R&D highlights of the trade bill

A bill aimed at strengthening the competitiveness of U.S. companies and reducing trade deficits passed the Congress last week. At press time, this Omnibus Trade Bill awaited President Reagan's signature. Tariff changes, the pending law's possible effects on new foreign-trade agreements, and an expanded definition of unfair trade practices that can trigger U.S. sanctions have dominated most discussions of this bill. However, a hodgepodge of less closely followed provisions in the 1,128-page legislative document could affect the U.S. research and development (R&D) community more directly.

Chief among them are two involving intellectual-property rights. Currently, importation of foreign products that infringe on federally issued patents, trademarks and copyrights can be banned — but only after it has been shown that importing the product would likely injure an efficiently operated U.S. industry. Under the new legislation, such proof of injury is no longer needed to ban infringing products.

A second change would for the first time allow holders of U.S. patents for processes to sue for damages those firms that either made or imported into the United States products manufactured by infringers of their patents.

The new law would also rename the National Bureau of Standards (NBS) in Gaithersburg, Md., and expand its functions. The new National Institute of Standards and Technology (NIST) is slated to continue NBS' current research activities — largely the development of measurement standards and related technologies — while taking on several advanced-technology-outreach responsibilities.

NIST is scheduled to launch regional technology-transfer centers, for example. It also would coordinate a national technology-extension service, encourage the development of industrial consortia to exploit scientific and technological advances, and operate a national information clearinghouse on state and local technology initiatives.

Under the pending law, a one-year National Commission on Superconductivity would review major policy issues regarding the applications of superconductor-research developments. Chaired by a member of the private sector, its first charge would be to draw up within six months recommendations for enhancing R&D and implementing technology advances.

Other provisions in the new legislation would:

- establish a series of specific "partnership programs" between governments and the private sector to improve science and mathematics education — from elementary school through college.
- set up a new College and University Research Facilities and Instrumentation Modernization Program, which would provide up to $10 million a year in competitive grants to help equip programs in agriculture, strategic metals, minerals, energy, forestry and oceanography.
- require the Secretary of State to make certain that future bilateral science and technology exchanges not only protect intellectual-property rights but also ensure that access to R&D opportunities, facilities and data "are, to the maximum extent practicable, equitable and reciprocal." The bill does not spell out how the Secretary should do this, beyond requiring that potential exchange programs initially be reviewed by federal agencies with expertise in the research area.
- triple the White House National Critical Materials Council's technical staff (to six persons) and double its support staff (to two) — all within 30 days. The council, set up in 1986, is charged with developing a federal plan for advanced materials R&D.

Finally, the new legislation declares it U.S. policy that the metric system is "the preferred system of weights and measures for U.S. trade and commerce," and would require that each federal agency use metric measurements in its procurements, grants and other business-related activities. To the extent possible, the bill says, federal workers must adopt these measures by 1992. *— J. Raloff*

New technologies emerge in medical AI

Two decades after medicine and computer science began a starry-eyed courtship, the honeymoon is over, physicians and biomedical engineers say. But scientists designing medical "expert systems" and other forms of clinically useful artificial intelligence (AI) are starting to see a few of their dreams come true. Researchers this week reported significant improvements in several intelligent medical technologies, including computer-generated radiotherapy protocols and polarized video screens that display anatomical images in three dimensions.

New applications of artificial intelligence, especially those aimed at improvements in medical imaging, "are beginning to help us realize the goal of being able to reach out and hold that tumor in our hands, roll it around, bounce it off the table," even before scheduling surgery, says Henry A. Swett of the Yale University School of Medicine. This week, he and other biomedical specialists described the state-of-the-art in medical artificial intelligence at the World Congress on Medical Physics and Biomedical Engineering in San Antonio, Tex.

In the past 12 years, computerized tomography (CT scan), ultrasound and magnetic resonance imaging have "almost totally transformed" diagnostic radiology, Swett says. Now, "intelligent radiologic workstations" are starting to help radiologists cope with the "tremendous information overload" that has accompanied these technologies, which produce huge amounts of data but are limited in their ability to process and represent that information in useful ways.

Scientists long have dreamed that artificial intelligence might someday guide them through the complexities of medical problem solving. Rooted in rules rather than numbers, and with its ability to make decisions based on uncertain or incomplete information, artificial intelligence seemed to hold many advantages over the subjective and fallible human brain. However, says Jeffry A. Siegel of Temple University Hospital in Philadelphia, although some newer AI systems are good cancer therapy decision-makers, "the notion of applied artificial intelligence as automated diagnostician is little more than fantasy." Rather, these systems are proving increasingly useful as "medical decision support systems" that review with their own explicit logic a physician's more intuitive diagnosis or treatment decision.

More important for now, artificial intelligence is spurring a revolution in medical imaging. For example, a new generation of liquid crystal video displays charged with AI-coordinated electrical currents produce rapidly alternating, oppositely polarized images that, when viewed through special polarized glasses, appear completely three-dimensional and are much easier to interpret than conventional "layered," two-dimensional views.

Facing an even more daunting technological challenge, Henry Fuchs and his colleagues at the University of North Carolina in Chapel Hill have developed a hard-wired, high-tech pair of "glasses" that displays for the user a three-dimensional visual field in "real time" through the use of programmed imagery. As the user moves about, the projected, simulated view changes appropriately. With an additional, hand-held sensor, the scene can be manipulated or layers of the image "erased."

Fuchs predicts the system may prove useful for designing more effective radiation therapies by providing simulated, three-dimensional views of a patient's internal anatomy along with a superimposed image of a radiation beam. The user could try various locations and orientations of radiation sources while a dynamic, contour map shows areas of increasing radiation dosage. *— R. Weiss*