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EPSCoR - STRIDE
A Potential International Partnership

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CONTENTS

I. INTRODUCTION

EPSCoR and STRIDE provide a unique opportunity for collaboration between the United states and the European Economic Community. EPSCoR - the Experimental Program to Stimulate Competitive Research - is operated by the National Science Foundation (NSF) with the aim of assisting 19 of the least competitive states in the U.S. to improve the quality and capability of their academic research endeavors such that they will become more competitive in bidding for Federal research funds. STRIDE - Science and Technology for Regional Innovation and Development in Europe - is part of the European Community's preparation for 1992 and aims to improve the research and technology (R&T) potential of lagging and less favored regions in the Community.

Both programs share a common objective - widening the base of science and engineering research capabilities in lagging or less favored regions. EPSCoR is primarily a research program, supporting basic academic research, while STRIDE supports the infrastructure for research, as well as technology transfer and industrial innovation.

The opportunities for sharing experience and information between both programs are considerable. A formal collaborative framework would add an important international dimension to both. It would provide opportunities for the EPSCoR states and the STRIDE regions to share information; to access, on an international basis, faculty, student and post graduate research personnel; to enrich the quality of research activity; to enhance the attractiveness of EPSCoR States and STRIDE Regions as research locations; to develop international reputations for research staff; to improve the quality of human resources; and generally to reduce the scientific isolation which tends to be a major problem for these regions and states.

The "equivalence" of interests, problems, capabilities and levels of development which the regions of both STRIDE and EPSCoR share, is a strong indicator of the potential for positive and productive collaboration; for a collaboration founded on shared problems and equality of inputs. There are already many practical examples of collaboration between research personnel in the U.S. and the EEC, which have developed organically over the years. A more structured and better funded effort could, however, provide a "win-win" situation for both the EPSCoR states and STRIDE regions, the European Commission itself and the NSF.

This paper outlines the origins and aims of both programs and describes work in progress to-date to establish a collaborative framework for STRIDE and EPSCoR cooperation.

II. U.S.- EEC PERSPECTIVES

The U.S. and EEC have similar perspectives on research, technology and regional economic development. The role of research and technology development (RTD) in fuelling economic growth and modernization is not disputed, even if the process by which this takes place is complex, and precise quantification remains elusive. The studies of both scientists and economists all point to the simple reality that strong economies are based on research and technology.

Research and technology development (RTD) describes a complex of activities related to the generation, acquisition, transfer and use of technology. It includes research, development, demonstration, technology transfer and technical innovation. It covers the spectrum of knowledge generation, transfer and application. In practice RTD intensive states and regions are innovative, produce more new products, have higher levels of productivity, expand their employment base more rapidly and ultimately are more competitive than traditional and low technology regions. For these reasons the strong sectors, industries, regions and states in Europe and the U.S. continue to invest heavily in RTD.

It is also now understood that strong national economies are based on strong local economies. It is also agreed that the regional economy, no less than the national or international economy, needs a continuous process of technical change and innovation. The economic performance of a region or a state is therefore a reflection of whether its enterprises are technologically innovative and dynamically growing or technologically backward and declining.

Economic performance in Europe and in the U.S. in recent times indicates two separate trends which have become increasingly evident. A number of the developed and developing economies and regions have improved their growth prospects, while nearly all the less and especially the least developed states and regions face depressed investment and falling living standards. Control of new technology and industrial innovation are now generally acknowledged as key variables underlying these divergent trends. The developed and developing economies are able to exploit technology to improve the competitiveness of their industry, while the least developed regions possess neither the technological resources nor the industrial structure to exploit technology-based growth.

Advanced economic activity is now considered to have a high propensity to concentrate in the leading regions. Both, the arguments and the evidence in favor of this view are formidable. The core of the case is that economic growth in leading regions has a significant self-sustaining element. There are many reasons for this. They include economies of scale and of agglomeration, factors related to the specialization of labor, to external economies created by innovation and the development of skills, as well as to the emergence of the strategic technologies.[1] Weaker regions, on the other hand, may find themselves in a cycle of decline.[2] The result may be a cumulative divergence of regional economies and incomes.

Recent economic studies point to the establishment of a process of cumulative causation, which is producing a self-sustaining growth process in certain regions. Disparities, instead of being self-adjusting, appear to be self-reinforcing. Current work in Europe has also provided evidence of a remarkable concentration of both industrial research and manufacturing innovations in the core regions.[3,4] The evidence in Europe is that firms in the periphery undertake significantly less innovation than those in the central regions.[5] There are, therefore, considerable forces favoring the concentration of advanced technological and innovative activity. Regional imbalances may tend, as a result, to become self-reinforcing, particularly in high growth industries and in the advanced technology sectors.

If one compares the ten weakest with the ten strongest regions in the European Community as a whole, the disparity in incomes is a ratio of 1:3. Up to 1970, disparities in income per head actually narrowed, but since the onset of recession in 1973, there has been divergence rather than convergence. Regional disparities in income in the European Community are at least twice as wide as in the U.S. Social disparities, which include standards of living and working conditions, employment, social security, education and training are also evident. For example, regional differences in unemployment are almost three times as wide in the Community, as in the U.S.

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[1] Ireland and the European Community: Performance, prospects and strategy. National Economic and Social Council (NESC). August 1989.

[2] KALDOR, N. The case for regional policies. Scottish Journal of Political Economy, Vol. 17, 1970.

[3] HIGGINS, T., MAGUIRE, C., NIELSEN, S., STRIDE. Science and Technology for Regional Innovation and Development in EUROPE. Commission of the European Communities., November 1987.

[4] GODDARD, J.,CHARLES, D., HOWELL, S. J., THWAITES, A., Research and technology development in the less favored regions of the Community (STRIDE). Commission of the European Community. 1987.

[5] OAKEY, R. P., THWAITES, A. T., NASH, P. A., The Regional distribution of innovative manufacturing establishments in Britain. Regional Studies. Volume 14, 1979.

The concept of a "multi-speed" Europe, could become the unwanted reality, threatening European integration and cohesion. The technological disparities in the Community are also substantial. The most disadvantaged, technologically, are Greece, Portugal, Southern Italy, Spain, Ireland and Northern Ireland. Between them, they account for almost 40% of the population of the Community, but they control only 10% of the technology.[6] On the other hand three-quarters of the European Community's R&D is accounted for by the three strongest member states.

Germany, for example, can invest 2.8% of GDP on R&D. Greece, at the other end of the scale, manages only a meager 0.35%. Of the one million people involved in R&D in the Community, 36% are accounted for by Germany alone. Greece, by contrast, accounts for 0.4%. The less favored regions (LFRs) of the Community together account for only 14%. The economic gap of the LFRs, so long formally recognized in Community policies through its regional and other structural instruments, is a factor of 3 to 10 times smaller than the technology gap for these countries.

The scale of the technology gap in Europe is estimated at $7 billion per annum. This indicates the level of additional annual investment which less favored member states in Europe would require in R&D to reach average Community levels.[7] Almost all the factors which drive technological development, also appear to favor the core regions communications, infrastructure, access to skills and markets, institutional resources, information and services and many others.

More subtle structural changes are also occurring, stimulated by technology-based innovation. The economic distance between countries is narrowing, while interdependence between a range of economic actors, producers, investors and consumers, is rapidly increasing. Opportunities for specialization and international trade are increasingly influencing overall economic performance. Technology therefore is providing major economic opportunities for those with the capacity to use it. On the other hand, the lack of such capability is a major obstacle to development for those most in need of it.

During recent decades there have been a number of developments which make it necessary to seek new concepts of

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[6] HIGGINS, T., et al., op cit.

[7] HIGGINS, T., et al., op cit.

knowledge generation, transfer and innovation.[8] The earlier linear paradigms are being replaced by more flexible and interactive processes. These are faster moving, multi-disciplinary, more costly and the effects are spilling over outside the industrial sector into agriculture, health care and commercial services. Internationalization has become more vital and more pervasive. Horizontal and inter-sectoral linkages are increasing. The institutional roles and relations of those involved in knowledge generation and transfer are changing. The university world wide, for example, is becoming more development oriented. New consortia, alliances and networks, national and global, are emerging for technology transfer. Participation in these "smart" international networks is vital, both for science and the economy.

The new dynamics of these processes, even if not fully understood, are well appreciated. This awareness is leading to increased in R&D, education and training and to a higher profile for science and technology in economic and industrial development in all countries and regions. As a consequence new policies are emerging, geared towards the creation of new local techno-economic combinations and paradigms to stimulate endogenous, self sustaining technology based economic growth, especially in the less developed regions. Faced, in Europe, with the failure of conventional regional development mechanisms, national governments and international agencies are increasingly looking to technology policy, as a strategic variable in regional development and as a means of reducing the deficits in economic performance and income between the developed and lagging regions.

III. EPSCOR DESCRIPTION

A. Introduction

The National Science Foundation (NSF), an independent Federal agency, operates under the National Science Foundation Act of 1950, as amended. Section 3-a authorizes the Foundation to "initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels in the mathematical, physical, medical, biological, social and other sciences......"[9] . Section 3-e clarify's section 3 by stating that NSF should strengthen Science and Engineering (S&E) research and education throughout the

[8] ZEGVELD, W., Technology, Globalisation and Competitiveness. Paper presented at the International Symposium "Towards Techno Globalism". Tokyo, 6-9 March 1990.

[9] NATIONAL SCIENCE FOUNDATION, Statutory Authority, February 1989, as amended. Section 3.(a).

nation but "avoid undue concentration of such research and education."[10]

The Foundation's Directorate for Scientific, Technological, and International Affairs (STIA) administers programs designed to: encourage small business science and technological innovations, promote international scientific cooperation, provide information for public policy formulation, and stimulate competitive research. The STIA Office of Experimental Programs to Stimulate Competitive Research is responsible for the latter. Its mission is to develop the scientific and technological (S&T) capacity of less competitive states that possess high quality science and engineering (S&E) talent; the capability to effect significant improvements in their research infrastructure; and the will to increase support of S&T as an investment in their economic well-being.

The Office carries out its mission through the Experimental Program to Stimulate Competitive Research (EPSCoR), a merit-based program initiated in 1979 as a means to assist less competitive states meet the challenge of increased competition for federal R&D funds. EPSCoR brings the states's academic research endeavors to nationally competitive levels by enhancing selected areas of academic research and by stimulating local action to effect lasting improvements in a state's S&T infrastructure (i.e., research, education, and technology).

Throughout the period 1979 to the present, eligibility for EPSCoR grant competitions has been restricted to those states receiving a lesser amount of NSF scientific research project support. This amount, initially set at one million dollars per year in 1980, has increased over the decade to the current limit of approximately five million dollars per year. Qualifying states are ranked ordered on both their federal and NSF academic research obligations in three categories: (1) total obligations; (2) total obligations per academic scientist and engineer; and (3) total obligations per capita.[11] A final rank is assigned to each state based upon the sum-of-ranks for the six indicators and the NSF invites the lowest ranking states to participate in EPSCoR.

The 1980 competition embraced seven states (Arkansas, Maine, Montana, North Dakota, South Carolina, South Dakota, and West Virginia): five, 5-year awards were made at a level of about $600,000 per year for a total of up to $3.0 million. The 1980 program with five states was so successful (North Dakota and

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10 Ibid, (e), pg. 4.

11 ANDERSON, RICHARD J., paper, EPSCoR: Building Science & Technology Capacity", 1991.

South Dakota had lost) that the Congress requested the NSF to solicit another round of competition among the states. In 1985 a second round of EPSCoR competition included the States of Alabama, Idaho, Kentucky, Louisiana, Mississippi, Nevada, North Dakota, Oklahoma, South Dakota, Vermont, Wyoming and the Commonwealth of Puerto Rico. Of these twelve jurisdictions, eight 5-year awards were made for a total of $3.0 million each.

Erich Bloch, then Director of the NSF, was concerned that the EPSCoR competition had so stimulated state political interest that he directed the EPSCoR staff to inform the non-awardee states of Idaho, Louisiana, Mississippi, and South Dakota, that if they would implement all or part of their EPSCoR plans over the following two years, the NSF would accept new 3-year implementation proposals for up to $1.8 million from each state. During the period 1988-present EPSCoR embraced all 16 States and the Commonwealth of Puerto Rico.

In 1989 Congress again directed the NSF to permit the prior competing states with the opportunity to compete for five additional years of EPSCoR support. In 1991 at the direction of Congress, NSF added two more states (Kansas and Nebraska) to the EPSCoR initiative bringing the total number of participants to eighteen states and the Commonwealth of Puerto Rico.

Non-Federal matching funds have played an important role in the success of EPSCoR. Initially the states were to match 10% of the EPSCoR grant funds the first year, 20% the second year et. seq. up to a total 50% match in the fifth year. This process produced a net match of about 1:1 between NSF and non-federal funds. In Round II, while unstated by NSF, competition among the states produced a 3:1 non-Federal match. Since its existence the Federal EPSCoR investment of $51.7 million has generated a non-Federal match of $156.2 million.

In 1989, the leadership within the EPSCoR states established themselves as a 501 c-3 non-profit corporation, to which most of the EPSCoR states belong. After publishing a report in April 1990, the Coalition has been successful in persuading Congress to establish EPSCoR-type programs in other Federal research funding agencies.[12]

B. Goal

The goal of EPSCoR is to (1) effect permanent improvements in the quality and capability of Academic S&E research and training; (2) to increase state and institutional support for S&E academic research and training, and (3) to improve the research

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[12] EPSCoR, "An Assessment of the Experimental Program to Stimulate Competitive Research", Coalition of EPSCoR States, April 1990.

infrastructure within the states so that science & engineering may flourish.

EPSCoR achieves its goals through a series of state-based objectives. Near term objectives are to employ national quality standards by merit review by the states in their submissions and by NSF through the peer review process; identify and reduce the barriers to quality research within the states by providing for more release time, equipment purchase, domestic & foreign travel to learn of advanced knowledge, technologies and practices, and actually support the research of Principle Investigators and targeted faculty.

The strategic objectives of EPSCoR within a participant state are: (1) to enhance state and local support for science & engineering research by increases in non-Federal match as well as the waiver of overhead by the participating institutions; (2) provide for a balance to research and teaching within the participating institutions with more release time for research or lessening the teaching loads, (3) by increasing interactions between universities and industry, and (4) by institutionalizing efforts to enhance the R&D environment so that the state, its economy, and its researchers might flourish.

C. Process

The EPSCoR process is relatively simple in scope yet complex in implementation. It begins with an initial 6 to 9 month Planning and Assessment proposal to the NSF that (1) determines barriers to competitive research within the state; (2) identifies those researchers who are not currently competitive but who, if funded, could become competitive over the terms of the grant, and (3) develops strategies which focus on the state/institutional "greatest comparative advantage(s)" for submission as research projects to be funded by the NSF. The EPSCoR planning phase stresses the "value added" concept so that the research projects selected for enhancement truly catalyze the state for change.

In establishing the initial EPSCoR committee to carry out the planning process, the NSF utilizes the "Innovator/early adaptor/early majority/late majority/laggard" concept put forth by Rogers & Shoemaker in their book titled "Communication of Innovation".[13] Through the use of a telephone survey, staff determine who the "movers & shakers" are within the academic community, the research community, and the governmental and private sectors. The more frequently a persons name is surfaced, the more likely the NSF is to place that person on the initial EPSCoR committee. If only one maxim comes out of this portion of

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[13] ROGERS, EVERT and SHOEMAKER, F. FLOYD, Communication of Innovation, Free Press, New York, 1971.

this paper, it would be that the single most important ingredient throughout the whole of EPSCoR is leadership, leadership, and more LEADERSHIP. Leadership on the part of academia; leadership on the part of government; and leadership on the part of the participating researchers. Leadership is difficult to find sometimes but the Rogers/Shoemaker curve can be applied to any region or state. David Drew, in "Strengthening Academic Science", a 1985 examination of the EPSCoR initiative, concludes that Federal and institutional leadership can convert the underutilized talent represented by many scientists in less competitive states into quality research productivity.[14]

Following the planning phase, each state submits a three to five-year implementation plan consisting of an overview of the state's EPSCoR Improvement Plan and individual research proposals in the S&E areas selected for enhancement. The Improvement Plan must describe a management plan which reflects the institutional, governmental, scientific and private sector interests in the state, and research components which embrace individual researchers or clusters of researchers targeted towards areas of research strength within the state and its institutions. The management committee selects a Project Director who is responsible for and orchestrates the state program. The research components are run by the typical Principal Investigator.

EPSCoR proposals are evaluated using a three stage review process. Each state is site visited to determine the level of commitment by the state, university(ies), researchers and the private sector, if appropriate. The site reviewers look at past achievements; rationale or relevance of the objectives; the feasibility of the objectives; the non-Federal commitment; S&E research impact; human resource development; and the management plan. Secondly, all components are processed through the traditional NSF review process where reviewers for panels or postal review are obtained from the NSF research directorates and divisions. These research reviewers utilize the traditional NSF criteria: research performance competence, intrinsic merit of the research, effect on the S&E infrastructure, and the utility or relevance of the research. Finally, a "blue ribbon" committee examines the site reviews; the research reviews; and makes funding recommendations to the program staff including: fund, fund with modifications, or do not fund.

D. Implementation

Many success stories can be found in the history of EPSCoR (see "An Assessment of the Experimental Program to Stimulate Competitive Research published by The Coalition of EPSCoR States

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[14] DREW, DAVID ELI, Strengthening Academic Science, Praeger, Westport, Conneticut, 1985.

in April 1990).[15] After site surveying six of the EPSCoR states in relative depth, and telephone surveying all EPSCoR states, Lambright and Cimitile concluded that there were basically three models of leadership active in the EPSCoR program. These are: (1) the Coalition Model, which embraces two or possibly three areas of interest such as the university administrators, industry, the state, and the researchers themselves; (2) the Director Model, which is defined by a strong individual who forces success and change; and (3) the Agency Model where a formal government agency literally takes over for EPSCoR.[16] The case, in fact is that all of the States generally fall somewhere within these classes depending on their maturity and the type of state infrastructure.

There appears to be a greater variance as you move from the very bottom ranking state to the twenty-fifth ranking state. The 19 EPSCoR states may vary depending upon whether one looks at Small Business Innovation Awards; Inc. 500 Hi Tech creations; Fortune 500 firms; or their criteria for selection, and rank as research institutions. While the EPSCoR states shift within the bottom set, they still generally remain within the bottom set. Feller, in his paper on "A Perspective on EPSCoR's Future, 1990-2000" states that EPSCoR has been a successful program for each of its participants. He then goes on to build a case that, "by choosing a no change policy, EPSCoR risks a drift into a self-contained, compartmentalized set of accomplishments...". Feller argues for (i) an expansion of activities, (ii) new opportunities for NSF's STIA Directorate, and (iii) improved articulation between EPSCoR and other NSF programs that share a common mission to foster cooperative working relationships between NSF and state governments.[17] Feller argues that NSF should place greater emphasis on EPSCoR's catalytic role and then builds to an EPSCoR/STRIDE relationship. The National Science Board has expressed concern about the prospects of American scientists being "frozen out" from scientific collaboration with Western Europe (National Science Board, "The State of U.S. Science and Engineering," February, 1990). Feller observes this unique opportunity for NSF to simultaneously achieve a foundation-wide objective while strengthening the EPSCoR program.

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15 Coalition of EPSCoR States, op cit.

16 LAMBRIGHT, W. HENRY, with the assistance of Carole Cimitile, a paper, "EPSCoR: Institutional Innovation in State Science and Technology", 1991.

17 FELLER, IRWIN, a paper presented at the Sixth Annual EPSCoR Conference (Washington D.C., 1990), "A Perspective on EPSCoR's Future, 1990-2000".

IV. STRIDE DESCRIPTION

A. Introduction

Recognition of research, innovation and technological development (RTD) by the European Single Act, as one of the Community's common policies has confirmed the essential role of RTD in promoting economic development and competitiveness, and in reinforcing economic and social cohesion. Also, in recent years, public authorities have become increasingly aware of the role to be played by RTD in regional development policies. The most advanced regions tend to tackle structural adaptation no longer by generalized aids to investment, but, in particular, by intensifying RTD activities.

However, if RTD is to be fully effective in a regional context and stimulate local economic development, many conditions must first be fulfilled. The regions must have a satisfactory standard of R&D infrastructures, qualified research personnel, technology transfer networks and genuine research skills in Universities, research institutions and of course within firms themselves. These factors are very unevenly distributed throughout the Community. Studies conducted by the European Commission show that the Community regions with the lowest RTD indicators also tend to be those that are least-favored economically. The disparities between regions as measured by RTD indicators are more than three times greater than in terms of socio-economic factors and cover a range of 12 to 1 between the best and worst cases.

These disparities are a real handicap for the harmonious development and cohesion of the Community. The less-favored regions' weaknesses in RTD are holding back the modernization process and are obstacles to the medium- and long-term adaptation of regional economies to modern needs. Although, clearly, each region need not necessarily have its own research facilities, it must at least have technology transfer structures and the skilled personnel enabling it to make use of technical progress achieved elsewhere for the benefit of its own economy.

The RTD deficits of LFRs in the Community is also the reason for their low rate of participation in Commission sponsored and other international competitive research programs. Projects are selected for inclusion in Community or transnational science and technology programs, on the criterion of excellence. The aim of such programs is to support Community industry in the face of competition from the US and Japan. This increases the efficiency of economic agents located more often in the developed regions than elsewhere. Admittedly, Community research programs have in recent years, made it possible to promote the creation of links between research centers and undertakings in the least-developed regions and their counterparts in the more prosperous ones. A number of programs also take account of the needs of the less-favored regions and SMEs in terms of services and technology; (for example, STAR (advanced telecommunications services in the regions), which is funded by the ERDF. VALUE (evaluation and dissemination of R&D results), IMPACT (development of the information services market), SPRINT (promotion of innovation and technology transfer) and BRITE (introduction of new technologies into production processes)).

Excellence, and therefore the possibility for operators in difficult regions of taking part in Community research networks and using such research as means of modernizing their industrial fabric, will be achieved by a sufficient number of operators, only if the regions concerned already have the resources for improving their science and technology infrastructures, for making a special effort in education and training, for developing cooperation with operators in more advanced regions, for national and international collaboration and for ensuring that innovations are introduced in firms, in particular SMEs. The STRIDE program should make it possible gradually to allocate to the weak regions the resources that constitute a necessary precondition for greater participation of their operators in international cooperation and networks.

By creating, in the less advanced regions, favorable conditions for utilizing the technological opportunities offered by RTD, the STRIDE programs will make a specific contribution under Article 130f of the Single European Act "to encourage (European industry) to become more competitive at international level". Greater involvement of the less-favored regions in Community research programs and other international initiatives and their integration into the Community technology dissemination networks is essential, if the long-term effectiveness of research and technology transfer is to be ensured. One of the aims of STRIDE is therefore to help from the outset to broaden, strengthen and speed up such involvement.

The lack or weakness of technology transfer bodies and the low innovative capacity of firms in such regions, also constitutes a severe handicap for modernization of the industrial fabric. It is therefore also necessary to stimulate the creation or development of a supply of high-quality services to firms by universities, research centers and technology transfer bodies, to ensure not only dissemination of the results of leading-edge research and innovation, but also and above all, the dissemination and utilization of technologies that are in widespread use in the developed regions.

These considerations explain why the Commission has recently launched on its own initiative, operational programs that help to strengthen the RTD capacities of the less-favored regions, so that they will be in a better position to face competition from both inside and outside the Community. The STRIDE initiative pursues that end through three courses of action: (1) strengthening the RTD resources of the weak regions; (2) encouraging greater participation in international and Community RTD programs; and (3) developing technology transfer services.

B. Objectives

The main aim of the STRIDE initiative is to strengthen the research, technological and innovatory (RTD) capacity of the regions whose development is lagging behind (Objective 1), so that they are better placed to attract or retain technologically advanced activities in the productive sectors of the regions and highly-qualified personnel. Consequently, most of the financial resources for STRIDE are allocated to regions that can most benefit from this course of action. STRIDE also assists regions seriously affected by industrial decline (Objective 2) by stimulating innovation in ways which encourage the diversification of the local economy.

STRIDE concentrates on three categories of measures, defined as follows:

(1) Better research capabilities in the Objective 1 regions.

(2) Participation in Community and other international research programs and networks.

(3) Promoting co-operation between research centers and industry.

In the first case STRIDE supports the creation or development of capability in a small number of fields of research, and for a small number of research centers, including universities, which are jointly agreed between the Member States involved and the European Community. Priority is given to fields of pre-competitive research which are capable of enhancing the economic potential of the region. In particular, STRIDE may finance:

- the creation and development of RTD centers, industrial research associations, contract research organizations and other institutes;

- the creation and improvement of laboratories which are an integral part of technical education and scientific establishments, or which take part in research projects or technology transfer activities, particularly in association with firms in the region; and

- the development of twinning arrangements with research institutes located outside Objective 1 regions, which can facilitate staff exchanges, access to research equipment or joint research activity.

Under the category, participation in community and other international research programs and networks STRIDE finances:

- actions to disseminate information among research centers including universities and firms about Community-assisted and other international research programs and networks;

- support for preparatory work for participation in international research cooperation, by assisting potential participants in the technical preparation necessary in drawing up proposals and by financing equipment needed to gain access to networks; and

- demonstration and pilot activities of technological applications made possible by Community-assisted and other research programs, provided that they are of significance for the regional economy in question.

STRIDE also acts to promote co-operation between research centers and industry (category 3). In Objective 1 and, to a more limited extent, in Objective 2 regions, STRIDE assists the promotion of innovation by encouraging and reinforcing RTD activities in firms. STRIDE finances the following measures:

- the setting up and operation of organizations such as consortia to foster cooperative links among education and research bodies and between them and large and small and medium-sized enterprises (SMEs);

- in Objective 1 regions only, establishing or supporting in firms expert studies, assistance for the purchase of equipment and know-how for applied research, experimental development, pilot projects and the introduction of innovation into products and processes, and research related to quality control, technology transfer and innovation services and facilities intended to serve regional development, provided that such actions are run in partnership with the productive sector. Vocational training requested by the productive sector for appropriate personnel such as technicians, engineers, researchers and experts is also supported; and

- finally, the short-term detachment for training purposes of personnel from research centers or firms located in eligible regions to research centers, firms or agencies providing services related to technology transfer or innovation in other regions of the Community or in third countries.

C. EEC Financing

The STRIDE programs are subject to joint financing by the Member States and the Community. In areas eligible for STRIDE, the total contribution during the period 1990-1993 is estimated at $450 million from Commission sources. The amount of the Community's budget contribution to individual operational programs takes into account regional differences in the distribution of RTD activities, and the quality of the operational program. The rates of assistance are decided in conformity with the regulations governing the Structural Funds and take account of the financing capacity of the national and regional authorities concerned. In evaluating the quality of the programs, the Commission takes into account, in particular, the following:

- o the presence of a coherent RTD strategy with a clear statement of the aims for regional technology development into which the aims of the operational programs under STRIDE have been properly integrated;
- o the likely development impact of the proposed measures and in particular their contribution to the achievement of the aims of the operational program, their coherence with other Community actions, and their likely impact on the productive sectors of the regional economy;
- o a demonstration of the additional character of the resources requested from the Community as well as those made available by the national and regional authorities and private sources in support of the operational program;
- o the ability to integrate with and make use of existing and planned networks within the European Community; and
- o effective mechanisms for implementation, management, monitoring and evaluation.

V. SIMILARITIES AND DIFFERENCES

STRIDE and EPSCoR share some important fundamental objectives. This may be surprising, since EPSCoR has been around for almost 12 years, whereas in Europe, STRIDE is a comparative newcomer, and in fact, is still not fully operational. (The formal evaluation procedures are currently being implemented by the Commission prior to allocation of the first tranche of funding to Member States). This slow start may suggest that Europe has been somewhat behind the U.S. in recognizing the needs of lagging regions in the RTD arena. However, having come to a recognition of these needs, Europe is preparing an investment of over $450 million in three years compared with $52 million in the

12 years of EPSCoR. Nonetheless, the complementarily of objectives is quite striking. Both STRIDE and EPSCoR aim at widening the base of science and engineering research capability. They provide opportunities for "new blood", human and institutional. New centers and groups of excellence are being established. This is particularly true in more recent years of EPSCOR, which is focusing now on establishing research clusters, sometimes incorporating researchers who are already competitive, nationally. They both recognize the importance for lagging regions of participation in international competitive research programs, as a means of overcoming scientific isolation, establishing confidence and building trust within the scientific community.

Both programs are a clear response to the demands of lagging regions themselves for remedial action by national/federal authorities. Both also allow considerable flexibility to participants to formulate programs and packages to suit their own individual circumstances and potentials. They can similarly be described as 'bottom up' in their strategic approach. Both require matching funds from state/member state governments. Both are selective in their geographical availability. In the US, only 19 States deemed to be uncompetitive in Federal programs are eligible - the EPSCOR states. In Europe, eligibility is restricted to so called Objective 1 regions i.e., those regions whose development is lagging behind and to a smaller number of Objective 2 regions - i.e., regions suffering industrial decline.

Fundamentally, both programs represent formal acknowledgement by relevant authorities of the role of research and development in local economic development. This is more apparent and more openly recognized in the case of STRIDE, where the focus is precisely on economic development compared with EPSCoR where the mandate of NSF requires the emphasis to be placed on science. It could, however, be argued, that this difference in approach does not necessarily reflect a different view about the solution to be problem of lagging regions. Rather, it is more precisely a reflection of institutional mandates of the sponsoring organizations. However, even if NSF cannot itself explicitly support science for the direct purpose of economic development, it is clear that individual EPSCOR States fully recognize this potential. EPSCoR has been used to change prevailing attitudes of State legislators on the importance of research in the economic life of the State. It has also generated an impressive array of organizational innovations at State level, especially in the emergence of structures to promote technology transfer and industrial innovation.

The differences between both programs are also striking. The most fundamental of those is the EPSCoR focus on science and basic academic research, compared to STRIDE which concentrates not on research per se, but on the capacity to undertake research on the human and infrastructural requirements, as well as on technology transfer and industrial innovation. The base of the STRIDE effort i.e., its range of eligible actions is consequently much wider than EPSCOR. STRIDE explicitly endorses the role of research in regional economic development - the basic raison d'etre for its existence, whereas EPSCoR cannot do this explicitly within its NSF mandate. STRIDE is concerned with enhancing the economic potential of regions, whereas EPSCOR is concerned with improving the competitive research capability of research institutions in the weaker states. The economic and social objectives of STRIDE are explicit.

The competitive dimension is a strong feature of EPSCoR while it is not as apparent in STRIDE. Intensive peer review at both state and Federal levels as well as stiff competition for a limited number of grants, helps to maintain the quality of EPSCoR research and the reputation of EPSCoR researchers among the established NSF research constituency. It eliminates the "pork".

STRIDE allocations, on the other hand, are made to individual member states on the basis of "flexible quotas" which are agreed in advance. Competition between member states is not as apparent as in the U.S. system, even though all proposals have to pass through an external evaluation procedure mounted by the Commission itself. Neither is the evaluation system for STRIDE based on peer review in the strictest sense. The STRIDE evaluation has a more mixed content, embracing wider social and economic issues and reflecting the wider scope of the program. It has been argued that STRIDE would benefit from a stronger competitive dimension and that it ought to look to the experience of EPSCoR in this respect.[18] Also, the allocation of funds is made to the national governments, usually via the Ministry for Finance, of each member state, rather than directly to the participating institutions, as in the case of EPSCoR.

There is a clear understanding in Europe that because of the complex and individual nature of the development process in different regions, a confluence of many RTD factors is required. Isolated RTD elements, it is understood, will not be sufficient. The STRIDE package is consequently multi-dimensional. EPSCoR, on the other hand is a one dimensional program, focusing on basic research, but in recognition of the different requirements of the individual States, allows a flexible "bottom up" approach in the formulation of proposals. The final EPSCoR package consequently represents a diverse array of actions and projects.

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[18] HIGGINS, T., Tecnomics: Cohesion Report, "Background Report on the Framework Program on Economic and Social Cohesion in the European Community", Dublin, March 1990.

The U.S. is more explicit in its acknowledgement of the existence of two levels of research performance i.e., those researchers who are already nationally competitive and those (the EPSCoR States) who, though very strong, still require special measures to bring to them to the level of competitiveness nationally. Hence, EPSCoR concentrates on the level just below national competitiveness. "Hot shots" with an established track record of success in competitive Federal programs need not apply. There is more difficulty in openly acknowledging the existence of two tiers of research capability in Europe. Any formal acknowledgement of a two-speed Europe, in research or in any other domain, might be damaging to long term integration and cohesion. In a sense, Europe is still working towards the establishment of its own "United States".

VI. POSSIBILITIES FOR A COLLABORATIVE FRAMEWORK

As recent as June 1989, the European Community, through a study of EPSCoR conducted by Dr. Tom Higgins with assistance by Dr. J. David Roessner, became interested in the EPSCoR program. [19,20] DG XII hired Tecnomics International, Ltd to study what programs the United States had to assist "less favored regions". The closest program that surfaced was the EPSCoR program, and Dr. Higgins, Director of Tecnomics, presented a paper on to DG XII and DG XVI entitled "Cohesion Report" wherein he recommended a closer examination of the EPSCoR program and its applicability to the goals of STRIDE (Science and Technology Research Innovation for Development of Europe). Six months later, Tom was visiting the National Science Foundation and five of its EPSCoR states (Kentucky, Oklahoma, Louisiana, Mississippi and Montana) over a two week period. He was joined by Dr. Hugh Logue, Senior Administrator of the STRIDE program for the first "leg" of his visit. While at NSF they presented a seminar on STRIDE and the interests began to mix. Logue returned to Europe and Higgins was joined by Dr. Jaun Caraca, Chairman of the Evaluation Committee for the STRIDE program. This visit resulted in a second report being presented to the European Communities entitled "A Review if the Impact of EPSCoR on Widening the Research Base in the U.S. Higgins saw the "EPSCoR has improved scientific cohesion within each state." However, a difference between EPSCoR and STRIDE was also noted. Higgins says "inter-state collaboration appears to be limited" and then gives the larger edge to STRIDE which requires a "twinning" of less favored regions with the stronger regions. He recommends that STRIDE/EPSCoR earmark a portion of

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[19] Ibid.

[20] ROESSNER, J. DAVID, "Federal Programs and Technology-based Regional Economic Development: The US Experience", Georgia Institute of Technology, Atlanta, October 1989.

their available funds, say 250,000 ECU on each side for a joint initiative, specifically to promote linkages and mobility between research staff, especially young talent.

As a result of the quality and depth of these reports, Dr Higgins was invited to participate in the Sixth Annual EPSCoR Conference held in Alexandria, Virginia in October of 1990. An invitation was extended by the European Community to Dr. Joseph G. Danek, Director of the Office of Experimental Programs and Bruce J. Reiss, Program Manager, to present the EPSCoR program in Brussels on November 4, 1990 to make a presentation to the First Annual STRIDE Conference held in Valencia, Spain in November, 1990.

Danek and Reiss were well received and interest in cooperative efforts abounded from most EC countries. Furthermore, the NSF people were able to hear, for the first time, the "in depth" proposals being considered by the LFR's. The NSF staff saw an opportunity here to "jump start" any collaborative efforts which might evolve from this newly established relationship. First, NSF made a small award to Dr. Jonathan Benson of the University of North Carolina - Charlotte, to research the appropriateness and applicability of establishing a S&T "Incubator" type center in the EEC for the EPSCoR States. This study will be completed by September, 1991. Secondly, NSF made an award to Dr. Irwin Feller of The Pennsylvania State University to visit Brussels and the LFR's to ascertain (through U.S./NSF eyes) what type of collaborative efforts might be realistic. Feller just recently returned from his visit to Brussels and Ireland to complete his initial tour under the award. Thirdly, NSF made an award to Dr. Tom Higgins to visit the remainder of the EPSCoR States to confirm where excellent science is going on which might be "twinnable" with the STRIDE program and participants. Both Drs. Feller and Higgins are mid-way through this process at the current time. Feller has been invited to a STRIDE conference in Braga, Portugal on May 16-17, 1991 to present his findings to date. Drs. Logue, Feller, Higgins, and Benson will present a seminar on the STRIDE/EPSCoR connection at the Seventh Annual EPSCoR Conference to be held in Portland, Maine on October 3 - 5, 1991. And Dr. Feller was invited to present a paper at the Second Annual STRIDE Conference to be held in Thessalonica, Greece in the October, 1991. The future possibilities appear outstanding for collaborative efforts, some of which are listed in our conclusions.

VII. CONCLUSIONS

Early results from work to-date indicate that collaboration between EPSCoR States and EEC is already an established reality. Collaborative activity, especially the exchange of faculty and research students has grown organically over the years, according to the interests of particular researchers. Some EPSCoR states already have a strong track record and commitment to collaboration with research institutions in the EEC, particularly in Germany, the United Kingdom, France, and Spain. Early assessments indicate a very strong interest and determination on the part of EPSCoR states to open up the windows of international collaboration with Europe. Such collaboration would benefit both sides. This is especially true in the folowing areas.

- o Access to an international pool of research personnel and information networks thereby providing new world-wide recruiting opportunities and information on world-wide trends in research.
- o Internationalization of research programs, to improve the quality of research teams, and open up inward looking faculty, and enhance excellence.
- o Improvement of the attractiveness of participating universities as locations for high quality research talent, thereby improving their international competitiveness and bringing new resources to EPSCoR states.
- o Facilitate retention of high quality faculty and enhance the educational quality of teaching programs by providing "global images" for students.
- o Overcome negative images of isolation and parochialism associated with EPSCoR states and the LFRs by demonstrating on an international stage their research capabilities, stimulating communications, forming support systems and increasing graduate student participation.
- o Provide EPSCoR states with international visibility and access to the EEC and EC leadership in Brussels.
- o Strengthen industrial recognition of the quality of research at local universities and the highlight the need for improved ties with Europe in the face of Japanese competition.

EPSCoR States are also demonstrating their interest in sharing unique local research resources with EEC researchers, such as those described below.

- o The University of Montana facilities at Flathead Lake, Montana as a facility for international environmental baseline studies.

- The University of Puerto Rico research facilities at Mayaguez for access to the biologically diverse resources of the Caribbean for marine research.

- Universities in Mississippi, Louisiana and South Carolina for wetlands research in the Mississippi river basin and the coastal plains.

- The University of Arkansas at Little Rock for collaboration in the proposed neutrino telescope - the GRANDE project.

- Access to the super-computing facilities and expertise at the University of Kentucky.

- Access to unique paleontological work on dinosaurs at Montana State University and the Museum of the Rockies.

- Access to advanced materials research facilities at Oklahoma State University.

Early results are demonstrating a strong justification for a more formal collaborative framework which would provide enhanced level of resources from both NSF and the EC to support and drive the existing valuable collaborative activity and to more fully exploit the rich potential which exists on both sides. red and better funded effort could, however, provide a "win-win" situation for the EPSCoR states, STRIDE regions, the European Commission itself, and the NSF.

EPSCoR - STRIDE
A Potential International Partnership

by

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Paper presented at the European Community Studies Association Second International Conference "The Challenge of a New European Architecture: Implications for the European Community's Internal and External Agendas". George Mason University, Fairfax, Virginia. May 22-24, 1991.

CONTENTS

I. INTRODUCTION

EPSCoR and STRIDE provide a unique opportunity for collaboration between the United states and the European Economic Community. EPSCoR - the Experimental Program to Stimulate Competitive Research - is operated by the National Science Foundation (NSF) with the aim of assisting 19 of the least competitive states in the U.S. to improve the quality and capability of their academic research endeavors such that they will become more competitive in bidding for Federal research funds. STRIDE - Science and Technology for Regional Innovation and Development in Europe - is part of the European Community's preparation for 1992 and aims to improve the research and technology (R&T) potential of lagging and less favored regions in the Community.

Both programs share a common objective - widening the base of science and engineering research capabilities in lagging or less favored regions. EPSCoR is primarily a research program, supporting basic academic research, while STRIDE supports the infrastructure for research, as well as technology transfer and industrial innovation.

The opportunities for sharing experience and information between both programs are considerable. A formal collaborative framework would add an important international dimension to both. It would provide opportunities for the EPSCoR states and the STRIDE regions to share information; to access, on an international basis, faculty, student and post graduate research personnel; to enrich the quality of research activity; to enhance the attractiveness of EPSCoR States and STRIDE Regions as research locations; to develop international reputations for research staff; to improve the quality of human resources; and generally to reduce the scientific isolation which tends to be a major problem for these regions and states.

The "equivalence" of interests, problems, capabilities and levels of development which the regions of both STRIDE and EPSCoR share, is a strong indicator of the potential for positive and productive collaboration; for a collaboration founded on shared problems and equality of inputs. There are already many practical examples of collaboration between research personnel in the U.S. and the EEC, which have developed organically over the years. A more structured and better funded effort could, however, provide a "win-win" situation for both the EPSCoR states and STRIDE regions, the European Commission itself and the NSF.

This paper outlines the origins and aims of both programs and describes work in progress to-date to establish a collaborative framework for STRIDE and EPSCoR cooperation.

II. U.S.- EEC PERSPECTIVES

The U.S. and EEC have similar perspectives on research, technology and regional economic development. The role of research and technology development (RTD) in fuelling economic growth and modernization is not disputed, even if the process by which this takes place is complex, and precise quantification remains elusive. The studies of both scientists and economists all point to the simple reality that strong economies are based on research and technology.

Research and technology development (RTD) describes a complex of activities related to the generation, acquisition, transfer and use of technology. It includes research, development, demonstration, technology transfer and technical innovation. It covers the spectrum of knowledge generation, transfer and application. In practice RTD intensive states and regions are innovative, produce more new products, have higher levels of productivity, expand their employment base more rapidly and ultimately are more competitive than traditional and low technology regions. For these reasons the strong sectors, industries, regions and states in Europe and the U.S. continue to invest heavily in RTD.

It is also now understood that strong national economies are based on strong local economies. It is also agreed that the regional economy, no less than the national or international economy, needs a continuous process of technical change and innovation. The economic performance of a region or a state is therefore a reflection of whether its enterprises are technologically innovative and dynamically growing or technologically backward and declining.

Economic performance in Europe and in the U.S. in recent times indicates two separate trends which have become increasingly evident. A number of the developed and developing economies and regions have improved their growth prospects, while nearly all the less and especially the least developed states and regions face depressed investment and falling living standards. Control of new technology and industrial innovation are now generally acknowledged as key variables underlying these divergent trends. The developed and developing economies are able to exploit technology to improve the competitiveness of their industry, while the least developed regions possess neither the technological resources nor the industrial structure to exploit technology-based growth.

Advanced economic activity is now considered to have a high propensity to concentrate in the leading regions. Both, the arguments and the evidence in favor of this view are formidable. The core of the case is that economic growth in leading regions has a significant self-sustaining element. There are many reasons for this. They include economies of scale and of agglomeration, factors related to the specialization of labor, to external economies created by innovation and the development of skills, as well as to the emergence of the strategic technologies.[1] Weaker regions, on the other hand, may find themselves in a cycle of decline.[2] The result may be a cumulative divergence of regional economies and incomes.

Recent economic studies point to the establishment of a process of cumulative causation, which is producing a self-sustaining growth process in certain regions. Disparities, instead of being self-adjusting, appear to be self-reinforcing. Current work in Europe has also provided evidence of a remarkable concentration of both industrial research and manufacturing innovations in the core regions.[3,4] The evidence in Europe is that firms in the periphery undertake significantly less innovation than those in the central regions.[5] There are, therefore, considerable forces favoring the concentration of advanced technological and innovative activity. Regional imbalances may tend, as a result, to become self-reinforcing, particularly in high growth industries and in the advanced technology sectors.

If one compares the ten weakest with the ten strongest regions in the European Community as a whole, the disparity in incomes is a ratio of 1:3. Up to 1970, disparities in income per head actually narrowed, but since the onset of recession in 1973, there has been divergence rather than convergence. Regional disparities in income in the European Community are at least twice as wide as in the U.S. Social disparities, which include standards of living and working conditions, employment, social security, education and training are also evident. For example, regional differences in unemployment are almost three times as wide in the Community, as in the U.S.

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1 Ireland and the European Community: Performance, prospects and strategy. National Economic and Social Council (NESC). August 1989.

2 KALDOR, N. The case for regional policies. Scottish Journal of Political Economy, Vol. 17, 1970.

3 HIGGINS, T., MAGUIRE, C., NIELSEN, S., STRIDE. Science and Technology for Regional Innovation and Development in EUROPE. Commission of the European Communities., November 1987.

4 GODDARD, J.,CHARLES, D., HOWELL, S. J., THWAITES, A., Research and technology development in the less favored regions of the Community (STRIDE). Commission of the European Community. 1987.

5 OAKEY, R. P., THWAITES, A. T., NASH, P. A., The Regional distribution of innovative manufacturing establishments in Britain. Regional Studies. Volume 14, 1979.

The concept of a "multi-speed" Europe, could become the unwanted reality, threatening European integration and cohesion. The technological disparities in the Community are also substantial. The most disadvantaged, technologically, are Greece, Portugal, Southern Italy, Spain, Ireland and Northern Ireland. Between them, they account for almost 40% of the population of the Community, but they control only 10% of the technology.[6] On the other hand three-quarters of the European Community's R&D is accounted for by the three strongest member states.

Germany, for example, can invest 2.8% of GDP on R&D. Greece, at the other end of the scale, manages only a meager 0.35%. Of the one million people involved in R&D in the Community, 36% are accounted for by Germany alone. Greece, by contrast, accounts for 0.4%. The less favored regions (LFRs) of the Community together account for only 14%. The economic gap of the LFRs, so long formally recognized in Community policies through its regional and other structural instruments, is a factor of 3 to 10 times smaller than the technology gap for these countries.

The scale of the technology gap in Europe is estimated at $7 billion per annum. This indicates the level of additional annual investment which less favored member states in Europe would require in R&D to reach average Community levels.[7] Almost all the factors which drive technological development, also appear to favor the core regions communications, infrastructure, access to skills and markets, institutional resources, information and services and many others.

More subtle structural changes are also occurring, stimulated by technology-based innovation. The economic distance between countries is narrowing, while interdependence between a range of economic actors, producers, investors and consumers, is rapidly increasing. Opportunities for specialization and international trade are increasingly influencing overall economic performance. Technology therefore is providing major economic opportunities for those with the capacity to use it. On the other hand, the lack of such capability is a major obstacle to development for those most in need of it.

During recent decades there have been a number of developments which make it necessary to seek new concepts of

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6 HIGGINS, T., et al., op cit.

7 HIGGINS, T., et al., op cit.

knowledge generation, transfer and innovation.[8] The earlier linear paradigms are being replaced by more flexible and interactive processes. These are faster moving, multi-disciplinary, more costly and the effects are spilling over outside the industrial sector into agriculture, health care and commercial services. Internationalization has become more vital and more pervasive. Horizontal and inter-sectoral linkages are increasing. The institutional roles and relations of those involved in knowledge generation and transfer are changing. The university world wide, for example, is becoming more development oriented. New consortia, alliances and networks, national and global, are emerging for technology transfer. Participation in these "smart" international networks is vital, both for science and the economy.

The new dynamics of these processes, even if not fully understood, are well appreciated. This awareness is leading to increased in R&D, education and training and to a higher profile for science and technology in economic and industrial development in all countries and regions. As a consequence new policies are emerging, geared towards the creation of new local techno-economic combinations and paradigms to stimulate endogenous, self sustaining technology based economic growth, especially in the less developed regions. Faced, in Europe, with the failure of conventional regional development mechanisms, national governments and international agencies are increasingly looking to technology policy, as a strategic variable in regional development and as a means of reducing the deficits in economic performance and income between the developed and lagging regions.

III. EPSCOR DESCRIPTION

A. Introduction

The National Science Foundation (NSF), an independent Federal agency, operates under the National Science Foundation Act of 1950, as amended. Section 3-a authorizes the Foundation to "initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels in the mathematical, physical, medical, biological, social and other sciences......"[9] . Section 3-e clarify's section 3 by stating that NSF should strengthen Science and Engineering (S&E) research and education throughout the

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[8] ZEGVELD, W., Technology, Globalisation and Competitiveness. Paper presented at the International Symposium "Towards Techno Globalism". Tokyo, 6-9 March 1990.

[9] NATIONAL SCIENCE FOUNDATION, Statutory Authority, February 1989, as amended. Section 3.(a).

nation but "avoid undue concentration of such research and education."[10]

The Foundation's Directorate for Scientific, Technological, and International Affairs (STIA) administers programs designed to: encourage small business science and technological innovations, promote international scientific cooperation, provide information for public policy formulation, and stimulate competitive research. The STIA Office of Experimental Programs to Stimulate Competitive Research is responsible for the latter. Its mission is to develop the scientific and technological (S&T) capacity of less competitive states that possess high quality science and engineering (S&E) talent; the capability to effect significant improvements in their research infrastructure; and the will to increase support of S&T as an investment in their economic well-being.

The Office carries out its mission through the Experimental Program to Stimulate Competitive Research (EPSCoR), a merit-based program initiated in 1979 as a means to assist less competitive states meet the challenge of increased competition for federal R&D funds. EPSCoR brings the states's academic research endeavors to nationally competitive levels by enhancing selected areas of academic research and by stimulating local action to effect lasting improvements in a state's S&T infrastructure (i.e., research, education, and technology).

Throughout the period 1979 to the present, eligibility for EPSCoR grant competitions has been restricted to those states receiving a lesser amount of NSF scientific research project support. This amount, initially set at one million dollars per year in 1980, has increased over the decade to the current limit of approximately five million dollars per year. Qualifying states are ranked ordered on both their federal and NSF academic research obligations in three categories: (1) total obligations; (2) total obligations per academic scientist and engineer; and (3) total obligations per capita.[11] A final rank is assigned to each state based upon the sum-of-ranks for the six indicators and the NSF invites the lowest ranking states to participate in EPSCoR.

The 1980 competition embraced seven states (Arkansas, Maine, Montana, North Dakota, South Carolina, South Dakota, and West Virginia): five, 5-year awards were made at a level of about $600,000 per year for a total of up to $3.0 million. The 1980 program with five states was so successful (North Dakota and

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[10] Ibid, (e), pg. 4.

[11] ANDERSON, RICHARD J., paper, EPSCoR: Building Science & Technology Capacity", 1991.

South Dakota had lost) that the Congress requested the NSF to solicit another round of competition among the states. In 1985 a second round of EPSCoR competition included the States of Alabama, Idaho, Kentucky, Louisiana, Mississippi, Nevada, North Dakota, Oklahoma, South Dakota, Vermont, Wyoming and the Commonwealth of Puerto Rico. Of these twelve jurisdictions, eight 5-year awards were made for a total of $3.0 million each.

Erich Bloch, then Director of the NSF, was concerned that the EPSCoR competition had so stimulated state political interest that he directed the EPSCoR staff to inform the non-awardee states of Idaho, Louisiana, Mississippi, and South Dakota, that if they would implement all or part of their EPSCoR plans over the following two years, the NSF would accept new 3-year implementation proposals for up to $1.8 million from each state. During the period 1988-present EPSCoR embraced all 16 States and the Commonwealth of Puerto Rico.

In 1989 Congress again directed the NSF to permit the prior competing states with the opportunity to compete for five additional years of EPSCoR support. In 1991 at the direction of Congress, NSF added two more states (Kansas and Nebraska) to the EPSCoR initiative bringing the total number of participants to eighteen states and the Commonwealth of Puerto Rico.

Non-Federal matching funds have played an important role in the success of EPSCoR. Initially the states were to match 10% of the EPSCoR grant funds the first year, 20% the second year et. seq. up to a total 50% match in the fifth year. This process produced a net match of about 1:1 between NSF and non-federal funds. In Round II, while unstated by NSF, competition among the states produced a 3:1 non-Federal match. Since its existence the Federal EPSCoR investment of $51.7 million has generated a non-Federal match of $156.2 million.

In 1989, the leadership within the EPSCoR states established themselves as a 501 c-3 non-profit corporation, to which most of the EPSCoR states belong. After publishing a report in April 1990, the Coalition has been successful in persuading Congress to establish EPSCoR-type programs in other Federal research funding agencies.[12]

B. Goal

The goal of EPSCoR is to (1) effect permanent improvements in the quality and capability of Academic S&E research and training; (2) to increase state and institutional support for S&E academic research and training, and (3) to improve the research

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[12] EPSCoR, "An Assessment of the Experimental Program to Stimulate Competitive Research", Coalition of EPSCoR States, April 1990.

infrastructure within the states so that science & engineering may flourish.

EPSCoR achieves its goals through a series of state-based objectives. Near term objectives are to employ national quality standards by merit review by the states in their submissions and by NSF through the peer review process; identify and reduce the barriers to quality research within the states by providing for more release time, equipment purchase, domestic & foreign travel to learn of advanced knowledge, technologies and practices, and actually support the research of Principle Investigators and targeted faculty.

The strategic objectives of EPSCoR within a participant state are: (1) to enhance state and local support for science & engineering research by increases in non-Federal match as well as the waiver of overhead by the participating institutions; (2) provide for a balance to research and teaching within the participating institutions with more release time for research or lessening the teaching loads, (3) by increasing interactions between universities and industry, and (4) by institutionalizing efforts to enhance the R&D environment so that the state, its economy, and its researchers might flourish.

C. Process

The EPSCoR process is relatively simple in scope yet complex in implementation. It begins with an initial 6 to 9 month Planning and Assessment proposal to the NSF that (1) determines barriers to competitive research within the state; (2) identifies those researchers who are not currently competitive but who, if funded, could become competitive over the terms of the grant, and (3) develops strategies which focus on the state/institutional "greatest comparative advantage(s)" for submission as research projects to be funded by the NSF. The EPSCoR planning phase stresses the "value added" concept so that the research projects selected for enhancement truly catalyze the state for change.

In establishing the initial EPSCoR committee to carry out the planning process, the NSF utilizes the "Innovator/early adaptor/early majority/late majority/laggard" concept put forth by Rogers & Shoemaker in their book titled "Communication of Innovation".[13] Through the use of a telephone survey, staff determine who the "movers & shakers" are within the academic community, the research community, and the governmental and private sectors. The more frequently a persons name is surfaced, the more likely the NSF is to place that person on the initial EPSCoR committee. If only one maxim comes out of this portion of

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[13] ROGERS, EVERT and SHOEMAKER, F. FLOYD, Communication of Innovation, Free Press, New York, 1971.

this paper, it would be that the single most important ingredient throughout the whole of EPSCoR is leadership, leadership, and more LEADERSHIP. Leadership on the part of academia; leadership on the part of government; and leadership on the part of the participating researchers. Leadership is difficult to find sometimes but the Rogers/Shoemaker curve can be applied to any region or state. David Drew, in "Strengthening Academic Science", a 1985 examination of the EPSCoR initiative, concludes that Federal and institutional leadership can convert the underutilized talent represented by many scientists in less competitive states into quality research productivity.[14]

Following the planning phase, each state submits a three to five-year implementation plan consisting of an overview of the state's EPSCoR Improvement Plan and individual research proposals in the S&E areas selected for enhancement. The Improvement Plan must describe a management plan which reflects the institutional, governmental, scientific and private sector interests in the state, and research components which embrace individual researchers or clusters of researchers targeted towards areas of research strength within the state and its institutions. The management committee selects a Project Director who is responsible for and orchestrates the state program. The research components are run by the typical Principal Investigator.

EPSCoR proposals are evaluated using a three stage review process. Each state is site visited to determine the level of commitment by the state, university(ies), researchers and the private sector, if appropriate. The site reviewers look at past achievements; rationale or relevance of the objectives; the feasibility of the objectives; the non-Federal commitment; S&E research impact; human resource development; and the management plan. Secondly, all components are processed through the traditional NSF review process where reviewers for panels or postal review are obtained from the NSF research directorates and divisions. These research reviewers utilize the traditional NSF criteria: research performance competence, intrinsic merit of the research, effect on the S&E infrastructure, and the utility or relevance of the research. Finally, a "blue ribbon" committee examines the site reviews; the research reviews; and makes funding recommendations to the program staff including: fund, fund with modifications, or do not fund.

D. Implementation

Many success stories can be found in the history of EPSCoR (see "An Assessment of the Experimental Program to Stimulate Competitive Research published by The Coalition of EPSCoR States

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[14] DREW, DAVID ELI, Strengthening Academic Science, Praeger, Westport, Conneticut, 1985.

in April 1990).[15] After site surveying six of the EPSCoR states in relative depth, and telephone surveying all EPSCoR states, Lambright and Cimitile concluded that there were basically three models of leadership active in the EPSCoR program. These are: (1) the Coalition Model, which embraces two or possibly three areas of interest such as the university administrators, industry, the state, and the researchers themselves; (2) the Director Model, which is defined by a strong individual who forces success and change; and (3) the Agency Model where a formal government agency literally takes over for EPSCoR.[16] The case, in fact is that all of the States generally fall somewhere within these classes depending on their maturity and the type of state infrastructure.

There appears to be a greater variance as you move from the very bottom ranking state to the twenty-fifth ranking state. The 19 EPSCoR states may vary depending upon whether one looks at Small Business Innovation Awards; Inc. 500 Hi Tech creations; Fortune 500 firms; or their criteria for selection, and rank as research institutions. While the EPSCoR states shift within the bottom set, they still generally remain within the bottom set. Feller, in his paper on "A Perspective on EPSCoR's Future, 1990-2000" states that EPSCoR has been a successful program for each of its participants. He then goes on to build a case that, "by choosing a no change policy, EPSCoR risks a drift into a self-contained, compartmentalized set of accomplishments...". Feller argues for (i) an expansion of activities, (ii) new opportunities for NSF's STIA Directorate, and (iii) improved articulation between EPSCoR and other NSF programs that share a common mission to foster cooperative working relationships between NSF and state governments.[17] Feller argues that NSF should place greater emphasis on EPSCoR's catalytic role and then builds to an EPSCoR/STRIDE relationship. The National Science Board has expressed concern about the prospects of American scientists being "frozen out" from scientific collaboration with Western Europe (National Science Board, "The State of U.S. Science and Engineering," February, 1990). Feller observes this unique opportunity for NSF to simultaneously achieve a foundation-wide objective while strengthening the EPSCoR program.

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[15] Coalition of EPSCoR States, op cit.

[16] LAMBRIGHT, W. HENRY, with the assistance of Carole Cimitile, a paper, "EPSCoR: Institutional Innovation in State Science and Technology", 1991.

[17] FELLER, IRWIN, a paper presented at the Sixth Annual EPSCoR Conference (Washington D.C., 1990), "A Perspective on EPSCoR's Future, 1990-2000".

IV. STRIDE DESCRIPTION

A. Introduction

Recognition of research, innovation and technological development (RTD) by the European Single Act, as one of the Community's common policies has confirmed the essential role of RTD in promoting economic development and competitiveness, and in reinforcing economic and social cohesion. Also, in recent years, public authorities have become increasingly aware of the role to be played by RTD in regional development policies. The most advanced regions tend to tackle structural adaptation no longer by generalized aids to investment, but, in particular, by intensifying RTD activities.

However, if RTD is to be fully effective in a regional context and stimulate local economic development, many conditions must first be fulfilled. The regions must have a satisfactory standard of R&D infrastructures, qualified research personnel, technology transfer networks and genuine research skills in Universities, research institutions and of course within firms themselves. These factors are very unevenly distributed throughout the Community. Studies conducted by the European Commission show that the Community regions with the lowest RTD indicators also tend to be those that are least-favored economically. The disparities between regions as measured by RTD indicators are more than three times greater than in terms of socio-economic factors and cover a range of 12 to 1 between the best and worst cases.

These disparities are a real handicap for the harmonious development and cohesion of the Community. The less-favored regions' weaknesses in RTD are holding back the modernization process and are obstacles to the medium- and long-term adaptation of regional economies to modern needs. Although, clearly, each region need not necessarily have its own research facilities, it must at least have technology transfer structures and the skilled personnel enabling it to make use of technical progress achieved elsewhere for the benefit of its own economy.

The RTD deficits of LFRs in the Community is also the reason for their low rate of participation in Commission sponsored and other international competitive research programs. Projects are selected for inclusion in Community or transnational science and technology programs, on the criterion of excellence. The aim of such programs is to support Community industry in the face of competition from the US and Japan. This increases the efficiency of economic agents located more often in the developed regions than elsewhere. Admittedly, Community research programs have in recent years, made it possible to promote the creation of links between research centers and undertakings in the least-developed regions and their counterparts in the more prosperous ones. A number of programs also take account of the needs of the less-favored regions and SMEs in terms of services and technology; (for example, STAR (advanced telecommunications services in the regions), which is funded by the ERDF. VALUE (evaluation and dissemination of R&D results), IMPACT (development of the information services market), SPRINT (promotion of innovation and technology transfer) and BRITE (introduction of new technologies into production processes)).

Excellence, and therefore the possibility for operators in difficult regions of taking part in Community research networks and using such research as means of modernizing their industrial fabric, will be achieved by a sufficient number of operators, only if the regions concerned already have the resources for improving their science and technology infrastructures, for making a special effort in education and training, for developing cooperation with operators in more advanced regions, for national and international collaboration and for ensuring that innovations are introduced in firms, in particular SMEs. The STRIDE program should make it possible gradually to allocate to the weak regions the resources that constitute a necessary precondition for greater participation of their operators in international cooperation and networks.

By creating, in the less advanced regions, favorable conditions for utilizing the technological opportunities offered by RTD, the STRIDE programs will make a specific contribution under Article 130f of the Single European Act "to encourage (European industry) to become more competitive at international level". Greater involvement of the less-favored regions in Community research programs and other international initiatives and their integration into the Community technology dissemination networks is essential, if the long-term effectiveness of research and technology transfer is to be ensured. One of the aims of STRIDE is therefore to help from the outset to broaden, strengthen and speed up such involvement.

The lack or weakness of technology transfer bodies and the low innovative capacity of firms in such regions, also constitutes a severe handicap for modernization of the industrial fabric. It is therefore also necessary to stimulate the creation or development of a supply of high-quality services to firms by universities, research centers and technology transfer bodies, to ensure not only dissemination of the results of leading-edge research and innovation, but also and above all, the dissemination and utilization of technologies that are in widespread use in the developed regions.

These considerations explain why the Commission has recently launched on its own initiative, operational programs that help to strengthen the RTD capacities of the less-favored regions, so that they will be in a better position to face competition from both inside and outside the Community. The STRIDE initiative pursues that end through three courses of action: (1) strengthening the RTD resources of the weak regions; (2) encouraging greater participation in international and Community RTD programs; and (3) developing technology transfer services.

B. Objectives

The main aim of the STRIDE initiative is to strengthen the research, technological and innovatory (RTD) capacity of the regions whose development is lagging behind (Objective 1), so that they are better placed to attract or retain technologically advanced activities in the productive sectors of the regions and highly-qualified personnel. Consequently, most of the financial resources for STRIDE are allocated to regions that can most benefit from this course of action. STRIDE also assists regions seriously affected by industrial decline (Objective 2) by stimulating innovation in ways which encourage the diversification of the local economy.

STRIDE concentrates on three categories of measures, defined as follows:

(1) Better research capabilities in the Objective 1 regions.

(2) Participation in Community and other international research programs and networks.

(3) Promoting co-operation between research centers and industry.

In the first case STRIDE supports the creation or development of capability in a small number of fields of research, and for a small number of research centers, including universities, which are jointly agreed between the Member States involved and the European Community. Priority is given to fields of pre-competitive research which are capable of enhancing the economic potential of the region. In particular, STRIDE may finance:

- the creation and development of RTD centers, industrial research associations, contract research organizations and other institutes;

- the creation and improvement of laboratories which are an integral part of technical education and scientific establishments, or which take part in research projects or technology transfer activities, particularly in association with firms in the region; and

- the development of twinning arrangements with research institutes located outside Objective 1 regions, which can facilitate staff exchanges, access to research equipment or joint research activity.

Under the category, participation in community and other international research programs and networks STRIDE finances:

- o actions to disseminate information among research centers including universities and firms about Community-assisted and other international research programs and networks;

- o support for preparatory work for participation in international research cooperation, by assisting potential participants in the technical preparation necessary in drawing up proposals and by financing equipment needed to gain access to networks; and

- o demonstration and pilot activities of technological applications made possible by Community-assisted and other research programs, provided that they are of significance for the regional economy in question.

STRIDE also acts to promote co-operation between research centers and industry (category 3). In Objective 1 and, to a more limited extent, in Objective 2 regions, STRIDE assists the promotion of innovation by encouraging and reinforcing RTD activities in firms. STRIDE finances the following measures:

- o the setting up and operation of organizations such as consortia to foster cooperative links among education and research bodies and between them and large and small and medium-sized enterprises (SMEs);

- o in Objective 1 regions only, establishing or supporting in firms expert studies, assistance for the purchase of equipment and know-how for applied research, experimental development, pilot projects and the introduction of innovation into products and processes, and research related to quality control, technology transfer and innovation services and facilities intended to serve regional development, provided that such actions are run in partnership with the productive sector. Vocational training requested by the productive sector for appropriate personnel such as technicians, engineers, researchers and experts is also supported; and

- o finally, the short-term detachment for training purposes of personnel from research centers or firms located in eligible regions to research centers, firms or agencies providing services related to technology transfer or innovation in other regions of the Community or in third countries.

C. EEC Financing

The STRIDE programs are subject to joint financing by the Member States and the Community. In areas eligible for STRIDE, the total contribution during the period 1990-1993 is estimated at $450 million from Commission sources. The amount of the Community's budget contribution to individual operational programs takes into account regional differences in the distribution of RTD activities, and the quality of the operational program. The rates of assistance are decided in conformity with the regulations governing the Structural Funds and take account of the financing capacity of the national and regional authorities concerned. In evaluating the quality of the programs, the Commission takes into account, in particular, the following:

- the presence of a coherent RTD strategy with a clear statement of the aims for regional technology development into which the aims of the operational programs under STRIDE have been properly integrated;
- the likely development impact of the proposed measures and in particular their contribution to the achievement of the aims of the operational program, their coherence with other Community actions, and their likely impact on the productive sectors of the regional economy;
- a demonstration of the additional character of the resources requested from the Community as well as those made available by the national and regional authorities and private sources in support of the operational program;
- the ability to integrate with and make use of existing and planned networks within the European Community; and
- effective mechanisms for implementation, management, monitoring and evaluation.

V. SIMILARITIES AND DIFFERENCES

STRIDE and EPSCoR share some important fundamental objectives. This may be surprising, since EPSCoR has been around for almost 12 years, whereas in Europe, STRIDE is a comparative newcomer, and in fact, is still not fully operational. (The formal evaluation procedures are currently being implemented by the Commission prior to allocation of the first tranche of funding to Member States). This slow start may suggest that Europe has been somewhat behind the U.S. in recognizing the needs of lagging regions in the RTD arena. However, having come to a recognition of these needs, Europe is preparing an investment of over $450 million in three years compared with $52 million in the

12 years of EPSCoR. Nonetheless, the complementarily of objectives is quite striking. Both STRIDE and EPSCoR aim at widening the base of science and engineering research capability. They provide opportunities for "new blood", human and institutional. New centers and groups of excellence are being established. This is particularly true in more recent years of EPSCOR, which is focusing now on establishing research clusters, sometimes incorporating researchers who are already competitive, nationally. They both recognize the importance for lagging regions of participation in international competitive research programs, as a means of overcoming scientific isolation, establishing confidence and building trust within the scientific community.

Both programs are a clear response to the demands of lagging regions themselves for remedial action by national/federal authorities. Both also allow considerable flexibility to participants to formulate programs and packages to suit their own individual circumstances and potentials. They can similarly be described as 'bottom up' in their strategic approach. Both require matching funds from state/member state governments. Both are selective in their geographical availability. In the US, only 19 States deemed to be uncompetitive in Federal programs are eligible - the EPSCOR states. In Europe, eligibility is restricted to so called Objective 1 regions i.e., those regions whose development is lagging behind and to a smaller number of Objective 2 regions - i.e., regions suffering industrial decline.

Fundamentally, both programs represent formal acknowledgement by relevant authorities of the role of research and development in local economic development. This is more apparent and more openly recognized in the case of STRIDE, where the focus is precisely on economic development compared with EPSCoR where the mandate of NSF requires the emphasis to be placed on science. It could, however, be argued, that this difference in approach does not necessarily reflect a different view about the solution to be problem of lagging regions. Rather, it is more precisely a reflection of institutional mandates of the sponsoring organizations. However, even if NSF cannot itself explicitly support science for the direct purpose of economic development, it is clear that individual EPSCOR States fully recognize this potential. EPSCoR has been used to change prevailing attitudes of State legislators on the importance of research in the economic life of the State. It has also generated an impressive array of organizational innovations at State level, especially in the emergence of structures to promote technology transfer and industrial innovation.

The differences between both programs are also striking. The most fundamental of those is the EPSCoR focus on science and basic academic research, compared to STRIDE which concentrates not on research per se, but on the capacity to undertake research on the human and infrastructural requirements, as well as on technology transfer and industrial innovation. The base of the STRIDE effort i.e., its range of eligible actions is consequently much wider than EPSCOR. STRIDE explicitly endorses the role of research in regional economic development - the basic raison d'etre for its existence, whereas EPSCoR cannot do this explicitly within its NSF mandate. STRIDE is concerned with enhancing the economic potential of regions, whereas EPSCOR is concerned with improving the competitive research capability of research institutions in the weaker states. The economic and social objectives of STRIDE are explicit.

The competitive dimension is a strong feature of EPSCoR while it is not as apparent in STRIDE. Intensive peer review at both state and Federal levels as well as stiff competition for a limited number of grants, helps to maintain the quality of EPSCoR research and the reputation of EPSCoR researchers among the established NSF research constituency. It eliminates the "pork".

STRIDE allocations, on the other hand, are made to individual member states on the basis of "flexible quotas" which are agreed in advance. Competition between member states is not as apparent as in the U.S. system, even though all proposals have to pass through an external evaluation procedure mounted by the Commission itself. Neither is the evaluation system for STRIDE based on peer review in the strictest sense. The STRIDE evaluation has a more mixed content, embracing wider social and economic issues and reflecting the wider scope of the program. It has been argued that STRIDE would benefit from a stronger competitive dimension and that it ought to look to the experience of EPSCoR in this respect.[18] Also, the allocation of funds is made to the national governments, usually via the Ministry for Finance, of each member state, rather than directly to the participating institutions, as in the case of EPSCoR.

There is a clear understanding in Europe that because of the complex and individual nature of the development process in different regions, a confluence of many RTD factors is required. Isolated RTD elements, it is understood, will not be sufficient. The STRIDE package is consequently multi-dimensional. EPSCoR, on the other hand is a one dimensional program, focusing on basic research, but in recognition of the different requirements of the individual States, allows a flexible "bottom up" approach in the formulation of proposals. The final EPSCoR package consequently represents a diverse array of actions and projects.

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[18] HIGGINS, T., Tecnomics: Cohesion Report, "Background Report on the Framework Program on Economic and Social Cohesion in the European Community", Dublin, March 1990.

The U.S. is more explicit in its acknowledgement of the existence of two levels of research performance i.e., those researchers who are already nationally competitive and those (the EPSCoR States) who, though very strong, still require special measures to bring to them to the level of competitiveness nationally. Hence, EPSCoR concentrates on the level just below national competitiveness. "Hot shots" with an established track record of success in competitive Federal programs need not apply. There is more difficulty in openly acknowledging the existence of two tiers of research capability in Europe. Any formal acknowledgement of a two-speed Europe, in research or in any other domain, might be damaging to long term integration and cohesion. In a sense, Europe is still working towards the establishment of its own "United States".

VI. POSSIBILITIES FOR A COLLABORATIVE FRAMEWORK

As recent as June 1989, the European Community, through a study of EPSCoR conducted by Dr. Tom Higgins with assistance by Dr. J. David Roessner, became interested in the EPSCoR program. [19,20] DG XII hired Tecnomics International, Ltd to study what programs the United States had to assist "less favored regions". The closest program that surfaced was the EPSCoR program, and Dr. Higgins, Director of Tecnomics, presented a paper on to DG XII and DG XVI entitled "Cohesion Report" wherein he recommended a closer examination of the EPSCoR program and its applicability to the goals of STRIDE (Science and Technology Research Innovation for Development of Europe). Six months later, Tom was visiting the National Science Foundation and five of its EPSCoR states (Kentucky, Oklahoma, Louisiana, Mississippi and Montana) over a two week period. He was joined by Dr. Hugh Logue, Senior Administrator of the STRIDE program for the first "leg" of his visit. While at NSF they presented a seminar on STRIDE and the interests began to mix. Logue returned to Europe and Higgins was joined by Dr. Jaun Caraca, Chairman of the Evaluation Committee for the STRIDE program. This visit resulted in a second report being presented to the European Communities entitled "A Review if the Impact of EPSCoR on Widening the Research Base in the U.S. Higgins saw the "EPSCoR has improved scientific cohesion within each state." However, a difference between EPSCoR and STRIDE was also noted. Higgins says "inter-state collaboration appears to be limited" and then gives the larger edge to STRIDE which requires a "twinning" of less favored regions with the stronger regions. He recommends that STRIDE/EPSCoR earmark a portion of

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[19] Ibid.

[20] ROESSNER, J. DAVID, "Federal Programs and Technology-based Regional Economic Development: The US Experience", Georgia Institute of Technology, Atlanta, October 1989.

their available funds, say 250,000 ECU on each side for a joint initiative, specifically to promote linkages and mobility between research staff, especially young talent.

As a result of the quality and depth of these reports, Dr Higgins was invited to participate in the Sixth Annual EPSCoR Conference held in Alexandria, Virginia in October of 1990. An invitation was extended by the European Community to Dr. Joseph G. Danek, Director of the Office of Experimental Programs and Bruce J. Reiss, Program Manager, to present the EPSCoR program in Brussels on November 4, 1990 to make a presentation to the First Annual STRIDE Conference held in Valencia, Spain in November, 1990.

Danek and Reiss were well received and interest in cooperative efforts abounded from most EC countries. Furthermore, the NSF people were able to hear, for the first time, the "in depth" proposals being considered by the LFR's. The NSF staff saw an opportunity here to "jump start" any collaborative efforts which might evolve from this newly established relationship. First, NSF made a small award to Dr. Jonathan Benson of the University of North Carolina - Charlotte, to research the appropriateness and applicability of establishing a S&T "Incubator" type center in the EEC for the EPSCoR States. This study will be completed by September, 1991. Secondly, NSF made an award to Dr. Irwin Feller of The Pennsylvania State University to visit Brussels and the LFR's to ascertain (through U.S./NSF eyes) what type of collaborative efforts might be realistic. Feller just recently returned from his visit to Brussels and Ireland to complete his initial tour under the award. Thirdly, NSF made an award to Dr. Tom Higgins to visit the remainder of the EPSCoR States to confirm where excellent science is going on which might be "twinnable" with the STRIDE program and participants. Both Drs. Feller and Higgins are mid-way through this process at the current time. Feller has been invited to a STRIDE conference in Braga, Portugal on May 16-17, 1991 to present his findings to date. Drs. Logue, Feller, Higgins, and Benson will present a seminar on the STRIDE/EPSCoR connection at the Seventh Annual EPSCoR Conference to be held in Portland, Maine on October 3 - 5, 1991. And Dr. Feller was invited to present a paper at the Second Annual STRIDE Conference to be held in Thessalonica, Greece in the October, 1991. The future possibilities appear outstanding for collaborative efforts, some of which are listed in our conclusions.

VII. CONCLUSIONS

Early results from work to-date indicate that collaboration between EPSCoR States and EEC is already an established reality. Collaborative activity, especially the exchange of faculty and research students has grown organically over the years, according to the interests of particular researchers. Some EPSCoR states already have a strong track record and commitment to collaboration with research institutions in the EEC, particularly in Germany, the United Kingdom, France, and Spain. Early assessments indicate a very strong interest and determination on the part of EPSCoR states to open up the windows of international collaboration with Europe. Such collaboration would benefit both sides. This is especially true in the folowing areas.

- o Access to an international pool of research personnel and information networks thereby providing new world-wide recruiting opportunities and information on world-wide trends in research.

- o Internationalization of research programs, to improve the quality of research teams, and open up inward looking faculty, and enhance excellence.

- o Improvement of the attractiveness of participating universities as locations for high quality research talent, thereby improving their international competitiveness and bringing new resources to EPSCoR states.

- o Facilitate retention of high quality faculty and enhance the educational quality of teaching programs by providing "global images" for students.

- o Overcome negative images of isolation and parochialism associated with EPSCoR states and the LFRs by demonstrating on an international stage their research capabilities, stimulating communications, forming support systems and increasing graduate student participation.

- o Provide EPSCoR states with international visibility and access to the EEC and EC leadership in Brussels.

- o Strengthen industrial recognition of the quality of research at local universities and the highlight the need for improved ties with Europe in the face of Japanese competition.

EPSCoR States are also demonstrating their interest in sharing unique local research resources with EEC researchers, such as those described below.

- o The University of Montana facilities at Flathead Lake, Montana as a facility for international environmental baseline studies.

- The University of Puerto Rico research facilities at Mayaguez for access to the biologically diverse resources of the Caribbean for marine research.

- Universities in Mississippi, Louisiana and South Carolina for wetlands research in the Mississippi river basin and the coastal plains.

- The University of Arkansas at Little Rock for collaboration in the proposed neutrino telescope - the GRANDE project.

- Access to the super-computing facilities and expertise at the University of Kentucky.

- Access to unique paleontological work on dinosaurs at Montana State University and the Museum of the Rockies.

- Access to advanced materials research facilities at Oklahoma State University.

Early results are demonstrating a strong justification for a more formal collaborative framework which would provide enhanced level of resources from both NSF and the EC to support and drive the existing valuable collaborative activity and to more fully exploit the rich potential which exists on both sides. red and better funded effort could, however, provide a "win-win" situation for the EPSCoR states, STRIDE regions, the European Commission itself, and the NSF.