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THE FALL OF U.S. AND THE RISE OF E.C. RESEARCH & DEVELOPMENT?

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Today, May 23rd, 1991, Congress endorsed extending fast-track authority for trade talks to continue negotiations on the GATT and to conclude a North American free-trade agreement with Mexico and Canada. Many Americans believe passage of such accords will enhance our supremacy in science and technology, especially in light of European Community projects in R & D. I for one am very doubtful that such agreements will alter our race with the E.C. member states as we face our most formidable nonmilitary challenge in this century - the EuroRevolution. Victory will not only be measured by economic leaps forward, but by the ability to sustain our lead in science and technology.

Without a progressive national policy on research and development (R & D) our citizens risk a significant drop in their prized standard of living that may be threatened as 320 million Europeans take on the rest of the industrial world, enriching themselves at the expense of the United States. As our trade representative Carla Hills passionately, and perhaps hopelessly, defends the free enterprise system, protesting reciprocity, quotas and unfair subsidies, the ...

Common Market nations race ahead to finish passage of their 279 directives seemingly oblivious to the outcries from Washington. But, little, if anything, is heard from our capital about the U.S.'s future in R & D.

Why it may be argued should Europeans who have for years sat by, often belittled by America's apparent monopoly in science and technology, remain but a shadow of strength when measured by U.S. advances. Yesterday's leadership is not automatically guaranteed. Taking what these 12 nation governments and their population feel are fair rights of progression for gain and opportunity, why should they continue to accept a second class status in the pyramid, knowing fullwell that they may be at the crossroads of a brilliant coming - a peaceful revolution to propel them into an unparalled prosperity.

Europe 1992 is being designed by European for Europeans, so that European companies will profit from subsidies and protectionism. Foreign fears of a Fortress Europe surrounded by one effective tariff wall, rather than numerous smaller ones, are real. Not since Napoleon's quest to unite Europe has anything so ambitious been attempted. The stakes are high. The Community's gross national product of \$4.6 trillion accounts for 20 percent of world output - more than the United States. The U.S. stake in Europe's plan is also huge. The European Community is America's chief trading

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partner, accounting for \$145 billion annually in combined exports and imports, more than either Canada or Japan. Including the output of U.S.-owned companies in Europe and European-owned firms in the U.S., the size of the relationship is \$1 trillion a year. The stakes may even be higher when we examine the dilemma we face in the laboratory. For fifty years our money, along with our scientific and technological innovations have been the prized treasures of U.S. export, which were supplied overseas in ample amounts. As a partial response, the Common Market was born from the ashes of World War II, with the United States and its Marshall Plan (the European Recovery Program) providing the wherewithall for reuniting a continent of disparate cultures, languages, and equally as important, differing taxes, tariffs, banking and insurance regulations, competing industrial standards, rigidity in worker movement, and a host of other barriers which guaranteed a sterile economic expansion when compared with the movements in the United States. The late 1970s and early 1980s saw a plateauing of profits and living standards throughout western Europe, while the opposite was true across the Atlantic.

From its headquarters in Brussels, the reaction was quick and thorough - to fight it out in the arenas of high tech and scientific innovation. In June 1985 a White Paper was published, defining the European Community's Commission program for "Completing the Internal Market," listing over

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300 legislative proposals and a timetable for their adoption. The internal market referred to all related activities with the 12 member states (Belgium, Denmark, France, Germany (West), Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, and the United Kingdom). The White Paper was soon endorsed by the Heads of States and Government. The aim was to weld together the 12 separate national economies into a single market - a single Europe by the end of 1992.

The White Paper was given a constitutional basis by the Single European Act, becoming a major amendment to the 1957 Treaty of Rome that had given birth to the Common Market. It was passed to facilitate the adoption of the White Paper measures within its timeframe. The Act adapted the Community's procedures for decision making and increased the scope for a type of majority (as opposed to unanimous) voting in the Council of Ministers. It became effective on July 1, 1987, was ratified by the Parliaments of all member states and improved significantly the institution system by setting new objectives for the Community, notably the completion of the internal market "an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with provisions of this Treaty" by 1992 and the strengthening of economic and social cohesion, without internal frontiers. One of the major conditions for success required a common thrust on research and development, to catch up with, and perhaps bypass, the

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United States' gargantuan marriage of industry, university laboratories, and government subsidy in developing advances in science and technology. A splintering of effort would not do. The combining of resources in Europe would be the only workable solution. This condition has long been part of our public policy system, but was elusive for Europeans.

By the end of 1989 progress had been made towards achieving objectives by securing the abolition of frontier controls on goods, the freedom of movement and establishment for people; the opening-up of public procurement markets; a variety of services, including financial, and transport; the liberalization of capital movements; the creation of suitable conditions for industrial cooperation; television without frontiers, and the removal of fiscal frontiers.

By the end of 1992 the expectation is that other directives will be passed impacting on liberalization of capital movements; non-life insurance, tax measures designed to improve the fiscal environment for cross-border operations; road transport; construction; a central bank and a common currency.

The European Community's best kept secret is her most threatening weapon. In only a few years the 12 member states have been planning a strategy, in part already operational, to take on the United States in her most cherished

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enterprises - scientific and technological innovation. The stage for conflict between the E.C. and the U.S. is set. A tug of war between us may rupture many of our common bonds. "A friend for ever," will be severely tested when Americans feel the pinch of an eventually lowered living standard. Fingers may well point to the new antagonists across the ocean creating the potential for a long drawn out struggle for supremacy, prestige, and a redefined meaning of "survival." Only if the leadership in Washington responds with ingenuity, speed and resources can we tackle this thorny issue.

The E.C. and member governments are releasing billions of dollars for their megaresearch programs. Within the next six years, along with company resources, about \$16 billion will be used to develop high-tech research and their resulting offsprings of products. With new E.C. directives, revised tax laws will allow greater expansion into the venture capital markets, resulting in Europe passing the \$2.5 billion the U.S. spent in 1988.

Below are the major realities coming from the 12 member states (further strength will come should Austria and Turkey, who have recently applied for membership to the European Community become nations 13 and 14) are presently doing by combining their people, talents, ambitions, and resources to emerge as the leader in science and technology.

## Overall Research

Since the early 1980s the E.C. has thrown vast quantities of funds and manpower into modernizing its scientific base. A host of programs have emerged, many of them borrowing from existing U.S. technologies. In the late 1970s the E.C. established the European Science Foundation (it was modeled after the U.S. National Science Foundation) linking the national research programs of sixteen nations. Its primary goal is to promote the collaboration in research, to encourage the mobility among research workers, to assist exchanges of information and ideas among participating nations and to encourage the harmonizing of research activities and programs.

Further coordination was needed. FAST, Forecasting and Assessment in the field of Science and Technology, was adopted in 1978. Its main goal is to define long-term research and development priorities for the Community on the basis of which new Community research programs can be planned. FAST is a shared-cost research program involving numerous research and forecasting centers in the Community, with activities focusing on the relations between technology, work and employment, the transformation of services, the

communication function, the future of the food system, and integrated development of renewable natural resources.

The Single European Act of 1987 led to the creation of a European Research and Technology Community giving the Community specific powers in the field of scientific and technical cooperation forming a basis for the framework program of research and technological development thru 1991, and of course, beyond. Its present eight primary areas of action are: quality of life, dealing with health (cancer and AIDS are emphasized), radiation protection and the environment; information technology and telecommunications; industrial technologies of manufacturing, advanced materials, raw materials, and technical standards and reference materials; biological resources including biotechnology, energy including thermonuclear fusion, radioactive waste management and storage, the decommissioning and dismantling of nuclear facilities; science and technology for development; marine resources; and European scientific and technical cooperation.

**SCIENCE**, the Stimulation of the International Cooperation and Interchange Need by European Research Scientists, was adopted in the summer of 1988. **SCIENCE** promotes the exchange of research workers within the E.C. and finances research projects, twin laboratories in different member states and provides grants to researchers to enable them to work in E.C.

countries other than their own.

To deal with research in nuclear energy, solar energy and related matters, a Joint Research Center (JRC) was created with its four establishments at Ispra in Italy, Karlsruhe in the Federal Republic of Germany, Geel in Belgium and Petten in the Netherlands.

Located in Culham, England, JET, the Joint European Torus, is a doughnut-shaped vacuum vessel for creating inexpensive, clean energy by the fusion of hydrogen atoms, as on the sun's surface. The objective is to construct such an experimental vessel large enough to study a plasma in conditions simulating those in a thermonuclear project.

SPRINT, the Strategic Program for Innovation and Technology Transfer was adopted in the summer of 1988 to reinforce and add a new dimension to the E.C.'s activities. SPRINT is an important element within the framework of the E.C.'s Research and Development aspirations to master technological change, lying at the heart of the technological transformation of the European economy. A second phase concentrates on: strengthening the European infrastructure for innovation services, by forming or consolidating intra-E.C. networks of technology transfer and innovation support professionals, supporting pilot projects on innovation transfer that focus

on the application of existing technologies to receptive sectors, improving the environment for innovation by making the process involved better known and increasing coordination between the member states and the E.C. Commission.

COMETT, the Community Program in Education and Training for Technology which provides a favorable environment for the assimilation and diffusion of new technologies and strengthens links between higher education institutions and the business sector. \$258 million have been set aside for this effort until 1995.

**The Computer Challenge**

Europe's computer industry is stirring from a long slumber. The home market for hardware doubled to \$38 billion from 1980 to 1985. On the software market, the E.C. calculated orders at \$25 million in 1987 and predicts a market size of \$58 million for 1992. The largest segment, the standard package software market, shows the fastest growth - 24 percent in 1987.

Several E.C. companies plan to spend vast amounts of money on JESSI, the Joint European Submicron Silicon, a program to develop future memory chips, with the E.C. and various governments paying half the costs. By June 1989 the E.C. threw its weight behind this \$4 billion research and

development program. With \$500 million annually, it is funded at twice that of Sematech, a comparable U.S. consortium.

ESPRIT, the European Strategic Program for Research and Development in Information Technology was launched in 1984. It involves work on mini-supercomputers, work on improving industrial production by getting computers to communicate with each other; computer systems that will be able to control equipment and appliances in private homes; the establishment of Europe-wide software certification procedures and developing computerized work stations that simultaneously use voice, writing, data and charts. Within the ESPRIT projects all the major European manufacturers are joining forces to make sure that their computers link up easily. ESPRIT II, approved in 1988, now has nearly 450 contracts funded with \$5 billion until 1993, of which half will be provided by the E.C. for work on computer-aided design standards, communication networks for manufacturing applications, etc.

Euronet Diane, the Direct Information Access Network for Europe was created in the early 1980s as an information service with a special transmission network (Euronet) linking London, Paris, Rome, Frankfurt, Dublin, Brussels, Amsterdam, Luxembourg and Copenhagen. It is composed of independent European computerized information services which can give access to data-bases and data banks on numerous subjects. It

is Europe's first high-speed, computerized, information retrieval system. Initially, 40 host computers gave access to over 300 data banks covering a wide variety of scientific, technical, social and economic information. Over 2,300 companies and organization use this system.

CERN, the European Organization for Nuclear Research, based in Geneva, has the European Laboratory for Particle Physics, a 14-nation \$700 million supercollider project that built the world's largest atom smasher, the 17-mile-long Large Electron - Positron Collider.

#### Industrial R & D

BRITE, the Basic Research in Industrial Technology in Europe project was launched in 1985 as a program to increase the use of advanced technologies in the traditional sectors of industry. Research is designed to be precompetitive in nature, with commercial product development being left entirely to industry. Projects were developed that paralleled many U.S. efforts, covering a wide range of industrial disciplines, often making surprising use of techniques developed in one area to make new applications in another, and a few key technological fields (including laser technology, membrane science, catalysis and particle technology, new material joining techniques) have been

priorities. Under the first phase of the BRITE program, 1,000 firms, research centers and universities have worked on 200 projects. \$722 million have been allocated to 1992.

EUREKA, a type of ad hoc industrial policy of the E.C. was founded in 1988. The program, sponsors 302 non-defense joint projects, at a cost that exceeds \$10 billion (including \$4 billion for the JESSI semiconductor program), to produce electronic systems and goods ranging from high-definition television to robots to computer chips. EUREKA encourages high-tech firms, now more than 1,600, to pool their projects and resources. In return, Governments do their utmost to facilitate collaboration by giving priority to projects.

TELEMAN, another Community research program is designed to strengthen the scientific and engineering bases used for the design of nuclear remote-handling equipment. It addresses basic problems associated with remote operation using computer assisted teleoperators with increasing degrees of autonomy, questions relating to teleoperation in nuclear environments, and the integration of disciplines that make up robotics.

**The Telecommunications Complex**

Worldwide, R & D spending on information technologies have risen from \$35 billion annually in 1986, and is projected to

be \$90 billion by 1990. At that time the electronic equipment industry will overtake the automobile sector. The burgeoning telecommunications phenomena will expand to 7 percent of the E.C.'s economy by the end of the century from its present 2 percent. No single Community country accounts for more than 6 percent of the world's telecommunication market, whereas the United States represents 35 percent. Yet, taken as a whole, the Community has a 20 percent world market. Since 1983 the Community has built up a European telecommunications policy all of which evolved from its 1987 Green Paper dealing with telecommunications services and equipment. Mergers have helped clear the path for dominance. Sweden's Asea and Switzerland's Brown Boveri recently united into a \$17.8 billion electronic goliath. Compagnie Generale d'Electricite of France acquired ITT's telecommunications equipment activities and now ties with AT & T for world leadership for telecommunications devices.

RACE, standing for Research and Development in Advance Communications in Europe, was created to encourage a favorable environment for the development of telecommunications. The Community established this program in 1986 as part of an overall strategy to promote the rational development of the various telecommunication systems and services that are emerging in Europe. Its specific objective with \$580 million provided until June 1992, is to allow the gradual evolution towards a Community integrated

broadband communications system.

STAR, the Special Telecommunications Action for Regional Development was launched in 1987 and aims to eliminate disparities in present and future infrastructures. The management of the differentiation of services is the main challenge facing telecommunications administrations and decision-makers world-wide.

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Whether January 1, 1993 sees the sun rise in sparkling fashion, or should more time be needed, the season is upon us when Europe flexes its muscle of recognition and independence. 1992 is targeted as a Europe for Europeans, but the reality demands tradeoffs - someone gains while others lose. Should the domino theory apply, conflicts between industrial nations will abound, with some winning at the expense of weaker countries.

Europe is on its way to becoming the world's single richest market. The European Community has taken a historic step forward. The post 1992 New Europe is first and foremost the product of a Continent-wide economic deregulatory movement, where hundreds of rules that should have been discarded long ago are finally being swept away.

With one currency and one passport, E.C. wheels will soon roll across the continent unhampered by frontier barriers. Will those same wheels roll across the plains of America to claim victory? The United States can ill afford to lose its lead in scientific and technological innovation. Europe has gathered its best to drive us down the slide. The brain drain no longer survives as those skilled Europeans who were transplanted to American shores are returning to their native lands to head up programs of competitiveness. Will the E.C.'s gains be at the expense of American losses? Will the post World War II infusion of U.S. funding to rehabilitate a devastated European oasis, return to haunt us fifty years later? Not too long ago many experts were writing Europe off, now most ask what lies ahead for the United States. Unless our government, in cooperation with industry and a passionate citizenry cry out for swift action to develop and sustain a renewed effort in research and development, our scientific and technological achievements will someday be recorded in history books describing the wonders of our past. Then we may all say "What might have been!"

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