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HOUSE COMMITTEE REPORT

(7)

Date referred: 1/22/88

FURTHER REFERRALS: Finance

DATE: 2-24-88

The Health, Education and Social Services Committee has considered HB 390

An Act establishing the Alaska Science and Technology Foundation; relating to the membership of the science and engineering advisory commission; and providing for an effective date."

RECOMMENDS:

- replace with CS HB 390 (HESS) the same title
- attached amendment(s) a new title
- do pass
- do not pass
- no recommendation
- individual recommendations
- additional referral to the _____ Committee

ADOPTS: _____ letter of intent

ATTACHES NEW FISCAL NOTE(s):

- fiscal impact same as previous fiscal note published _____
- zero fiscal note same as previous zero fiscal note published _____
- zero with analysis

SIGNING DO PASS:

Bill Ellis
Will Koyama
Clayton Stanley
ROD E. HARRIS
Mr. Stuenkel

SIGNING OTHER RECOMMENDATIONS:

Bill Hudson - No Rec. -
David Wiley NO REC

Will Koyama
 COF Chairman's signature
Bill Ellis

STATE OF ALASKA THE LEGISLATURE

POUCH Y - STATE CAPITOL
JUNEAU, ALASKA 99811
907-465-3800

LEGISLATIVE AFFAIRS AGENCY LEGISLATIVE REFERENCE LIBRARY

May, 1988

Copies of minutes listed below were originally included in this file. The minutes are available on the STAIRS database CMPR. In order to save space copies of minutes have not been left in the files.

Mary Van Nimwegen

H HESS	2-19-88	9:00 a.m.
H HESS	2-23-88	8:30 a.m.
H HESS	2-24-88	8:30 a.m.

By House HESS

HOUSE BILL 390

Amendment #2

Page 6, line 13:

Delete "of" and insert in its place "in"

Page 5, line 3:

Delete "shall" and insert in its place "may"

By House HESS

HOUSE BILL 390

Amendment #1

Page 3, lines 19 - 21:

Delete all material after "AS 39.2C.180" and insert:

. Board members not employed by the state or university receive an honorarium of \$400 for each day spent on official business of the board.

STATE OF ALASKA THE LEGISLATURE

POUCH STATE CAPITOL
JUNEAU, ALASKA 99811
907 465 3800

LEGISLATIVE AFFAIRS AGENCY

MEMORANDUM

February 23, 1988

SUBJECT: Constitutionality of resident preference
 measures in HB 390 (Establishing the Alaska
 Science and Technology Foundation)

TO: Representative Johnny Ellis
 Co-chairman, House HESS Committee

FROM: Teresa B. Cramer *JBC*
 Legislative Counsel

You have asked for an opinion concerning whether the provision of HB 390 which requires that the board of directors of the Alaska Science and Technology Foundation give preference to state residents in making grant awards pose constitutional problems.

The bill provides that the foundation is a state agency funded by legislative appropriations. The purpose of the foundation is to encourage basic and applied research in Alaska by making grants to fund the research project. The board of directors is required to give preference to an applicant who is an Alaska resident, association, organization, or institution when awarding grants. If a state applicant lacks the expertise or capability to perform the research without assistance from a nonresident, the board may jointly award the grant to the resident and a nonresident.

In my opinion, the resident preference portions of HB 390 may be subject to challenge under the state equal protection clause, Art. I, sec. 1 of the state constitution.

The state supreme court has adopted a sliding scale for determining whether legislation violates the equal protection clause, depending on the importance of the individual right that is infringed. Alaska Pacific Assur. Co. v. Brown, 687 P.2d 264 (Alaska 1984). The court looks first to the nature of the interest. In HB 390,

Representative Johnny Ellis

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February 23, 1988

nonresidents are placed at a substantial disadvantage in applying for grants to perform research. This right is akin to the right to employment, which has been held a substantial right, requiring that the state demonstrate greater justification for the discrimination and establish that the means used to achieve its goals fit closely with the ends that the legislation seeks to accomplish.

In Sec. 37.17.010(b), set out in sec. 1 of the bill, the purpose of the foundation is given as

to promote and enhance economic development, technological innovation and capability, and public health in Alaska through basic and applied research.

Economic development is a justifiable state interest. However, the tie between encouraging economic development and restricting the research to achieve it to state residents is less clear. To survive a challenge under the equal protection clause the state would have to demonstrate that state residents as a group were substantially better able to accomplish this goal than nonresidents. The court has held in Lyndon Transport v. State, 532 P.2d 700, 711 (Alaska 1975) that

[a] discrimination between residents and nonresidents based solely on the object of assisting the one class over the other economically cannot be upheld under either the federal privileges and immunities or the equal protection clauses.

The justification for preferring residents cannot be based on providing residents jobs at the expense of nonresidents.

HB 390 might also be subject to challenge under the federal privileges and immunities clause, Art. IV, sec. 2 of the federal constitution. That clause applies to "fundamental rights" and protects "citizens" and not corporations and therefore might not apply to all potential plaintiffs. If the court held that the right to compete for grants was an employment right, the clause would clearly apply. Francis v. Robison, 713 P.2d 259 (Alaska 1986). The analysis under the clause would be similar to analysis under the state equal protection clause. The state would have to demonstrate that the reason for the discrimination against nonresidents was to remedy a problem that was causing social ills and that nonresidents were a "peculiar source of the

Representative Johnny Ellis
Page 3
February 23, 1988

evil." The preference imposed would have to be shown to be closely tied to solving the problem.

If I may be of further assistance, please advise.

TBC:bb
wkb3/019



Alaska State Legislature

Please enter into the record my testimony to the House HESS
committee name

committee on HB 390 & HB 391, dated February 23, 1988
bill/subject

We believe HB 390/HB 391 is an investment in Alaska's future and we therefore strongly support it and hope you will as well. One of Alaska's greatest resources is the creativity of its citizenry. This fact has been demonstrated time and again. HB 390/HB 391 provides an opportunity to draw upon that creative resource and direct it to applied research leading to enhancement of economic development, enhancement of public health and enhancement of technological innovation in and for Alaska.

Some additional points we would like to make:

1. Because of the large engineering profession that exists in Alaska - engineers have played a vital role in the past and present development in the state and will be a critical element in the future of the state - we believe the name of the bill should be changed to Alaska Science and Engineering Foundation. Consider if you will the role engineers have played in the design, construction and operation of the North Slope oil fields or their role in improving public health facilities in rural and urban Alaska.

2. To ensure balanced representation of science and engineering on the Board of Directors of the Alaska Science and Engineering Foundation (Sec 37.17.040) we recommend that the section be amended so the:

Two members residing in Alaska be one scientist and one engineer

Two members residing outside Alaska be one scientist and one engineer

3. Finally, we believe the emphasis of the research projects funded by Alaska Science and Engineering Foundation be on applied research. I mean by this research directed at solving Alaska's problems, the type of problems that engineers can provide a leadership role in solving.

Signed: _____

Testifier - John P. Zarling Ph.D., P.E., Director

Institute of Northern Engineering, University of Alaska Fairbanks

Representing (Optional)

539 Duckering Building, UAF, Fairbanks, AK 99775

Address

Office - 907 474-7775

Phone No.



Alaska State Legislature

Please enter into the record my testimony to the House HESS
 committee name

committee on HB 390 & HB 391, dated 1/22/88
 bill/subject

The bills are an excellent concept and will materially assist the State of Alaska in stabilizing the economy by developing new methods and techniques of accomplishing needed solutions to our problems. The concept iterates the role of the engineer but does not fully address the fact that the engineer is the translator between science fact and usable end product. To this end it is strongly urged that the word "technology" be replaced in the title of the bill, in the name of the foundation, and in the name of the endowment in both bills by the word "ENGINEERING". "Technology" describes both science and engineering. The National Science Foundation has had continuing problems with the exclusion of the word "ENGINEERING" from it's title. Dr. E. Block, Director of the National Science Foundation, continues to point to the role of engineering and has had to make significant organizational changes to compensate for the omission. The further change of appointment of a "scientist and an engineer" in Section 37.17.040 b 1 and b 2 instead of "scientists or engineers" will help to assure a balance.

Vincent S. Haneman, Jr.

Signed: _____

Testifier
 Dean, School of Engineering, University of Alaska Fairbanks

Representing (Optional)

1258 Viewpointe Drive, Fairbanks, AK 99709

Address

Office 907 474 7330

Phone No.

Science Foundation Hearing scheduled for 2/19/88
status as of
2/17/88 15:25

<i>Name of witness</i>	<i>Affiliation</i>	<i>Points witness is expected to make.</i>	<i>How much time estimated for testimony?</i>	<i>Will have written material to distribute?</i>	<i>Received yet?</i>	<i>Confirmation status</i>	<i>Location (ANC, FAI, or JUN)</i>
Henry Cole	Science Advisor to Gov. Cowper	Introduction and overview	12-15 min.	yes	no	Confirmed	ANC
David Reaume	Alaska Economics Inc.	Economic links between high tech. and economic development.	15-20 min.	yes	out-line	Confirmed	JUN
Ole Matheson	UAS-biologist	Impact of research to fisheries, and Scandinavian examples.	10-12 min.	yes	no	Confirmed	JUN
Ed Clinton	Dowland-Bach (Anc. inventor)	A foundation in high tech. promotes the private sector	10-12 min	yes	no	Confirmed	ANC
John "Spike" Karmon	Alliance Bank	Financial community perspective.	10-12 min.	probably		Confirmed	ANC
Syun Akasofu	Dir., Geophysical Inst., UAF	Foundation as a catalyst of additional federal and private research investment in Alaska.	10-12 min	yes	no	Confirmed	FAI
Wm. Wood	Former Pres., U of A	Impact of knowledge & education on progress of mankind, Alaska, etc.	10-12 min	yes	no	Confirmed	FAI

HB 390

SECTIONAL ANALYSIS

*** Section 1**

Sec. 37.17.010

The Alaska Science and Engineering Foundation is housed in the Department of Revenue. Its purpose is to promote economic development, technological innovation and public health through basic and applied research in Alaska.

Sec. 37.17.020

The endowment of the Alaska Science and Engineering Foundation is managed along with other moneys of the permanent fund, but the identity of this money is kept separate and the interest on this money is distributed as grant funds.

Sec. 37.17.030

- a) At the request of the board of directors, the interest income from the endowment shall be released to the foundation. Net capital gains are split between the principal and income of the endowment.
- b) In addition, to endowment income, the foundation can distribute money received from gifts, grants, and other aid; funds received by the foundation do not lapse.
- c) The foundation's administrative expenses come from the endowment income, subject to the Executive Budget Act.
- d) Grants are distributed through a competitive bidding process.
- e) Income may be deposited to the principal, but cannot be withdrawn by the board at a later time.

Sec. 37.17.040

The nine members of the board of directors are appointed by the Governor to staggered four year terms and may be removed for cause. The membership is specified and is designed to represent the interests of the scientific community

as well as the general public. Four members must be scientists or engineers, two from in-state and two from out-of-state.

Sec. 37.17.050

The board shall elect its officers to terms of no more than two years.

Sec. 37.17.060

A majority of the board constitutes a quorum.

Sec. 37.17.070

The board must meet at least twice a year. Per diem and travel expenses, as well as a \$400 per day honorarium, are paid to the members for meetings of the board and its subcommittees (the same arrangement and dollar amount as the Alaska Permanent Fund Corporation).

Sec. 37.17.080

Provides for the hiring of an executive director and additional staff. All employees are in the exempt service.

Sec. 37.17.090

- a) Notice of all solicitation for grant proposals must be given at least annually.
- b) Grant proposals shall be reviewed by an anonymous peer review panel appointed by the board. Grants of less than \$5000 may be exempted from this peer review.
- c) The policy and research priorities for the state set by the Alaska Science and Engineering Advisory Commission shall be considered by the foundation in making grant awards.
- d) At least 50 percent of endowment income must go to grants of \$100,000 or less.
- e) The board will specify the amount of each grant that can be used for overhead.
- f) Grant recipients will be required to file reports. Research results will be distributed to the public regularly, unless deemed proprietary by the board.

- g) A fair percentage of income from royalties, licenses, and patents resulting from grant research shall be paid to the endowment principal.
- h) All qualified Alaskans may be eligible for grants. Preference shall be given to Alaskan grant proposals be they individuals, firms, organizations, or academic institutions. Out-of-state recipients may have to associate with an Alaska organization. Grants must further purposes of the foundation to solve Alaska problems.
- i) If grant money is awarded for equipment purchases, the foundation owns that equipment.
- j) An annual report to the Governor and legislature is required.

Sec. 37.17.100

The Alaska Executive Branch Ethics Law shall apply to board members, and they shall adopt a conflict of interest policy for themselves and the peer review panel.

Sec. 37.17.110

Permits the board to adopt necessary regulations.

*** Section 2**

Sec. 39.25.110

Adds the executive director and staff of the foundation to the exempt service.

*** Section 3**

Sec. 44.19.257(a)

Adds the executive director of the foundation to the membership of the Alaska Science and Engineering Advisory Commission.

*** Section 4**

Sec. 44.19.259

Exempts the executive director of the foundation from the staggered term provision of the Advisory Commission.

*** Section 5**

Immediate effective date.

***** AN OUTLINE OF *****
AN ECONOMIST'S VIEW OF THE PROPOSED ALASKA SCIENCE FOUNDATION

The economic questions which deserve answers if one is to judge the merits of the proposed Alaska Science Foundation are (1) Why should state government involve itself in research & development ? and (2) What can Alaska expect to realize in the form of a return on its investment in R&D ? My answers to these questions should not be interpreted as a blanket endorsement of any specific proposal, but rather as a basis for my belief that a properly designed and implemented science foundation of the sort proposed can in the long run help to stimulate both economic growth in Alaska and an intellectual broadening of our community. The corollary to this statement is that a badly designed or badly implemented program will do neither.

If even a well designed program could not be justified, then we would be foolish to waste time on this proposal. The main theme of this paper is that a well designed publicly funded research & development agency would be an important public asset.

WHY SHOULD STATE GOVERNMENT GET INVOLVED ?

There are five justifications for Alaska state government involvement in an R&D program aimed at broadening our economic base: (1) the widespread sharing of risk and thereby its effective reduction; (2) the recognition that economic growth in Alaska is of secondary importance (at best) to private investors; (3) the tendency towards under investment in R&D by the private sector that follows from the inability of

innovators to capture all of the benefits of their innovations; (4) the desire on the part of some players to protect their investments in what may be obsolete skills and technology; and (5) government's accepted role as guardian of the interests of the unrepresented, in this context future Alaskans.

***** DETAILS TO BE PROVIDED IN FINAL REPORT *****

WHAT RATE OF RETURN CAN BE EXPECTED ON AN INVESTMENT IN R&D ?

The consensus is that in the long run the mean gross social return to investment in research and development lies between 30 percent and 50 percent. Of considerable importance is the generally accepted fact that there is a great deal of variation across programs, and for a given program over time. An investment in R&D is risky and acknowledged to be so. Many well designed and well implemented R&D programs show zero or negative returns on investment. It is expected that there will be numerous failures before a success is achieved, just as it is expected that an oil company will drill many dry holes for every discovery.

Of the 30 percent to 50 percent mean gross return on R&D investment about one-third to two thirds is typically captured by the investor with the remainder accruing to other players. The IBM company benefited greatly from prior investments by Apple Computer. Other companies, some outside of the United States, benefit from the developments pioneered by Apple and by IBM. In principle there exist many

innovations with a more than adequate gross social return on investment which will not come to market or which will be delayed for some time because the innovator cannot capture enough of the return. This is a key reason for government involvement.

Translated into direct impacts on Alaska these observations can be restated in the form of a small set of propositions.

Proposition #1: There are no guarantees that an expenditure on R&D will have any measurable impact on the Alaska economy beyond the creation of R&D jobs per se.

Proposition #2: For every \$1 million invested in Alaska R&D an expected return of 40 % on investment means that the possible outcomes measured in terms of annual income created center around \$1.4 million per year.

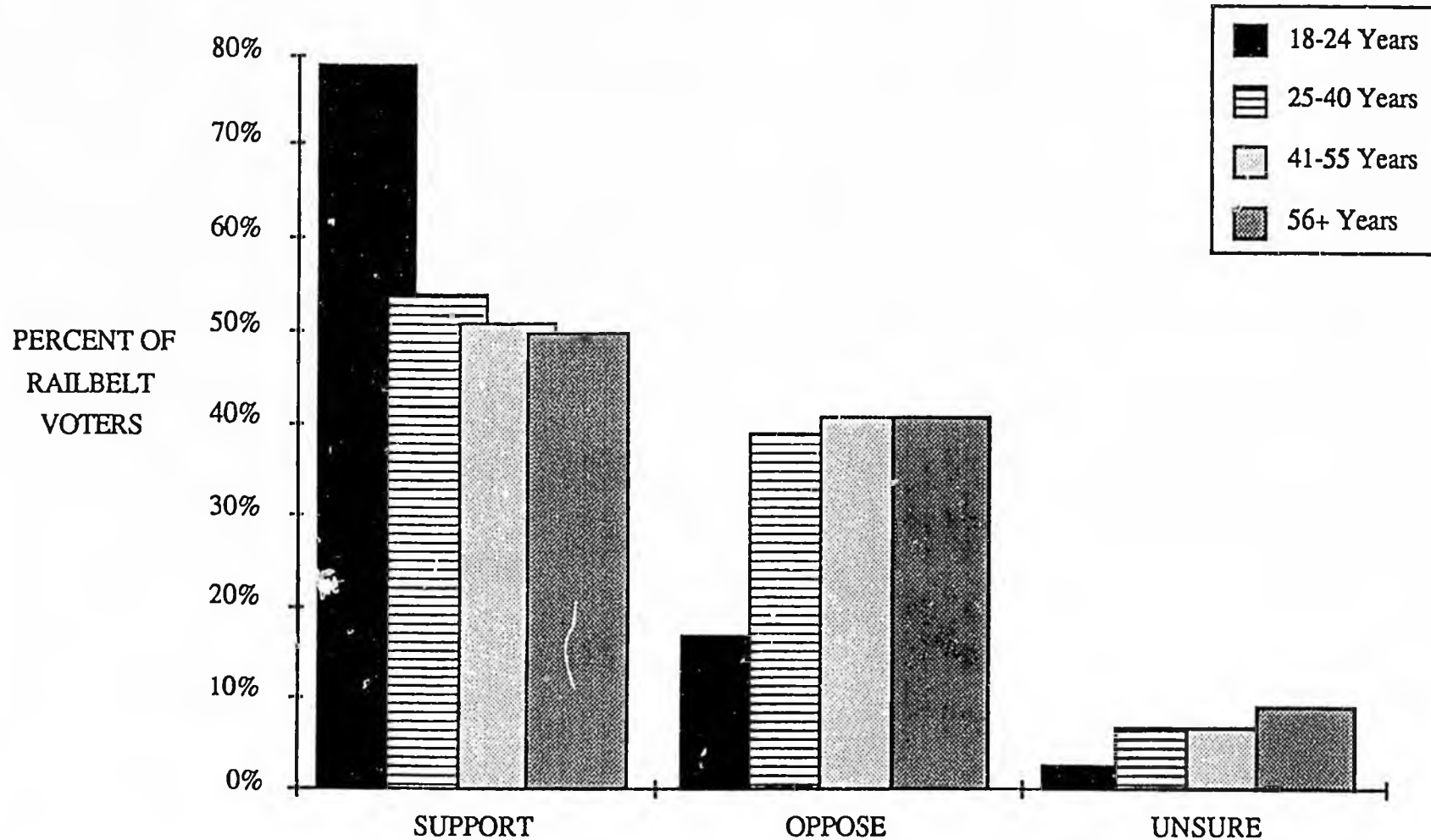
Proposition #3: The potential for a bonanza exists. Publicly funded R&D could lead to breakthroughs with very large rates of return.

The latter possibility, that of a bonanza, is to many people the chief reason why an Alaska Science Foundation is desirable. On average, the results can be expected to be unexciting but solid, the downside risk is minimal (at most we lose our investment), and the upside potential is worth reaching for.

David M. Reaume
February 16, 1988

Railbelt Attitudes Toward The Science Foundation, By Age

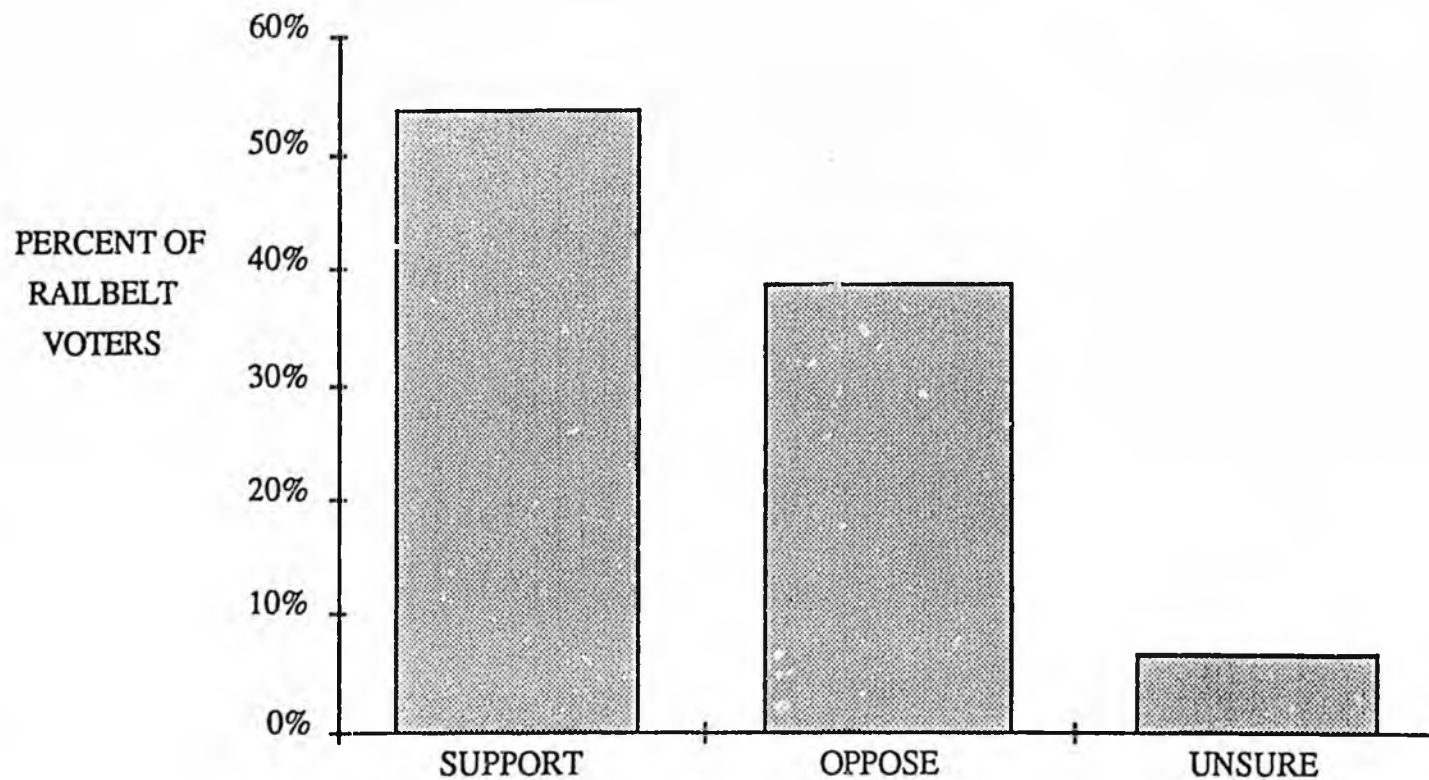
Would you support or oppose establishing a \$100 million science and applied technology fund to encourage scientific research in Alaska?



Source: Dittman Research Corp., January 1988

Railbelt Attitudes Toward The Science Foundation

Would you support or oppose establishing a \$100 million science and applied technology fund to encourage scientific research in Alaska?



Source: Dittman Research Corp., January 1988

ALASKA CONFERENCE OF MAYORS

RESOLUTION NO. 88-19

RESOLUTION OF THE ALASKA CONFERENCE OF MAYORS
SUPPORTING ESTABLISHMENT OF THE
ALASKA SCIENCE FOUNDATION.

WHEREAS, the link between scientific/technical achievement and economic development has been clearly demonstrated in communities around the world; and

WHEREAS, local governments are playing a leading role in efforts to achieve economic development in Alaska; and

WHEREAS, there is no institution in Alaska with responsibility to apply scientific knowledge to locally defined and selected economic development issues; and

WHEREAS, the scientific resources of the University of Alaska, state government, and other Alaska organizations have not been effectively mobilized to meet technical and economic development and health needs identified by local leaders; and

WHEREAS, the state administration has proposed to establish and endow the Alaska Science Foundation to provide and focus scientific and technical resources on clearly defined Alaska needs.

THEREFORE, BE IT RESOLVED that the Alaska Conference of Mayors urges the legislature to establish the Alaska Science Foundation; and

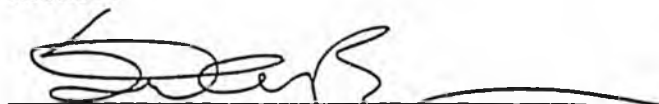
BE IT FURTHER RESOLVED that municipal and community and industry leaders be provided formal representation on the governing board of the Alaska Science Foundation to insure a practical and applied orientation to the research.

Adopted this 10th day of February 1988.



Erling T. Johansen, President
Alaska Conference of Mayors

ATTEST:



Scott A. Burgess, Executive Director
Alaska Municipal League

TESTIMONY BEFORE THE HEALTH, EDUCATION AND SOCIAL SERVICES
COMMITTEE OF THE HOUSE OF REPRESENTATIVES
ON HOUSE BILL 390, 391

Anchorage, Friday, February 19, 1988
Dr. Henry Cole, Science Advisor

It is a pleasure to be here and I thank the Committee for the opportunity to present arguments and information in support of the Alaska Science and Engineering Foundation. I am Henry Cole, Science Advisor to Governor Cowper and before introducing the various witnesses, I would like to briefly describe the Alaska Science and Engineering Foundation and make some remarks about the nature of the technological possibilities in Alaska.

The purpose of the Foundation is to promote and enhance economic development, technological innovation and capability, and public health in Alaska through basic and applied research. It will be governed by a nine member board of directors who represent a broad range of scientific, academic and public interests. Policy for the Foundation will be set by the basic statement of purpose plus other research priorities as may be determined by the Alaska Science and Engineering Advisory Commission. The executive director of the Foundation will sit as a voting member of the Commission.

The work of the Foundation will be accomplished through the funding of research proposals for a broad range of applied and pure scientific and engineering research topics dealing with

Alaska. Proposals shall be competitively reviewed by a group of technical advisors in various fields selected from the State and Nationwide or outside the country. Any qualified Alaskan resident, institution, University or business may be eligible to apply for funds. Preference will be granted to Alaskan proposers - all other scientific criteria being met. If it turns out that in some cases that we do not have sufficient technical expertise in Alaska to successfully accomplish the work then grants may be given to out of state proposers or to proposers who join with out of state bidders.

The \$100 million endowment will reside in the Permanent Fund and only the interest shall be used to provide money for grants, an amount normally between \$6 to \$8 million.

Technology is the application of human ingenuity, science and skill to the natural resources of this world to produce a resource of greater value than it had at first. The enhancement of value may lead to greater beauty, greater utility or a marketable product. We already have important examples of projects for the enhancement of resources in the State:

Coal from the Healy or Beluga coal fields is 27% moisture. This means it produces 7200 BTU/lb rather than 11000 BTU/lb. Technology can create a more saleable "value added" product, with a higher heat content and price when the exact technique for cheaply drying and stabilizing the coal is determined through research.

Coal dust may be pressed into a briquette with a binder of coal tar and starch and can create a three pound packaged fuel for sale to Korea. Engineering studies are required to determine the exact parameters for a low cost process.

These are examples of well defined projects which illustrate the "value added" concept.

So what's the problem? The problem is that each year an appropriation must be sought on a case by case basis and no long range planning may, in reality, be put in place. Long range planning is required to develop facilities and attract competent engineering talent. These particular projects are matching fund arrangements through a joint State/DOE agreement but there is, in fact, no legal mechanism whereby funds for State designated and non-University research may be easily managed.

Part of the need for a long term commitment in research is set by the topic itself. It derives from the differences between geological and biological or hydrological data. If one studies the geologic record in the Arctic Wildlife Refuge, a petroleum survey program could be funded intermittently, responsive to the short-term demands for information at that time. I am not suggesting that this would be an effective way to run a program. But at least there would be no danger of losing data.

On the other hand, if you are concerned with fisheries and other renewable resources, you must establish a base line of observations for many years to investigate the growth and changes through time. A gap in the time sequence of those observations can easily invalidate results. There is no way a single summer long program with large number of ships on the Bering Sea will succeed in producing the years-long temporal data you need on, say, the nutrition cycle, the maximum sustainable yield, and data for multi-million dollar fisheries management decisions.

In other words, the inherent nature of biological processes demands that a significant long term time commitment for observation and study be made to hope for any success whatsoever. Likewise, with genetic studies of forests, and new species of trees, wildlife cycles, the development of more suitable grains for the Arctic, the growth of seaweed cultures or the investigation of red tide, continuity is critical.

Consider important health problems: infectious disease, cancer, injury and suicide, atherosclerosis and the link with diet, or other public health issues. These take time and that commitment must be complete.

That is why we have proposed an endowment as a funding method: in order to protect these programs from the disruption of intermittent funding levels. It is this resultant stability which allows rational growth of research institutions and firms and attracts the best people to be a part of the necessary infrastructure of engineers and scientists. This is the meaning of the word capability in the statement of purpose of the bill. For sustained and credible growth of our ability to solve problems in the future we must build and commit to a strong base of expertise in Alaska.

A second aspect of the technological enterprise is that others can learn as rapidly as we can. If we do not prepare, we can miss our chance, and lose the opportunity to be leaders in innovative technological development in the Arctic.

The Finns, through their well funded Finnish Technical Institute, have been working for years on new Arctic construction techniques with considerable success.

The Canadians also: Based upon an argument of national defense, which leads to a broad national policy to reduce dependence on foreign oil, Canada has spent \$50 million to encourage improved construction practices, investigate more effective insulation, space heating, and city layout for weather protection. We have these skills but need to establish similar or better coherent programs. The Science Foundation could help on that.

China contains 40% discontinuous permafrost. Do we know how to build roads and foundations in permafrost? We certainly do and thus we should seize such an opportunity to expand our capability and export our technology.

There is already a large constituency of scientists, engineers and the general public with ideas for projects and economic development. But the problem is that although many of these projects are unique to Alaska they may not easily fit with the program guidelines of a university or the federal agencies and may be unsuitable for venture capital or loans. It is in these cases that the Science and Technology Foundation could be of great assistance. In other words the Science and Technology Foundation will be able to manage and fund projects which are unique and represent true Alaskan Missions.

What are some of these Alaskan Projects?

A Chemist in Anchorage wishes to evaluate Southwestern Alaska Fisheries as a Dietary source of Omega-3 fatty acids;

Another Chemist from Anchorage has written a proposal to investigate the possibilities in Alaska for Culture of Mollusks and Seaweed for sale;

A biologist has devised a scheme for salmon enhancement in Western Alaskan Coastal Villages through recirculating incubators;

From the Interior: a miner has developed a prototype machine for continuous underground mining in permafrost to mine underground placer deposits without blasting.

In Anchorage there is an engineer who has developed computer operated portable calibration devices for the pipeline but is seeking funds through the Federal Small Business Innovative Research program.

In Wrangell there is a proposal to create an Alaska Pilot Oyster project.

In Petersburg a fisherman wants to work on Littleneck Clam Harvesting, Detoxification, and Marketing.

In Kodiak there is interest in the development of Small Scale Fish Smoking Processors.

And there are other much larger Projects: Ways to make our oil resources go further and the conversion of natural gas to methanol and gasoline.

These are actual proposals for practical short and long term projects written by Alaskans in both rural and urban areas. Our desire through the Foundation is to present and realize the idea to all Alaskans that science and technology can empower them to deal more successfully with their own lives and economic needs.

It must be understood that the Alaska Science and Engineering Foundation cannot perform this function of technical growth and education in the State singlehandedly. The Foundation will work best through the effective link up and mobilization of the other resources of the state necessary for this technological enterprise: The Universities, with their great information and skill base, Private Industry with their support and project definition, the public with their innovative ideas, and the financial community and institutions to transfer ideas to a commercial level. The experience in other states shows that only through a partnership of these institutions, and redefining and modifying their traditional roles will we accomplish our goal. The Foundation will be the essential catalyst and motivator for this change in our state.

QUESTIONS AND ANSWERS ABOUT
THE ALASKA SCIENCE AND ENGINEERING FOUNDATION

1) What is the Alaska Science and Engineering Foundation?

The Foundation is an agency to fund Alaskan projects and programs of a scientific and technical nature whose results will be economically or scientifically useful to the state.

2) What are the goals of the Science Foundation?

The goals are to promote economic development and technological innovation and capabilities, and public health through basic and applied research.

3) How important is the Foundation to Alaska's future?

Science and technology will be a key driving force for future economic development in the State of Alaska. Over the past 50 years, the research and development expenditures in the United States have been responsible for 30 to 50% of the improvements in society. There is no more important single task in Alaska than to convert our economy from one based upon natural resources and their erratic cycles to one of significant value added to our resources and broad economic diversity.

- 4) Have other states established science and engineering foundations?

Yes. Forty-three other states have spent a total of \$700 million to establish research parks, incubator programs, small grant programs or other mechanisms to assist the link up of technology with economic development. The top seven states have spent \$350 million for this purpose. Alaska has spent nothing.

- 5) What are some examples of programs that might be funded?

Research into the enhanced recovery of oil and utilization of natural gas.

The chemistry of the drying and stabilization of coal in order to raise its heating value from 7200 BTU/lb to 11000 BTU/lb and thus increase its marketability.

The determination of the maximum sustainable yield of bottomfish and other fisheries in Alaska waters.

The investigation of causes of seasonal affective disorder in the Arctic climate and its relationship to injury and suicide.

Seed capital for engineering and development of a recirculating salmon hatchery in western Alaska.

Research on the genetic differences between pen reared salmon and the wild stock.

- 6) Why is it important that the foundation be financed through an endowment rather than annual appropriations?

A long-term, serious commitment to science and technology at a suitable level of funding will achieve the maximum effectiveness for the state's science dollar. In technical business, projects only come to fruition after several years. Many scientific projects, particularly those in renewable resources, require data which stretches through time. No satisfactory answer is available unless a long term research commitment is assured.

- 7) Does the need for a long-term commitment and funding mean no immediate returns are foreseeable for funded projects?

No. Many practical and useful technical projects of rapid return will be funded by this foundation.

- 8) About how much money will be available for research support?

An endowment of \$100 million housed in the Permanent Fund will produce an annual basis from \$6 to \$8 million dollars. This is not an excessive amount for research but can be the basis of a long term commitment.

- 9) Who will be eligible to apply for funding?

All Alaskan resident, businesses, organization, institutions, state or private universities shall be given primary consideration for funding. When no Alaskan group or individual is capable of doing the work, whether through lack of personnel or equipment, they are encouraged to enter into a joint venture with a group from outside the state. In cases where there is no one in the state capable of addressing a problem, outside scientists and engineers would be encouraged to apply.

- 10) How does the organization of this foundation compare with well-known examples such as the National Science Foundation or the Ford Foundation?

Aside from differences in their stated objectives, the Alaskan Foundation will have many features similar to other foundations: a nine member board of directors comprised of

four scientists or engineers, two of whom are from outside the state, plus four public members and one member of a state agency. Technical review will be performed by an advisory panel of technical experts selected from within and outside the state. The daily operation of the Foundation will be guided by an executive director and staff.

FEB 22 08 12:28 LEG. AFFAIRS - NASHLEH

P.O. Box 3136
Palmer, AK 99645
February 19, 1988

Dear Legislators:

RE: Comments concerning Alaska Science Foundation

An Alaska Science Foundation would be an excellent method to provide funds for research in renewable natural resources whose development is needed to diversify our economy. Currently we do not have the research base to develop these resources on a sustained yield basis. Little is known about the carrying capacity of our land for forestry, rangelands, wildlife, and other renewable resources. Many additional management questions occur in these fields as well as agriculture and land reclamation. This type research is not very competitive at the national level, and private foundations have indicated that these are local management problems. Availability of state funds on a competitive grant basis would be a real asset to renewable resource development.

Competitive grants, as proposed, is one of the most appropriate ways to ensure quality research at a reasonable price. Researchers would have to develop sound proposals subject to peer review and would have to justify their budgets. It would also provide an avenue for innovation. Most other state research funds are funneled down through agencies or the university to fund on-going projects. None of that money is available for other researchers who may have worthwhile ideas outside the scope of these programs.

The concept of ensuring that Alaskans are performing the research or having outsiders associated with Alaskan institutions is a good idea. Much NSF funding for Alaskan research goes to outside institutions. Having an outsider on the board helps to keep the program's perspective broader.

Requiring reports is essential for technology transfer and insures that the data and results become available instead of sitting in someone's file cabinet.

I would support the idea of using part of the Permanent Fund earnings for this endowment. This could be considered an investment in the same manner as stocks or bonds. However, dividends would be the ability to use our resources wisely and creation of development jobs instead of just returning money.

In summary, the Alaska Science Foundation is an excellent method for obtaining research to obtain needed information concerning management of our renewable natural resources. This, in turn, could help diversify the economy. There are relatively untapped natural resources (forestry, grazing) in the southcentral portion of the state that could be developed with sound, ecological practices if we had the research base.

Sincerely,

Dot Helm/88
Dot Helm



Alaska State Legislature

Please enter into the record my testimony to the House HESS
committee name

committee on HB 390, 391 , dated Feb. 19, 1988
bill/subject

I have four comments to make on House Bills 390 and 391 after hearing the first hour of testimony on Fri., Feb. 19. Thank you for your willingness to accept public input.

First, I support wholeheartedly the general concept and the general design of the Alaska Science and Technology Foundation endowed from the state's general fund. It is appropriate for a forward looking citizenry such as ours to be sowing seeds of technological progress for succeeding generations as much as for our own.

Second, the \$400 amount of the daily honorarium mentioned on p.3 (of HB0390A) in line 19 seems unnecessarily inflated.

Third, the exemption from peer review for small grants mentioned on p. 4, line 12 is not wise, in my opinion. Peer review of ALL proposals is in order.

Fourth, I wish to speak out in favor of that "second class cousin", the word BASIC in the phrase "basic and applied research." Although Dr. David Raouf's testimony mentioned that economic returns MIGHT not be immediate, I sensed in the testimony of him and others that foreseeable potential payoffs in solving pressing state problems ought to be one important measurement of the worthiness of the proposals to be funded. Preoccupation with "money back into the pocket sooner rather than later" is not surprising. Our nation has an attitude of impatience with science for its failure to give us immediate solutions to complex technological problems on demand. That preoccupation is not compatible with the long term welfare of a science dependent culture such as ours. The history of science is richly studded with examples of good research which was discounted or ignored - sometimes for decades - only to be proven a cornerstone of some later advances involving health, understanding of nature or even of great economic gains. If we look only for the list of possible applications before we loosen the purse strings, we shortchange only ourselves.

In short, no mere mortals can determine what the economic effects of a study may be 50 years later. I support the funding of "pure" or "basic" research coequally with that of "applied" research.

Signed: David M. Busey
Testifier

Representing (Optional)

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A STATEMENT ON LEGISLATION
TO ESTABLISH AN ALASKA SCIENCE AND TECHNOLOGY FOUNDATION
PRESENTED TO THE ALASKA HOUSE OF REPRESENTATIVES
COMMITTEE ON HEALTH, EDUCATION, AND SOCIAL SERVICES

BY

Lyle D. Perrigo
1921 Congress Circle, Apartment B
Anchorage, Alaska 99507

February 19, 1988

Messrs. cochairmen and members of the Alaska House of Representatives Committee on Health, Education, and Social Services, my name is Lyle D. Perrigo. My comments today on House Bills 390 and 391, to establish and fund an Alaska Science and Technology Foundation, are based on 30 years of experience in conducting and leading applied research programs in a national laboratory, a nonprofit research institute, and a center of the University of Alaska. Also relevant are the one and one-half years in which I was the senior science director for the University of Alaska Foundation; in that period I participated in the work reported in the document entitled "A Challenge to Alaska." I believe my background provides a useful perspective on how research can be and often is used for pragmatic and economic purposes as well as some of the major research needs that face Alaska. Although I am the deputy director of the Arctic Environmental Information and Data Center (AEIDC), University of Alaska, and I work directly with the U.S. Arctic Research Commission, this statement is solely my own and does not necessarily reflect the views of our center, the University of Alaska, or the U.S. Arctic Research Commission.

Before advancing some specific thoughts about the legislation being considered by your committee, some comments pertaining to research, views on

its importance, and programs elsewhere in the nation which foster research are in order to lay a foundation for my recommendations.

- ° Research is often considered to be comprised of two types of endeavor, basic and applied research. The former comprises work to increase man's knowledge and understanding of natural phenomena and human interactions. The latter is a term used to describe pragmatic efforts to solve problems and employ the products, processes, or systems developed from existing knowledge for economic benefit or the well-being of industry, the government, and/or people. Both types of research are needed in Alaska.
- ° Except for certain technology transfer activities even applied research takes significant amounts of time before tangible results are apparent; for example, five to ten years may pass between onset of an applied research project and achievement of significant economic benefits.
- ° Economic or pragmatic success, even in applied research, is uncertain. Perhaps one project in ten will result in a large payoff, while two in ten may provide acceptable economic or other valued benefits. The remainder likely produced useful scientific and technical results but are otherwise not directly viable.
- ° Basic research is often done in universities. Nonprofit, for-profit, industry, and national laboratories as well as special multidisciplinary centers within some universities comprise the world of applied research. Some focus their work on one or two areas, while others pursue a wider spectrum of activity. The spawning of small nonprofit and for-profit research organizations is one step in the diversification process.
- ° At the present time 43 of the 50 states have programs to stimulate research. Emphasis on the acquisition and application of new knowledge is of interest because they lead to economic diversification and new

jobs. Some of the more successful programs are found in Massachusetts, North Carolina, Ohio, Pennsylvania, and Texas.

- ° The U.S. Arctic Research Commission plans to visit Juneau in early March. A significant consideration in its timing is pending legislation to establish an Alaska Science and Technology Foundation. The Commission expects to meet with the governor, committees of the legislature and the Juneau public to support the concept embodied in current legislation. The Commission believes a research foundation would provide a means of broadening the base of well-qualified research scientists and engineers and acquiring a better understanding of physical, biological, social and medical phenomena in the North. Having an Alaska Science and Technology Foundation is not considered as a gambit that would lessen work on federal and national issues; it would speed the process.

Comments on Proposed Legislation

Because an Alaska Science and Technology Foundation could play a very important role in diversifying the economy of the state and providing a better future for its residents, I support the concepts behind HB 390 and HB 391. Several changes are needed, however, to fine tune the wording in those bills to ensure the foundation is practical, workable, and has a well-defined mission. Amendments to achieve the following would meet those objectives:

- ° Organization and Reportability. Placing the proposed foundation within any existing department could make it a political football. What is needed is a public corporation similar to the Alaska Railroad. Considerable autonomy is required so that good science and technology rather than other agendas govern the preparation of priorities, consideration of proposals, the distribution of funds and evaluations of

performance and results. There are always legislative and administrative procedures to disestablish such a body if it violates the trust placed in it.

- ° Focus and Interests. Language should be included in the legislation to clearly focus the foundation's attention on Alaskan problems and interests. There are parallel federal and national interests in certain parts of the state and in certain scientific fields. There should be no wording to give the impression that Alaskan dollars might be spent to solve federal/national problems. We have more than enough of our own problems to handle without taking care of part of those belonging to the federal government.
- ° Governing Board. Considerable care in defining the length of terms and categorizing qualifications for membership is needed. First, the terms should run for six, rather than four years. We need stability and considerable insulation from political processes. Second, placing exclusionary language in the bill limiting the number of people from Alaskan universities to one will help allay public fears about the creation of a backdoor funding mechanism for universities. Further, at least one board member should come from each of the following basic industries: (a) oil and gas, (b) fisheries, (c) mining and minerals, and (d) forestry/forest products. Nominees from those sectors may or may not be scientists or engineers. We need someone from outside the state on the board; one, not two. A draft version of this bill had the speaker of the house and the president of the senate naming one member each. I hope such wording is not reinserted because naming one member each could involve the legislature in administrative matters. It seems to me that

both bodies would wish to be in a position to overview operations. Entanglements could make that a more difficult process.

- ° Applied and Basic Research. Our university research apparatus is generally geared, with a few exceptions such as the Arctic Environmental Information and Data Center (AEIDC), to undertake basic research. A basic emphasis is normally the role of most universities. Getting new products, processes, and equipment into the market requires applied research. That type of work is often done by private groups and not-for-profit research institutes and occasionally special, multidisciplinary arms of universities. I hope that the final wording used in the bill will clearly call for both types of research and leave the door open for participation to the private sector and nonprofit organizations as well as universities.

Wording charging the foundation with responsibility to support technology transfer of projects with promising results is one means of strengthening the applied side of research. In the sense I use the phrase technology transfer, I mean demonstration and applications research. It is far broader than information transfer, which often involves distributing reports, talking with interested people and accessing files via computer linkages.

- ° Limits on Size of Grants. Current wording calling for half the grants from the foundation to be \$100,00 or less is unnecessarily restrictive. First, there may be fewer technically sound proposals in any one year that might fall below that limit than there are realistic demands for projects costing more money. Second, inflation degrades the dollar's purchasing power. Hanging a specific value on a program such as this

creates housekeeping problems for future legislatures unless those dollars are indexed.

- ° The Endowment. As a matter of personal philosophy, I believe the legislature should loan the foundation a sum for only 12-15 years. If a substantial amount (say \$75-100 million) were provided initially, the foundation could set aside any unused portion of the interest generated each year to build its own base of support while actively soliciting funds from other sources to build an endowment to provide long-term stability for research funding. The public should be much more inclined to support legislation which calls for the return of the principle in 15 years than permanently allocating it to the foundation. In fact, this concept might be applied to a number of other projects wishing to use Permanent Fund monies.

In summary, I have given information on the importance of research, the stages through which it moves from the generation of new knowledge to application and some processes by which research leads to diversification. Also, I presented ideas on methods to strengthen and make workable the concept outlined in HB 390 and which would be funded by HB 391.

Thank you for this opportunity to express my views.

AN ECONOMIST'S VIEW OF THE PROPOSED ALASKA SCIENCE FOUNDATION
David M. Reaume, February 22, 1988

In a review of the professional literature on the relationship between research and development expenditure and economic growth, Morton Kamien and Nancy Schwartz of Northwestern University's graduate school of management had this to say: "All of the evidence at the level of the firm, industry, and economy indicates that the contribution of R&D to economic growth and productivity is positive, significant, and high."

[JOURNAL OF ECONOMIC LITERATURE, Vol. XIII, No.1, page 11 (1975)]

Nothing that has happened since their survey was conducted has changed that conclusion. The present consensus opinion among professionals who have studied the issue is that the gross social rate of return to R&D expenditure lies between 30% and 50%; where by "gross social return" is meant the profits of the innovator plus any profits which accrue to imitators or which can be directly attributed to the use of the innovation.

A question immediately arises. Can a government funded and managed R&D program be expected to perform as well as the average of those which have been shown to yield such large gross social rates of return? In the body of this report I will address two aspects of this question of interest to those who wish to judge the merits of the proposed Alaska Science Foundation. (1) Why should state government involve itself in R&D; and (2) What can Alaska expect to realize in the form of a return on its investment in R&D?

WHY SHOULD STATE GOVERNMENT GET INVOLVED ?

There are five justifications for Alaska state government involvement in an R&D program aimed at broadening our economic base: (1) the widespread sharing of risk and thereby its effective reduction; (2) the possibility that industries important to Alaska's future cannot or will not optimally invest in R&D; (3) the tendency towards under investment in R&D by the private sector that follows from the inability of innovators to capture all of the rewards of their innovations; (4) the desire on the part of some players to protect their investments in what may be obsolete skills and technology; and (5) government's accepted role as guardian of the interests of the unrepresented, in this context future Alaskans.

(1) RISK SPREADING/REDUCTION-- Investment in research & development even under ideal circumstances is risky. Although the average (mean) return may be as high as 50 percent, the variance of returns is also high, possibly comparable to the variance of results in oil exploration. In other words, the R&D equivalent of finding a dry hole is a very common experience. Government funding of R&D helps to spread the losses from R&D dry holes over a larger number of players. This has the effect of making more attractive many actuarially sound but risky R&D plays that might otherwise be left unexploited. If the additional players stand to benefit from the R&D, their participation may be justified.

(2) INDUSTRIES IMPORTANT TO ALASKA ARE AT THE BOTTOM OF THE R&D PILE-- New products and better ways of producing existing products will be found only if they are sought. Alaska's non-oil workhorse industries are near the bottom of the national ladder in terms of R&D expenditure measured either as a percent of sales, as a percent of pre-tax profits, or per employee. For example, in 1985 the metals and mining industry spent only 1.5 percent of sales on R&D, compared to 4.1 percent for the aerospace industry, 3.5 percent for the automobile industry, 7.3 percent for the drug industry, and 4.4 percent for the electronics industry. The food & beverage industry nationally spent an even lower percent of sales on R&D than did metals and mining (0.8 percent). For whatever reason, (a shortage of funds is likely part of the answer), we cannot expect Alaska's existing basic industries to provide the product and process innovations needed if Alaska is to prosper. (Data from Standard & Poor's Compustat Services as published annually in BUSINESSWEEK magazine's R&D Scoreboard.)

(3) INNOVATORS CANNOT CAPTURE ALL OR MOST OF THE REWARDS-- It appears from the research conducted over the past twenty years that between one-third and two-thirds of the profits directly attributable to an innovation are typically captured by imitators and by others, and not by the person or firm making the breakthrough. What this means is that many advances that are expected to produce more than adequate total profits are not pursued if too large a fraction of the total can be captured by parties other than the innovator. The patent system is an imperfect guarantor of property rights. If many Alaska players gain from a single innovator's breakthrough, state government funding may be needed to assure that good projects with dispersed benefits find their way onto the R&D agenda.

(4) ENTRENCHED INDUSTRIES MAY SUPPRESS R&D IN ORDER TO PROTECT EXISTING INVESTMENTS-- This is another way of saying that the goals of companies doing business in Alaska need not include growth and expansion if the risk to existing products and technology is perceived as great. In such cases new products may be much delayed or may be developed by others at some cost in terms of missed Alaska opportunities. Satisfaction with the status quo and mis-estimation of potential demand have been identified as other reasons why R&D may be suppressed. (Examples on request.)

(5) GOVERNMENT HAS A SPECIAL OBLIGATION TO FUTURE ALASKANS-- Future citizens are the special concern of government, or at least have been considered so at most times in U.S. history. Operationally, this means that government in its role of guardian of the interests of the unrepresented should be somewhat more forward looking than a citizen concerned solely with his or her own future. In the context of our discussion of the merits of the proposed Alaska Science Foundation, this means that the long lead times inherent in R&D processes should not weigh heavily against endowing the Foundation.

WHAT RATE OF RETURN CAN BE EXPECTED ON AN INVESTMENT IN R&D ?

The consensus is that in the long run the mean gross social return to investment in research and development lies between 30 percent and 50 percent. Of considerable importance is the generally accepted fact that there is a great deal of variation across programs, and for a given program over time. An investment in R&D is risky and acknowledged to be so. Many well designed and well implemented R&D programs show zero or negative returns on investment. It is expected that there will be numerous failures before a success is achieved, just as it is expected

that an oil company will drill many dry holes for every discovery.

(An excellent summary of research into the impact of R&D on growth is TECHNOLOGY, LABOR, AND ECONOMIC POTENTIAL, by Roger E. Brinner, Data Resources, Incorporated Study No. 29.)

In major piece of research conducted for the National Bureau of Economic Research, John Kendrick and Eliot Grossman had this to say:

'The most important determinant of productivity growth is what Denison calls 'advances in knowledge'-technological and organizational-as applied in production. It results from cost-reducing innovations in the ways and means of production.' (PRODUCTIVITY IN THE UNITED STATES TRENDS AND CYCLES, Johns Hopkins University Press, 1980, page 16)

Of the 30 percent to 50 percent mean gross return on R&D investment about one-third to two thirds is typically captured by the investor with the remainder accruing to other players. The IBM company benefited greatly from prior investments by Apple Computer. Other companies, some outside of the United States, benefit from the developments pioneered by Apple and by IBM. In principle there exist many innovations with a more than adequate gross social return on investment which will not come to market or which will be delayed for some time because the innovator cannot capture enough of the return.

Translated into direct impacts on Alaska these observations can be restated in the form of a small set of propositions.

Proposition #1: There are no guarantees that an expenditure on R&D will have any measurable impact on the Alaska economy beyond the creation of R&D jobs per se.

Proposition #2: For every \$1 million invested in Alaska R&D an expected return of 40 % on investment means that the possible outcomes measured in terms of annual income created center around \$1.4 million per year.

Proposition #3: The potential for a bonanza exists. Publicly funded R&D could lead to breakthroughs with very large rates of return.

A well-designed Alaska Science Foundation is a good idea. On average, the results can be expected to be unexciting but solid; the downside loss potential is minimal (at most we lose the interest on the endowment); and the upside potential is worth reaching for.