for 40 years. We should use them, rather than spreading money all over the place for untried organizations and ideas."

A program President Reagan proposed last January to establish new science and technology centers based at universities would not follow the GOCO model. However, DOE leaders do want the proposed $4.4 billion superconducting supercollider to be a GOCO project.

Organization and Structure

Los Alamos, Sandia and the Lawrence Livermore National Laboratory in Berkeley, Calif., are labs with dual defense and civilian missions. As such, they would be at the core of any efforts to use the labs to promote the simultaneous advance of defense and competitive capabilities. Together with six other DOE multiprogram labs whose research is confined to civilian missions, they employ more than 8,000 scientists and 7,500 engineers and have operating budgets totaling about $6 billion a year.

Organized during World War II, the labs expanded beyond defense research after the war, picking up responsibility for research on civilian nuclear power and related radiation and health effects. By the mid-1950s, several of the labs boasted capabilities in many disciplines, including physics, chemistry, biology and mathematics, as well as wide-ranging engineering expertise on making bombs from fission and fusion power. Meanwhile, the national labs also gained sway over the so-called "national trust" missions in the physical sciences, including high-energy physics and the radiobiological sciences.

When the energy crisis hit in the mid-1970s, the national labs, with mixed and controversial results, devoted substantial resources to basic and applied research and development of alternative energy technologies.

The organizational structure of the DOE national laboratories was born of Cold War exigencies and lack of governmental experience in managing large-scale scientific and technological enterprises. So it was that President Truman directed that a diverse group of contractors be enlisted to run the labs, including individual universities, university consortia and industrial firms. Los Alamos is operated by the University of California (Berkeley); Sandia, by American Telephone & Telegraph Co.; and Brookhaven National Laboratory by Associated Universities Inc.

Contractors, particularly industrial firms, were reluctant to take on the task. To allay their fears of entrapment in government red tape, the government gave them wide latitude to operate independently and to achieve a size commensurate with the challenge of their missions.

These concessions contributed much to the labs' subsequent success and high reputation, say close observers. Herman Roser, who has long been associated with the labs, and who served as Assistant Secretary of Energy for Defense Programs from 1981-84, says: "Two big factors account for their success. They have not had to operate under the Civil Service system, which meant that they could pay what the market dictated for talent and not be bound by narrow GS ratings or job descriptions. Second, they could quickly put together multidisciplinary teams from their own ranks to attack science or technology problems when they arose."

That point was also made by Orval Jones, Sandia's executive vice president, during an interview in Albuquerque. He added that another key element is "the ability, because of our size and diversity, to achieve a critical interdisciplinary mass when we attack a problem, to bring together different perspectives from electrical and mechanical engineers, high-energy physicists, chemists, biologists and math whizzes. That interaction, which we have honed to a fine degree here, is almost unique for research organizations."

The nine DOE national labs have staffs ranging in size from 2,500 to 8,500, most mixing a large number of scientific and technical disciplines.

Pay can range far above federal salary caps. Ranking managers and scientists at Sandia earn $150,000 or more.

Los Alamos and Sandia

Los Alamos and Sandia, each with payrolls exceeding 8,000 people, offer interesting case studies of the national labs' differing capabilities and responses to today's defense and competitiveness challenges.

Los Alamos was founded in 1943, and its early history is indelibly identified with J. Robert Oppenheimer and the program to develop the world's first nuclear weapon. Today its primary focus remains the science of national security, with major programs in advancing nuclear warheads, innovative weapons design, verification and control technology, nuclear material production, strategic defense research and non-nuclear munitions and weapons. Los Alamos also has conducted extensive R&D programs in energy, including work on nuclear fusion and

advanced fission reactors, and geothermal and solar energy.

The lab has also developed substantial ancillary expertise in material science, computers, and radiobiology; in September, it announced a breakthrough in computer tracking of the evolution of the AIDS virus.

Los Alamos employs almost twice as many scientists as engineers. At Sandia, on the other hand, the ratio is reversed: about one scientist for every two engineers. Sandia's defense role is largely confined to the engineering and systems integration of nuclear weapons. The lab has also done extensive work in arms control verification and advanced conventional weapons. Until 1973, Sandia's activities were 100 percent defense-related, but since then it has expanded into energy research and engineering in the areas of combustion, solar and photovoltaics research and fossil fuel extraction technology.

The approaches taken by the two labs to the defense and civilian innovation missions vary principally because of differences in their primary missions, in the nature of the contractors who run the enterprises, and in the technical backgrounds of their research staffs.

"Los Alamos has always been dominated by scientists, and its parent contractor is the University of California," says Antoinette Joseph, director of field operations in DOE's Office of Energy Research. "Thus, to some degree it resembles an academic campus, with a preference for discussions of cutting-edge science within a collegial, almost seminar-like setting. Sandia's strength is in applied engineering and systems integration—big projects with identifiable products and results."

She adds that the DOE contractors running the labs also impart "a real difference in leadership. At Sandia, the lab directors have often come directly from, and then gone back to, the AT&T corporate hierarchy. The model is more results-oriented than Los Alamos."

Roser adds, "They're more imaginative at Los Alamos, but they would chew on a problem forever if you'd let them. They really need stronger input from industry. At Sandia, on the other hand, you can count on meeting deadlines even with the most complex systems project." The two are "suprisingly complementary" and a "true national asset," he says.

Managers' Goals, Incentives

Managers in the DOE laboratories occupy an unusual position in the U.S. scientific and technological workplace. Public funds support their research and a federal department oversees their programs, yet they are not part of the federal Civil Service and enjoy wide latitude in how they achieve their defined goals.

BRUCE McELOY

"DOE protected [lab managers] for a long time from a changing world here in Washington, but that is no longer possible. Everybody second-guesses everybody else in Washington these days."

Antoinette Joseph
Office of Energy Research, DOE

The "enormous challenge of the work" and the first-rate research tools at the labs help attract an accomplished staff, says Sandia's Jones. Warren Miller, deputy director for research at Los Alamos, observes that scientists working at the labs "are much more likely to keep up with, and be a part of, the cutting edge of their profession than typical scientists working for the federal government." Dacey added that "Sandians do not think of themselves as federal bureaucrats. 'Bureaucrat' is a kind of pejorative term out here."

Ties between DOE and the labs, usually harmonious in the past, have shown signs of strain in recent years. In 1983, a prestigious White House science panel headed by David Packard, chairman of the board of Hewlett-Packard Co., criticized the department for "excessively detailed direction of laboratory R&D activities" and concluded that such 'micromanagement' has seriously impaired R&D performance at the labs. The panel blamed "lack of stability in DOE," including many personnel changes and shifting, unfocused missions, as causes of the department's deficient leadership.

While DOE has moved to remedy other criticisms in the report, managers at Los Alamos and Sandia don't see much less micromanagement now than in 1983. "If anything, says Jones, "the situation has gotten a little worse. It seems that every time we turn around there are new orders, regulations, forms and directives." That assessment is shared by Roser, himself a former DOE official with direct laboratory oversight.

Joseph, whose DOE office of energy research is not itself the subject of major criticism from the lab managers, defends the overall record of the department, arguing that there was a certain insularity and lack of political reality in the managers' criticisms. "DOE protected them for a long time from a changing world here in Washington, but that's no longer possible," she says. "Everybody second guesses everybody else in Washington these days. DOE—and the labs—have to respond to investigations and recommendations from a much larger universe—from the DOE Inspector General, from OMB, from GAO, from OTA and from heaven knows how many congressional staff members. It's easy to blame the department, and sometimes it may be at fault, but often managers here are just reacting to demands placed on them that they can't ignore or finesse."

National Security: Still Top Priority

Although leaders of the two labs want to help meet the challenge of U.S. civilian competitiveness, they say that national security programs will remain their central priority.

Defense accounts for about 70 percent of the work at Los Alamos and 80 percent at Sandia. At Los Alamos, says Hecker, non-defense work "will augment rather than be a substitute for our defense mission."

Lab officials anticipate that the composition of their defense work will change during the next decade. Jones says that Sandia's planning is "increasingly taking into account the likelihood of major arms control agreements in the next few years. They will have a real impact on the size and contents of the current U.S. nuclear stockpile. In addition, we have the largest arms control verification technology program in the nation, and under the potential new agreements, that will assume even greater importance."

E. H. Beckner, vice president for defense programs at Sandia, says the intermediate-range nuclear missile treaty under negotiation between the United States and the Soviet Union would likely produce increased demand on lab resources in two areas: conventional weapons and short-range tactical nuclear weapons.

If an agreement is signed, he says, U.S. allies, particularly West Germany, might well "demand a shoring up of weakened defenses in Europe, to give them the ability to withstand or turn back a Soviet invasion. This will mean newer, faster, more accurate tactical nuclear weapons not included in the agreement, and more sophisticated, smarter conventional weapons. For that, they would turn to the labs."

At the moment, the labs are centrally involved in the Reagan Administration's most important new defense program, the multi-billion-dollar Strategic Defense Initiative. Lawrence Livermore, Los Alamos and Sandia rank 4th, 8th and 14th among the top SDI contractors in terms of dollars awarded from 1983-87, according to a study released by the Federation of American Scientists this spring. Grouped together, they would rank first; with contracts exceeding $1.2 billion during the period.

Roger Hagengruber, Sandia's vice president for exploratory systems development, observed that the labs' budgets "look high, because so much of SDI is in a research phase; once you get to testing and development, our budgets will pale beside those of the major defense contractors."

Dacey, who headed Sandia for the first three years of SDI, says the lab had not viewed the program as a source of additional staff and had been careful to concentrate its work "only in those areas where we had unique experience and capability." Los Alamos took a similar view of its role in the SDI program, says Peter Lyons, the lab's deputy associate director of defense research programs.

Despite the caution, Hagengruber and others make it clear that the labs' scientists are excited by the formidable challenges presented by SDI technologies. "U.S. strength has always depended on the vigor of our R&D base," Hagengruber says. "SDI challenges us across a broad front of technologies, and while we cannot know the outcome or results of our efforts in every area, the payoff militarily and technologically for the nation is bound to be large."

Los Alamos, with $458 million in SDI contracts in 1983-87, is conducting research on directed energy weapons, electromagnetic launchers (railguns), nuclear back-up options in the event of Soviet abrogation of the ABM treaty, and ways to make SDI systems less vulnerable to countermeasures. Sandia, with $217 million in contracts, is working on various systems-engineering, analysis and testing projects.

The Competitiveness Challenge

In Washington's search for ways to make the product of U.S. industry more competitive in world trade, science and technology are at the center of discussion. Proposals abound

Top managers at the national laboratories include (from left to right): Siegfried Hecker, director at Los Alamos; Orval Jones, executive vice president at Sandia; and Roger L. Hagengruber, Sandia's vice president for exploratory systems development.

for new programs and new institutional arrangements (a Technology Department, for example) to promote innovation.

After achieving large budget cuts for civilian R&D programs, the White House in 1984 began a National Science Foundation (NSF) program to create engineering research centers linking industry and universities. There are now 11 centers, and the NSF plans five or six more in the next year.

In his State of the Union address last January, Reagan proposed further steps in the interest of U.S. competitiveness: the establishment of a separate group of science and technology centers that would link industry with universities, but in this case would exploit research opportunities in key scientific disciplines.

Top officials at the DOE laboratories, along with a number of congressional leaders, are convinced that the labs should play a much more active role in fostering civilian innovation. To this end, Sen. Domenici proposed on June 9 that the national labs be assigned to lead consortia researching three items: harnessing superconductivity, mapping the human genome, and forging advanced semiconductor manufacturing techniques.

R&D centers would be created at the DOE labs, with increased authority to enter cost-sharing research agreements with industry, grant exclusive patent rights where appropriate and otherwise conclude a variety of licensing agreements with companies in the private sector. In testimony before the House Science and Technology Committee on June 10, Los Alamos director Hecker made a more specific and detailed proposal on superconductors. He suggested that Congress provide $5 million over five years to establish six to eight research centers at the labs to study superconductor technologies.

Culpepper indicated that the Administration would look skeptically on proposals to give the labs such powers as the independent right to grant patents, saying that Washington would insist on a strong hand in decisions related to national security issues.

NSF director Erich Bloch, though, has said he thinks the DOE labs could have a role to play in the new R&D centers the Administration is planning.

Earlier efforts to use the national labs to speed civilian technogical advances have had very mixed records, especially in the field of energy.

The DOE's attempts to push solar, wind, geothermal and other energy technologies to the point of commercial viability were disappointing. The labs aren't equipped to read market signals, observed Dacey. And at DOE, Joseph predicted they would run into the same problem in attempts to move beyond defense research programs that "don't have to take into account costs and bottom-line balance sheets."

Hecker recognizes the problem, but says he believes that "the realization over the last few years that we really are in a major competitive struggle has changed the attitude of both business and government toward each other. Industry is much more receptive to working with us, and the labs have made real efforts to give them meaningful access."

By defining goals modestly, emphasizing research, not product design, and targeting work to the needs and structure of the target industry, the labs can contribute to commercial innovation, he says. "We know that when we move beyond our defense role, life becomes more complex, and success is more elusive and harder to define. But given the magnitude of the challenge the United States faces in global competition, we must find better ways of utilizing the extraordinary technical resources in the national laboratories." □

SPEEDING TECHNOLOGY TRANSFER

One way in which the national laboratories could help U.S. industry compete in world trade would be to try harder to transfer the results of government-sponsored research to the private sector.

That, in fact, has been a goal Congress has pressed upon the labs for the past seven years, in the knowledge that only 5 percent of the patents granted to the federal government are ever used by industry. In contrast, 33 percent of private-sector patents are used by businesses.

As a result of a 1980 law, Los Alamos and Sandia National Laboratories each have an Office of Research and Technology Applications, with two full-time professionals working on technology transfer. Congress also has made it easier for businesses, universities and others in the private sector to secure rights to patents developed under Energy Department contracts.

Los Alamos and Sandia now regularly inventory lab technologies to identify processes and products of potential use to private industry. For example, Los Alamos identifed 190 materials technologies as having commercial value and held a seminar to present them to 49 interested companies. The labs also bring university scientists in on fellowships and conduct extensive outreach with university and corporate officials to encourage technology transfer. The labs also encourage their staffs to help start new businesses using technologies developed there.

Top managers at the labs argue that more could be done to speed technology transfer. They want the Energy Department to delegate to the labs its authority to grant exclusive patents to companies and individual entrepreneurs and to loosen some rules that prevent inventors on their staffs from pursuing commercial opportunities. And they want to cut red tape that now delays industry sponsorship of lab research.

The Academic-Industrial Complex

A host of new agreements for industrial sponsorship of academic research are the focus of a growing debate

At the Massachusetts General Hospital (MGH), Howard M. Goodman is setting up a new Department of Molecular Biology that will have a staff of 50 and ample research facilities. Its senior scientists will be recommended for faculty appointments at the Harvard Medical School, with which MGH is affiliated, but their support will come exclusively from Hoechst AG, a German pharmaceutical firm. Hoechst has founded the new department with a contractual guarantee of nearly $70 million over the next 10 years. That figure is a minimum; it could well be supplemented if Goodman's research team is productive in ways that are valuable to the company. In exchange for the $70 million, MGH has agreed to grant Hoechst exclusive worldwide licenses to any patentable developments that emerge from company-sponsored research.

At the Harvard Medical School itself, another new department is being established with substantial industrial investment. E. I. du Pont de Nemours & Company will spend $6 million over 5 years to support the new Genetics Department headed by Philip Leder. DuPont is not the sole support of the department, but it will receive licenses to market any commercially useful research for which it has paid.

At Rockefeller University, Chua Nam-Hai is conducting research on the structure and regulation of plant genes involved in photosynthesis. As of this spring, Chua's work will be supported by a 5-year, $4-million contract from the Monsanto Company, which will receive licenses to market patentable discover-

During the past 2 years, corporate investment in academic science has proliferated at major research universities throughout the United States, particularly those on the East and West coasts. From the university's point of view, the special appeal of the burgeoning industrial connection is quite simple—money. Federal support of basic research has been gradually declining for the past decade, and the situation has now been measurably worsened by the dismal state of the economy and the Reagan Administration's determination to reduce government spending. Grants from the National Institutes of Health (NIH) and the National Science Foundation, for example, are fewer in number and harder to get. For universities to turn to alternative sources of research support is not only prudent but downright essential. Scientists who 10 years ago would have snubbed their academic noses at industrial money now eagerly seek it out. University biologists who have collaborated throughout their careers only with each other are learning that collaboration with industrial scientists can be intellectually stimulating too.

From industry's point of view, its present investment in academic research arises not from some altruistic desire to help compensate for lagging federal support but rather from the very business-like judgment that universities have something corporations want to buy—research talent and technical skill. Recombinant DNA technology, for instance, which is on the verge of great commercial exploitation, has its intellectual roots on campus. But with rapid scientific advancement, the conventional distinction between basic and applied research has become blurred. The molecular biologists who have invented and developed recombinant DNA work thus have become a commodity of considerable interest to corporations. The fact is that, in nearly every case so far, industry has chosen to support specific individuals whose research talents are complementary to its needs. Industry, it is worth noting, is not bestowing large, "string-free" grants for universities to distribute on the basis of peer review. For example, when Hoechst decided it wanted to create a department for Howard Goodman to head, no MGH or Harvard Medical School committee was asked for advice. That is the norm.

Although universities have had corporate ties of one sort or another for years—traditional patterns of faculty consulting are a case in point—the present concentration of industrial interest in academic science is generating no small measure of concern about whether the academy is selling its soul. There are some common elements to these new university-industry connections, but there is no set pattern to the agreements, which take a variety of forms as attempts are made to devise ways of writing contracts that offer maximum protection to academic values. A few examples suggest the range of new linkages between industry and academe.

- Channing Robertson of Stanford University and Harvey Blanch of the University of California at Berkeley each will receive approximately $1 million over 4 years to support basic research in the development of chemical processes using genetically engineered microorganisms. The money comes from the Center for Biotechnology Research, a nonprofit organization which, in turn, is financed by a for-profit company called Engenics. Engenics was formed recently with capital from six major corporations—Bendix, General Foods, Koppers, Mead, MacLaren Power and Paper, and Elf Technologies of Société Nationale Elf Aquitaine—which see great promise in the work Robertson and Blanch are doing. Licensing agreements with the universities assure Engenics rights to commercially useful research; if Engenics flourishes, so will the nonprofit center, which will derive future income from its 30 percent equity interest in the company. The center must spend its resources on basic academic research. This unusual nonprofit/for-profit union

The recent growth of industrial investment in academic science has raised a number of ethical and legal issues applicable to the formation of university-industry relations. Throughout the United States, universities are struggling to develop guidelines that will permit collaboration to take place without seriously compromising traditional academic values. In a series of articles, News and Comment will examine some of the major new agreements and assess the implications of the academic-industrial complex.

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Negotiations have been proceeding for some time and there were rumors that an agreement might be announced during Zhao's visit. The most substantial development, however, was the comment by Zhao during a formal toast at the state dinner that China "will not engage in nuclear proliferation. We will not help other nations develop nuclear weapons." The NNPA requires that U.S. nuclear technology can be sold only to countries that agree not to export nuclear weapons technology or information. Zhao's remark appeared to remove that issue from contention. Nonproliferation advocates, however, have been pressing the Administration to conclude an agreement only if the Chinese will also insist on the placing of safeguards on any nuclear technology they export.

U.S. sources expect the Administration to push to complete negotiations to make it possible for the agreement to be signed on President Reagan's scheduled trip to Peking in April.

—JOHN WALSH

Europe Eyes U.S. Model on Joint Research Rules

The ten member states of the European Economic Community (EEC), taking a cue from the Reagan Administration's effort to boost technological innovation, are considering a proposal that joint research efforts between high-technology companies in Europe be exempted from the stiff antimonopoly rules contained in the Treaty of Rome, the agreement setting out the code of economic behavior on which the community is based.

In the past, such exemptions have been permitted in individual cases. Last month, for example, the Brussels-based commission of the EEC agreed to allow three West German companies to collaborate in a joint program of research and development on coal gasification. Similar exemptions have also been negotiated for microelectronics research projects carried out under the umbrella of the European Strategic Program for Research and Information Technology (*Science*, 6 Jan., p. 28).

The commission of the EEC, in a draft regulation which is currently being circulated for discussion and is expected to be adopted by the council of ministers within the next few months, is now proposing a blanket exemption for similar research efforts in these and other fields, ranging from textiles to pharmaceuticals.

Some conditions would remain. An exemption would not be allowed, for example, for research projects involving more than one of the three largest European companies in any particular field. Nor would it be permitted when the combined turnover of the companies sponsoring the research exceeded $400 million, an attempt to ensure that the major beneficiaries of the new competition rules are medium-sized companies.

As in the United States, commission officials hope that the main effect of the proposed regulation will be to provide psychological reassurance to research managers that joint research projects will not be subject to a legal challenge from Brussels. At the same time, however, the commission is going further than the Reagan Administration in proposing that the exemption be extended to cover the joint production of new technological products arising from the research.

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Battelle Predicts Rise in R & D Spending in 1984

Thanks chiefly to a surge in spending by private industry, expenditures on research and development in the United States will climb to $94.2 billion in 1984, according to a forecast by the Battelle Memorial Institute. That would be an 8.9 percent increase over 1983 levels, or a 3.7 percent rise after inflation is taken into account.

According to the usually reliable Battelle figures, industry will spend $48.8 billion, a 10.3 percent increase, and the federal government will spend $42.7 billion, a 7.8 percent rise. The increased federal outlays largely reflect the continuing defense buildup. The Department of Defense is expected to account for 64.5 percent of government R & D expenditures in 1984, up from 58.9 percent in 1983.

—COLIN NORMAN

Guidelines for Artificial Heart Implants Revised

The University of Utah's review committee for research on human subjects has approved a revised and expanded protocol for implanting artificial hearts into patients. Pending review by the Food and Drug Administration, the approval opens the way for introducing an improved version of the artificial heart into patients who are healthier than was the first recipient of an artificial heart, Barney Clark. Clark died in March 1983 112 days after being implanted with such a device.

The revised procedure will allow University of Utah surgeons, directed by William C. DeVries, to select patients who are in less advanced stages of heart failure. Previously, the protocol called for waiting until the eighth week after a patient reaches what the American Heart Association designates as the fourth category of cardiomyopathy. One major difficulty in Clark's case was that his heart disease had caused considerable deterioration in other organ systems. Those complications were his immediate cause of death.

The revised protocol also has expanded the patient's informed consent form so that it now includes information gained from Clark's experiences. The new protocol removes any upper age limit for patients who undergo the experimental procedure, and it specifies that various nutritional and exercise regimes may be studied following the operation. In future implants, the synthetic heart valves will be made of solid titanium without the welds that caused problems in the model Clark received. Also, use of a portable support system during the postoperative period has been approved, potentially allowing future recipients to feel somewhat less encumbered during the recovery period than was Clark.

Two members of the review committee voted against the revised protocol, arguing that the next artificial heart recipients ought to be patients whose hearts have stopped suddenly and thus are not suffering from the multiple and potentially confounding complications seen in patients in the advanced stages of heart failure.

—JEFFREY L. FOX

Boy's Birth Is First From Embryo Transfer

By Jay Mathews
Washington Post Staff Writer

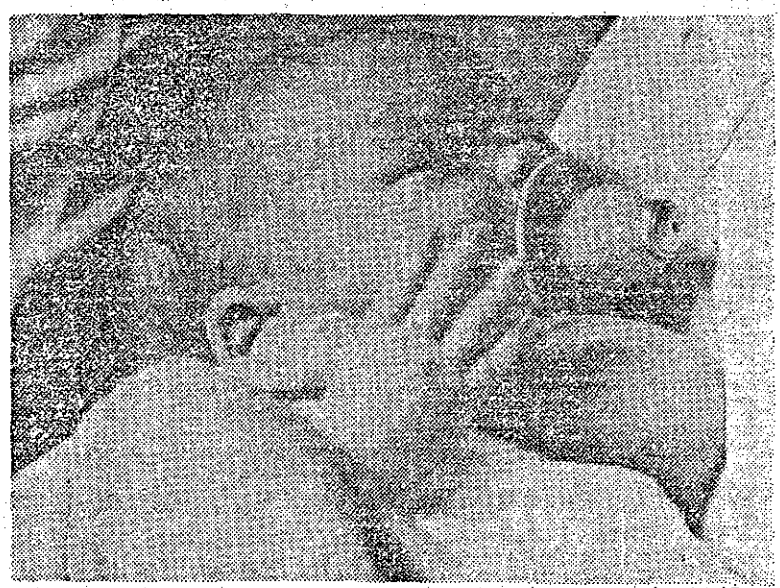
LONG BEACH, Calif., Feb. 3—A medical team today announced the first birth of a baby to a woman who received an embryo from another woman, the latest in a rapid succession of medical techniques designed to help infertile couples.

"This is an exciting day for us," said Dr. John E. Buster, head of the Harbor-UCLA Medical Center team, as he showed videotapes of the healthy boy, born about two weeks ago in Los Angeles County. Buster said that the parents, who had tried for eight years to have children, wished to remain anonymous.

Michael J. Eberhard, vice president of a company that is planning to set up a profit-making embryo transfer center here, said that 50,000 infertile American women could benefit from the procedure.

Unlike "in vitro," or in-glass fertilization, in which eggs are taken from an infertile woman and fertilized in a laboratory dish, the embryo transfer requires no surgery. It does, however, require the infertile woman to accept an egg from a donor who has been fertilized artificially with sperm from the infertile woman's husband. The child she bears, unlike in most in vitro fertilizations, will not be genetically related to her.

Australian doctors recently implanted an ovum in a woman after it had been surgically removed from another woman and fertilized in vitro, but the embryo spontaneously aborted days later. Buster said that his technique also might help a woman who could conceive but needs another woman to carry the fetus to full term.



Associated Press

Embryo-transfer baby was born two weeks ago; parents requested anonymity.

According to Buster, the woman who bore the first embryo-transfer baby had undergone three operations to try to correct several problems, including an inflammatory condition of the ovaries and the uterus, and blocked Fallopian tubes. He said that the new procedure will attract many women who do not want surgery and who want to avoid the several surgical extractions of eggs sometimes necessary before an in vitro fertilization works.

Another member of the team, Dr. Ingrid A. Rodi, said that some couples do not want to endure what may be a two-year wait at oversubscribed in vitro clinics. Internationally, about 250 babies have been born through the sometimes misnamed "test-tube" method. Forty centers in the United States are equipped for the procedure, but only a few have had regular success.

Reporters at a crowded news conference at the Memorial Medical Center here asked several members of the team, including physicist Richard G. Seed, the inventor of the transfer process, why it was considered necessary to patent the technique, as they are trying to do. Seed said that he thought that the in vitro process had not been patented because its developers did not know that they could do so.

Eberhard said that investors had spent nearly $3 million without government support to develop the transfer method and were entitled to some return. His company, Memorial Health Services, plans to set up the world's first ovum-transfer center at Memorial Medical Center this spring with the help of the Reproduction & Fertility Clinic Inc. of Chicago, which filed the patent applications. Team members indicated that the procedure would cost $4,000 to $7,000 for each attempted transfer, about the same as for in vitro attempts.

Although embryo transfer has been used with animals since 1890, doctors said that they had to develop a special method to flush the five- or six-day-old human embryo out of the donor's uterus and retrieve the ovum, still too small to see with the naked eye, so that it could be transferred to another woman.

Rodi said that the team is attempting to expand its current list of 12 ovum donors, who are paid about $250 for each month they undergo tests or ovum transfers, to about 50 women. This would make it easier to match blood type, hair and eye color, and menstrual cycle with those of the recipient.

Industrial Policy From the Grass Roots?

By Walter Olson

In Washington, the notion of "industrial policy" seems to be falling into a kind of disrepute. Recently three economists, spanning the ideological spectrum from the Brookings Institution to the American Enterprise Institute to the Heritage Foundation, jointly declared that the presumption "that politicians and government officials can 'pick winners' more efficiently than markets . . . has no basis in historical fact."

In the 50 states, however, industrial policy has met with a much more enthusiastic reception. The nation's governors and state legislators are rushing to embrace all sorts of schemes meant to direct and channel economic activity. Possibly the best known of these schemes is the proposed "Greenhouse Compact" in Rhode Island, which has been approved by the state legislature and will appear on the ballot as a referendum today. The compact is an ambitious plan (whose accompanying report takes up more than a thousand pages) for thrusting the state government deep into European-style planning of economic "winners" and "losers." Although it provides for at least $40 million in new spending, its proponents say they won't have to ask for tax boosts or cuts in other spending to pay for it; instead, taking a leaf from the supply-siders' book, they expect increased economic activity to provide a revenue re-flow big enough to pay for the program.

Rhode Island's plan is more sweeping than others, but it is no longer unique; dozens of states are experimenting with similar techniques. On May 11 and 12, representatives of various state governments met in Washington to discuss state industrial policies under the auspices of the National Commission on Industrial Innovation (NCII), a group founded and headed by former California Gov. Jerry Brown.

Would Coalition Be Desirable?

A recurrent theme of the conference, often announced as if it were a remarkable revelation, was that government, business and labor, and perhaps education too, should cooperate to solve national problems. The speakers seemed to complain that for some reason—sheer cussedness, perhaps—these groups have been fighting each other instead of working together.

Suppose it were possible to form such a "grand coalition" of the most powerful forces in the society. Would it be desirable? For any such tripartite or quadripartite consensus to endure, some proposals that would be good for productivity and innovation would have to be ruled off the agenda because they would harm the interest of one or another group. On the other hand, it may be only too easy to strike a deal satisfactory to all three or four big interests by sacrificing the interests of some unorganized or not-yet-existent group. Michael Barker of the Gallatin Institute, a Washington-based think tank, says: "The present is organized to the teeth. The future is unborn."

It should be easier to organize a grand coalition in one state than in the nation as a whole, for reasons that are familiar from the Federalist Papers. In a small state, interest groups are fewer and less diverse, and it may be possible to unite virtually the whole establishment behind a package deal. Rhode Island officials say that the only serious opposition to the Greenhouse Compact has come from a few economists at Brown University. In Washington, a large community of think tanks and policy analysts would have been picking away at the compact for months now. Even if the AFL-CIO and the Chamber of Commerce were inclined to negotiate some federal equivalent—which they are not—there is no assurance that Congress would enact the result.

The grand coalition can thrive when it finds the right victims. In Minnesota, business and labor leaders succeeded in passing legislation to discourage takeover bids for companies based in the state. Managements wanted job security, and the unions feared that out-of-state owners might close down local plants. The big losers were the shareholders, many or most of whom live in other states anyway.

Nowadays it is mostly the taxpayers who pick up the tab, since the new state industrial policies typically involve explicit or implicit subsidies to business. For states to compete for business simply by lowering taxes and cutting regulations, according to many industrial-policy advocates, is mere "smokestack chasing": Direct subsidies—which somehow escape this invidious label—are the wave of the future. These subsidies do not come free. The union and government partners get to attach strings. Most typically, a business must commit itself to provide some number of jobs—perhaps more than it strictly needs—and to forswear capital mobility by agreeing not to leave the state for some period.

Among the subsidies most commonly provided:

Job training. Little wonder that states have been rushing into this area, since it is the perfect subject of quadripartite agreement. Business gets its work force trained for free or on the cheap; educators get more work; labor gets jobs, and government officials get a new social program to take credit for. The strings attached can be significant, however. Tennessee is training workers for a new General Electric plant, but GE has to file detailed job descriptions well in advance, and the state, rather than GE, gets to take the job applications and do most of the screening of trainees.

All this competition for state money rewards grantsmanship more than entrepreneurship, especially since many businesses want nothing to do with government.

University research. Several states have developed new programs that push university research efforts toward areas with commercial potential. Advocates of industrial policy note that many European countries provide big subsidies for industrial research and product development. But doesn't the U.S., with fewer subsidies, far outcompete the Europeans in both areas? Regis McKenna, executive director of the NCII, acknowledges that it does. Then why do we need big new subsidy programs? Because, Mr. McKenna explains, research subsidies would allow business to free up its funds for marketing efforts.

California and other states have programs that invite companies to co-sponsor targeted research at universities on subjects of direct commercial value. It is ironic that Jerry Brown should be promoting this cause—and not simply because, as governor, he ruthlessly cut his state's university budgets. One of Mr. Brown's oldest political allies, the Western Center on Law and Poverty, is suing the University of California for allegedly working with business to develop farm machines that displace migrant workers.

"Incubators" and "greenhouses." For many years, university towns have been spinning off small high-tech companies. This process has come to the notice of state officials, who have decided that it would be more fruitful if they directed, organized and subsidized it. At least a half-dozen states have begun "greenhouse" programs that establish special buildings or complexes to house new businesses in one or another technical field. (A few states also operate full-fledged industrial parks.) A microelectronics greenhouse, for instance, will offer its tenants subsidized rent and perhaps other services, such as a library, copying equipment or shared computer time.

Sizable Funds

Why it is important to subsidize these costs rather than others is not clear. Cheap private quarters are available in most cities and, in any event, high-tech industry is not an especially intensive user of floor space. Still, a greenhouse is a much more visible result of a governor's efforts than a group of subsidized employers on scattered sites—and thus more gratifying to what Mr. Brown warns can be a yearning to "hang a government sign around every new job."

Mini-SBAs. The record of the federal Small Business Administration does not seem a very inspiring example. Even so, all 50 states have established their own mini-SBAs, sometimes to dispense advice to those who ask for it, sometimes to administer procurement set-asides, sometimes to furnish loans and grants. These funds can be quite sizable. On April 10, Pennsylvania's voters endorsed a $100 million fund to hold the debt of small and medium-sized firms. Montana is earmarking $30 million in coal-tax revenues for small-business loans, which is proportionally the equivalent of a federal SBA with $4.5 billion more to lend every year—something like 10 times the size of the actual federal SBA. Connecticut's Product Development Corp. extracts as its quid pro quo for grants not only a promise to provide in-state jobs but also a royalty on product sales.

All this competition for state money rewards grantsmanship more than entrepreneurship, especially since many fledgling businesses want nothing to do with government entanglements. Mr. Brown tells a story from 1977, a time when California was running a big surplus. He approached some Silicon Valley executives with a proposal to devote a chunk of the money to a "California 2000" fund to subsidize high-tech. "We don't want it," they told him. "Just get out of our way."

Mr. Olson is the associate editor of Regulation magazine, published by the American Enterprise Institute.

Emerging Soviet Emigres Raise Their Political Voice

By Igor Reichlin

This year, Ronald Reagan's bid for re-election may get unsought—but welcome—backing from a fledgling political group made up of Soviet Jews who found refuge in the U.S. in the early '70s and are now eligible to vote.

In New York City alone, there are more than 60,000 former Soviets and almost 20,000 of them already may be naturalized U.S. citizens. The emigres seem to have forceful views about the state of their new nation, and are now getting to have their say in American politics.

In 1982, almost 2,000 former Soviets (more than 75% of those eligible) voted for Brooklyn, N.Y., Rep. Stephen Solarz, a liberal Democrat who is emphatically pro-Israel and is credited with having frequently appealed to the Kremlin on the behalf of Soviet Jews.

Nevertheless, when speaking of the federal government, many of these new Americans say the Reagan administration has a realistic foreign policy and can contain communism better than the Democrats. Also, having seen the economy at the Ralph Bunche Institute, a New York-based think tank, took a nationwide poll of Soviet refugees. His recently published study suggests "The Republican Party enjoys substantial prestige with the new immigrants who consider—and approve—its stance on the law-and-order issue as firm, and its domestic and foreign policy as forthright. Their attitude places them fairly close on the right wing of the Republican Party."

In general, these emigres seem to differ drastically from those Russian Jews who came to the U.S. at the turn of the century numbering almost two million and who brought a peculiar mix of ideas on how to achieve social equality and justice that fueled the already rising trade-union movement here.

Soviet Jews, however, had already experienced what social justice and equality could mean in a socialist state and lost faith in these values. One emigre recently suggested the equation "Democrats=liberals=communists."

Coming from a totalitarian society, the emigres approach Western democracy in a ticle in our newspaper, he doesn't try to write an opposite article," said Peter Vail, then an editor of an emigre weekly New American, in a broadcast interview. "But his first wish is to close the newspaper and put us all into jail."

This interview, shown a year ago on public television in a documentary "The Russians Are Here," left few emigres indifferent. Neither did the program itself, written, directed and produced by Ofra Bikel. Almost in unison, the emigres claimed the PBS show was politically biased, portraying them as the rejects of the Soviet system and the misfits in American society.

Two ideologies clashed here, says Mr. Levkov: Ms. Bikel's own critical approach to American society, and the former Soviets' political orthodoxy. And when Ms. Bikel's film suggested the emigres were maladjusted because they failed to appreciate American freedom, they saw it as her attack on their conservative outlook.

ever performances had been scheduled. As a result, the concerts took place only in two cities out of seven and the total turnout was down to several hundred instead of the expected thousands.

The concert affair was the first political victory for the emigres, as it dealt a blow to the Soviets, who apparently had expected to win back some of the emigres' nostalgic sympathy—and dollars. It also "brought political awareness to many emigres," says Gene Sosin, director of program planning for the Radio Free Europe/Radio Liberty (a U.S. government broadcasting station), who for many years has worked with the former Soviets in Europe and the U.S. Still, the question remains: Will they be able to play any meaningful part in American politics?

Boris Velberg, New American's editor in chief, doesn't see it happening soon. "Although every three out of four emigres now say they prefer Reagan, most of them can hardly participate in political activities of

companies are to make nuclear exports to China.

Negotiations have been proceeding for some time and there were rumors that an agreement might be announced during Zhao's visit. The most substantial development, however, was the comment by Zhao during a formal toast at the state dinner that China "will not engage in nuclear proliferation. We will not help other nations develop nuclear weapons." The NNPA requires that U.S. nuclear technology can be sold only to countries that agree not to export nuclear weapons technology or information. Zhao's remark appeared to remove that issue from contention. Nonproliferation advocates, however, have been pressing the Administration to conclude an agreement only if the Chinese will also insist on the placing of safeguards on any nuclear technology they export.

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—JEFFREY L. FOX

America Dominates in Biotechnology

OTA study highlights U.S. strengths but also notes potential vulnerability to foreign competitors—especially the Japanese

The United States has a commanding lead over its industrial competitors in the development and application of biotechnology, an exhaustive study by the Office of Technology Assessment (OTA) has concluded. American dominance of the fledgling industry is so extensive, according to OTA, that U.S. companies hold an edge in virtually every area, from basic research to the ability to attract high-risk capital.

Nevertheless, the report is quick to point out that the U.S. lead, though large, is not unassailable, and it dwells at length on some potential vulnerabilities. Given the high-decibel attention currently being paid to high-technology industry is the United States, the study is likely to spark a chorus of political rhetoric about the need to stave off yet another foreign technological challenge. Japan is reckoned to be the closest competitor, followed, in order, by West Germany, the United Kingdom, Switzerland, and France.

The strengths of the U.S. biotechnology enterprise are, however, more obvious than its weaknesses. Take, for example, funding. The OTA study indicates that the private sector in the United States invested more than $1 billion in 1983 to commercialize new biological techniques, which are defined as recombinant DNA, cell fusion, and novel bioprocessing technologies. Although some large chemical and pharmaceutical companies are putting money in biotechnology, a large fraction of U.S. investment has gone to start-up companies financed by venture capital. In contrast, in Europe and Japan, where tax laws do not favor the creation of venture capital funds, virtually all of the work is being done by large pharmaceutical companies. This difference alone has given the United States a comparative advantage in the ability to capitalize rapidly on the results of basic research, OTA says.

In research funding, too, the United States is miles ahead. OTA calculates that the U.S. government spends more than $500 million a year on biotechnology-related research and development, while the Japanese government spends only about $60 million. This provides a well-developed base on which the U.S. biotechnology industry has built. Moreover, the recently established links between university scientists and biotechnology companies—themselves partly a reflection of the booming venture capital markets—have moved the technology rapidly into the private sector. University-industry links have not flourished as vigorously in Europe and Japan.

If the U.S. industry does have an Achilles heel, however, it may be the relative lack of funding to develop new engineering technologies related to the production of biotechnology products. "In the next decade, competitive advantage in areas related to biotechnology may depend as much on developments in bioprocess engineering as on innovations in genetics, immunology, and other areas of basic science," OTA argues. And it points ominously to the fact that the federal government spends only about $6.5 million a year on developing such technologies.

> Limited partnerships alone invested $500 million in biotechnology in 1983.

Japan, in contrast, spends a relatively large fraction of its government funds for biotechnology on solving generic problems in bioengineering. "This strategy worked well in the semiconductor industry, and Japan may very well attain a larger market share for biotechnology products than the United States because of its ability to rapidly apply results of basic research available from other countries," OTA warns. What is needed to counter this approach? More federal funds for generic applied research, together with money for training grants is the stock answer.

Another potential vulnerability is the flip side of one of the strengths of the U.S. industry. All those new companies launched with venture capital will need major injections of new funds because they are likely to continue to report heavy losses in the next few years. Venture capital is good for starting up companies but not for keeping them going because the short-term returns are not so attractive. The staid, but wealthy pharmaceutical companies that are getting into biotechnology in Europe and Japan, in contrast, can use retained profits to underwrite their new ventures. OTA suggests a variety of creative tax measures to keep the money flowing into U.S. companies as they move from infancy into adolescence.

Some biotechnology companies are, however, already making good use of current tax laws to entice funds from wealthy investors. For example, limited partnerships and private stock placements are increasingly being used to fund such costly endeavors as clinical trials, scaling up processes for commercial production, and early product development. Limited partnerships alone are estimated to have channeled $500 million into biotechnology in 1983, and the figure could climb to a staggering $1.5 billion in 1984. U.S. tax laws provide much greater encouragement than those of other countries for the creation of such partnerships.

But it is clear from OTA's analysis of the products currently being pursued by the industry that an inevitable shakeout is in store. With perhaps 200 companies launched in the past few years and only about two dozen products nearing commercial introduction, there is unlikely to be room for everybody—no matter how attractive the federal government makes the tax environment.

Although the OTA report is extremely upbeat about the economic potential of biotechnology, one figure should give some pause. Only about 5000 jobs have so far been created in the industry, and the production phase is expected to be equally capital-intensive. Biotechnology companies will clearly provide few jobs for those communities that are assiduously wooing them.

What impact is the study likely to have on U.S. policy? Although it was commissioned by several congressional committees looking for ways to blunt a possible technological challenge from Japan, it is, ironically, likely to have more of an impact on the policies of the United States' competitors. Noting that the report concludes that U.S. biotechnology is, by and large, healthy, Nanette Newell, the project director, predicts that scientists and politicians in other countries may use it as ammunition to argue for domestic political and economic reforms.—COLIN NORMAN

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The strengths of the U.S. biotechnology enterprise are, however, more obvious than its weaknesses. Take, for example, funding. The OTA study indicates that the private sector in the United States invested more than $1 billion in 1983 to commercialize new biological techniques, which are defined as recombinant DNA, cell fusion, and novel bioprocessing technologies. Although some large chemical and pharmaceutical companies are putting money in biotechnology, a large fraction of U.S. investment has gone to start-up companies financed by venture capital. In contrast, in Europe and Japan, where tax laws do not favor the creation of venture capital funds, virtually all of the work is being done by large pharmaceutical companies. This difference alone has given the United States a comparative advantage in the ability to capitalize rapidly on the results of basic research, OTA says.

In research funding, too, the United States is miles ahead. OTA calculates that the U.S. government spends more than $500 million a year on biotechnology-related research and development, while the Japanese government spends only about $60 million. This provides a well-developed base on which the U.S. biotechnology industry has built. Moreover, the recently established links between university scientists and biotechnology companies—themselves partly a reflection of the booming venture capital markets—have moved the technology rapidly into the private sector. University-industry links have not flourished as vigorously in Europe and Japan.

If the U.S. industry does have an Achilles heel, however, it may be the relative lack of funding to develop new engineering technologies related to the production of biotechnology products. "In the next decade, competitive advantage in areas related to biotechnology may depend as much on developments in bioprocess engineering as on innovations in genetics, immunology, and other areas of basic science," OTA argues. And it points ominously to the fact that the federal government spends only about $6.5 million a year on developing such technologies.

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Japan, in contrast, spends a relatively large fraction of its government funds for biotechnology on solving generic problems in bioengineering. "This strategy worked well in the semiconductor industry, and Japan may very well attain a larger market share for biotechnology products than the United States because of its ability to rapidly apply results of basic research available from other countries," OTA warns. What is needed to counter this approach? More federal funds for generic applied research, together with money for training grants is the stock answer.

Another potential vulnerability is the flip side of one of the strengths of the U.S. industry. All those new companies launched with venture capital will need major injections of new funds because they are likely to continue to report heavy losses in the next few years. Venture capital is good for starting up companies but not for keeping them going because the short-term returns are not so attractive. The staid, but wealthy pharmaceutical companies that are getting into biotechnology in Europe and Japan, in contrast, can use retained profits to underwrite their new ventures. OTA suggests a variety of creative tax measures to keep the money flowing into U.S. companies as they move from infancy into adolescence.

Some biotechnology companies are, however, already making good use of current tax laws to entice funds from wealthy investors. For example, limited partnerships and private stock placements are increasingly being used to fund such costly endeavors as clinical trials, scaling up processes for commercial production, and early product development. Limited partnerships alone are estimated to have channeled $500 million into biotechnology in 1983, and the figure could climb to a staggering $1.5 billion in 1984. U.S. tax laws provide much greater encouragement than those of other countries for the creation of such partnerships.

But it is clear from OTA's analysis of the products currently being pursued by the industry that an inevitable shakeout is in store. With perhaps 200 companies launched in the past few years and only about two dozen products nearing commercial introduction, there is unlikely to be room for everybody—no matter how attractive the federal government makes the tax environment.

Although the OTA report is extremely upbeat about the economic potential of biotechnology, one figure should give some pause. Only about 5000 jobs have so far been created in the industry, and the production phase is expected to be equally capital-intensive. Biotechnology companies will clearly provide few jobs for those communities that are assiduously wooing them.

What impact is the study likely to have on U.S. policy? Although it was commissioned by several congressional committees looking for ways to blunt a possible technological challenge from Japan, it is, ironically, likely to have more of an impact on the policies of the United States' competitors. Noting that the report concludes that U.S. biotechnology is, by and large, healthy, Nanette Newell, the project director, predicts that scientists and politicians in other countries may use it as ammunition to argue for domestic political and economic reforms.—COLIN NORMAN

America Dominates in Biotechnology

OTA study highlights U.S. strengths but also notes potential vulnerability to foreign competitors—especially the Japanese

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INSIDE: THE SCIENCE AGENCIES

WASH. POST 1/31/84

The Japanese are challenging the U.S. lead in yet another new technology—gene engineering—and that lead could vanish in the next few years if basic research isn't translated into commercial products, the congressional **Office of Technology Assessment** says in a new report.

"Biotechnology has, to date, been an American success story . . . ," said Rep. **Albert Gore Jr.** (D-Tenn.), who asked for the study. "It is imperative that we not let this advantage slip away from us, and we need to ensure that this industry is not crippled."

"U.S. efforts to commercialize biotechnology are currently the strongest in the world," said the 612-page report, citing the nation's well-developed base in the life sciences, entrepreneurial spirit and the availability of financing for high-risk ventures.

Last year, private industry spent more than $1 billion to research and develop methods of manipulating the genetic makeup of existing organisms, the technology office said.

The report said, however, that the U.S. lead may evaporate during the next decade if federal support of basic research continues to decline and if more funds are not provided to help turn laboratory successes into commercial products.

The report said that the United States has not followed through on its lead in basic research in gene engineering. It said that the technology to take gene engineering out of the lab and into the factory is complex and that not enough people here are trained to do that.

Instead of concentrating on basic research, the Japanese government has spent considerable amounts of money on industrial processes.

The report, written under the direction of the OTA's **Nanette Newell**, said the U.S. government spent about $511 million last year on basic research in biotechnology, but only about $6.4 million on applied research, such as funds to train students in commercial biological methods.

The Japanese government, on the other hand, spends a substantial proportion of its annual $60 million biotechnology budget on applied research, the report said. Specific numbers were not available for Japan, the OTA said, but the West German and British governments both spend up to 10 times more on commercial biotechnology research than does the United States.

ANTITRUST

The report suggested several options Congress could choose to try to boost the U.S. industry: funding the retraining of industrial workers, changing antitrust policy to allow companies to share workers and resources, restricting imports of biotechnology products, restricting the export of U.S. knowledge and equipment and giving federal aid to specific industries or technologies.

Gore said he would work in the House Science and Technology Committee to boost spending in the fiscal 1985 budget, but he declined to discuss specific amounts. He also called for Senate action on House-passed legislation to create a $425 million annual program of aid to states for math and science education.

The report was criticized by author **Jeremy Rifkin**, president of the Foundation for Economic Trends, which has questioned the scientific and ethical implications of practical applications of biotechnology. In a statement, Rifkin said the report "reflects a pro-industry bias" that gives "only brief consideration" to potential environmental risks.

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INDUSTRIAL RESEARCH . . . A boom in industrial research has started, according to the **National Science Foundation**. Company-financed research is expected to increase by about 11 percent in fiscal 1984 to $48 billion, according to the NSF's **Science Resource Studies Office**.

In a survey of 76 companies in six major industries, five of the industries said they were planning double-digit increases in company-funded research. From 1982-84, two of the biggest increases came in machinery (17 percent) and chemicals (12 percent). The motor vehicle industry is lagging behind, with only a 2 percent average annual increase in constant dollars.

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The United States is immune from suit under the doctrine of sovereign immunity except a sit consents to be sued. *United States v. Mitchell*, 445 U.S. 535, 538, *reh'g denied*, 446 U.S. 992 (1980); *United States v. Testan*, 424 U.S. 392, 399 (1976). Further, "[a]waiver of sovereign immunity 'cannot be implied but must be unequivocally expressed.'" *Mitchell, supra*, 445 U.S. at 538 *quoting United States v. King*, 395 U.S. 1, 4 (1969). In an action for money damages it is clear that the Administrative Procedure Act cannot serve as a basis for a waiver of the Government's sovereign immunity. *See Califano v. Sanders*, 430 U.S. 99, 104-07 (1977); *Newson v. Vanderbilt University*, 653 F.2d 1100, 1107 (6th Cir. 1981). The Federal Tort Claims Act, 28 U.S.C. §2671 et seq., which waives to some extent the Government's immunity, is of no avail to appellant's claim of waiver since §2680(c) of that Act provides an exception to a claim for relief arising from the assessment and collection of taxes. It is clear that the United States has no waived its immunity to suits of this nature. *See Stanke-vitz v. IRS*, 640 F.2d 205, 206 (9th Cir. 1981); *Mack v. Alexander*, 575 F.2d 488, 489 (5th Cir. 1978).

Appellant cites *Larson v. Domestic and Foreign Commerce Corp.*, 337 U.S. 682 (1949), as authority to abolish the doctrine of sovereign immunity. However, *Larson* does not stand for such a proposition, but, rather, the Court stated that such a repudiation was left to the will of Congress. 337 U.S. at 704-05. *See Newson, supra*, 653 F.2d at 1107.

V

Appellant's final claim is that the district court erred in dismissing her claim against Kentucky state police officer Donald Powers. Appellant avers that officer Powers conspired with the other defendants to deprive her of her constitutional rights, alleging that Powers contacted the IRS and gave erroneous information which resulted in the faulty tax assessment. Appellant also claims that Powers, under color of state law, defamed her by telling friends and associates that she was involved in drug trafficking.

In dismissing the claim against officer Powers the district court held that since he was the only remaining defendant he could not be held to conspire with himself. Although it would be in error to dismiss the conspiracy claim against powers merely because District Director McHugh was accorded qualified immunity, *see Dennis v. Sparks*, 449 U.S. 24, 28 (1980), *Macko v. Bryon*, 641 F.2d 447, 449-50 (6th Cir. 1981), the record is void of any proof as to a conspiracy between Powers and the other defendants.

The record shows that officer Powers, pursuant to his legal authority, executed a valid warrant to search the home of appellant. Further, the record demonstrates that Powers did not contact the IRS concerning appellant's alleged involvement in drug trafficking, but another police officer contacted the IRS without the approval or authority from officer Powers. While it is true that Powers, in his individual capacity, could be liable for any wrongful acts committed in his official capacity under 42 U.S.C. §1983, it is clear from the record that, beyond the bare and unsupported allegations made by the appellant, no claim can be made against this defendant. Although the appellant raises the issue that Powers defamed her by saying to her friends and associates that she had been selling narcotics, we note that the claim of defamation, standing alone, is not subject to redress under §1983, absent more tangible harm. *See Paul v. Davis*, 424 U.S. 693, 709 (1976), *reh'g denied*, 425 U.S. 985 (1976).

Accordingly, the judgments of the district court are affirmed. No costs are taxed. The parties will bear their own costs on this appeal.

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LIMITATIONS PERIOD: EXECUTOR'S LATE FILING NOT EXCUSED BY ATTORNEY'S ADVICE

An executor's late filing of the estate tax return is not excused by his reliance on an attorney. (U.S. Court of Appeals for the Eighth Circuit)

Facts: John J. Smith, the plaintiff-appellant, was appointed personal representative of the estate under the will of Ann Olson, who died on Dec. 17, 1978. Smith retained an attorney to help settle the estate. The estate tax return for Olson's estate was due nine months after her death pursuant to §6075(a). Unfortunately, Smith's attorney was under the mistaken impression that the return was not due until one year after Olson's death.

On Dec. 7, 1979—over two months after the due date—Smith filed the estate tax return for Olson's estate. The IRS assessed a late-filing penalty of $5,232 pursuant to §6651(a)(1). Smith paid the penalty, filed a claim for a refund, and upon its denial instituted this action in the district court.

Holding: Smith's reliance on his attorney did not constitute reasonable cause for his failure to file the estate tax return within the nine-month period.—CA 8; *Smith v. U.S.*, No. 82-1767, 3/29/83.

Partial Text of Opinion: Smith concedes that he failed to file the tax return for Olson's estate within nine months of her death as required by 26 U.S.C. §6075(a). Section 6651(a)(1) of the Internal Revenue Code provides that if a tax return is not timely filed, there shall be added to the tax due a five percent penalty for each month the return is unfiled, not to exceed twenty-five percent of the tax due, "*unless* it is shown that such failure is due to *reasonable cause* and not due to wilful neglect." 26 U.S.C. §6651(a) (Emphasis added.) Smith contends that he has established such "reasonable cause" for his untimely filing because he relied upon his counsel's advice regarding the due date for the estate tax return.

The district court, relying on this Court's recent decisions in *Boeving v. United States*, 650 F.2d 493 (8th Cir. 1981), and *Estate of Lillehei v. Commissioner*, 638 F.2d 65 (8th Cir. 1981), held that Smith's reliance on his counsel did not constitute reasonable cause for his failure to timely file the estate tax return within the meaning of section 6651(a)(1). We affirm.

In *Boeving v. United States, supra*, 650 F.2d at 495, this Court reversed the district court's finding that the Internal Revenue Service could not impose a penalty on an untimely estate tax return because the executrix had reasonably relied upon her attorney who was mistaken as to the required filing date. We stated:

> In our view, however, the district court's treatment of the taxpayer is precluded by the recent decision of this Court in *Estate of Lillehei v. Commissioner of Internal Revenue*, 638 F.2d 65 (8th Cir. 1981). The executor or executrix has a personal and nondelegable duty to file a timely return, and reliance on the mistaken advice of counsel is not sufficient to constitute "reasonable cause" for failing to fulfill that duty.

Id. at 495.

The district court's grant of summary judgment here against Smith was plainly proper under this Court's *Boeving* and *Estate of Lillehei* decisions. Although these decisions do not establish a rule of law that a personal representative's reliance on counsel can *never* constitute reasonable cause under section 6651(a)(1) for failing to file a timely return, Smith has not demonstrated any facts that distinguish the circumstances in this action

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from those present in *Boeving* and *Estate of Lillehei*. Thus, those cases are controlling here, and the court below did not err in finding that Smith's reliance on his attorney did not constitute reasonable cause for his failure to file the estate tax return within the nine-month deadline.

Finally, the penalty imposed by the Internal Revenue Service did not exceed the amount authorized by 26 U.S.C. §6651(a)(1). Accordingly, the district court did not err in rejecting Smith's claim that the fine was improper.

The judgment of the district court is affirmed.

-- End of Section H --

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