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FUTURE FUNDING OF RESEARCH

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Introduction

Pleasure to be with you today and to have the opportunity to talk informally with you about "Future Funding of Research" as viewed from a perspective to which I must confess, I am still adapting. There are those who imagine that the post of an advisor in the White House conveys unlimited power to stop and start programs -- to command chauffeur driven limousines -- to decide and guide the programs of a nation. It is hardly that. There are a lot of things going on at any given moment -- no question. There are all manner of new ideas, initiatives and directives being proposed and missivos going in every direction. It is not, however, an orderly process. One of my colleagues suggested that his job, as he perceived it, was not unlike that of herding a roomful of cats from point A to point B. That seemed reasonably apt to me until I discovered he was discussing his previous job as a Dean.

I was accustomed to the usual scrutiny and outlandish speculation that surrounds a Dean's office but not really prepared for that which surrounds the White House.

Illustration: Genome patenting -- briefing and meeting Blue Sheet

Illustration: Casual remarks at meeting "The White House thinks"

Important first to say something about the Office of Science and Technology Policy as I must confess that when first I was asked to serve, my own notion of the Office and what it did was fuzzy at best -- and for good reasons -- but it is unimportant as will be apparent to see it in context and in history --

- **Concept of science advisor - V. Bush and nuclear Eisenhower/Kennedy**

- **Sputnik**

- **Nixon**

- **1976 - Enshrined in Federal legislation**

  President appoint/Senate confirm Science Advisor

  4 Associate Directors

- **Carter years and Press**

- **Reagan years.**

<u>Bush admin:</u> Science and Education seen as key to the future of America and good Science as key to sound policy formulation.

Assistant to the President - Bromley

Associate Directors - 1st time

Ind. Pol.

International Health

Space/Physics

Life Sciences - Wyngaarden

Office 15 to 50

PCAST

FCCSET

My own initiative - unexpected for me and indeed a surprise to many of my colleagues. I had not been politically involved with either party and knew none of the White House administration.

Asked by Bromley

Calls from Press/Bennett/Their

Principles: Science/Education-Key -- President is serious

Interagency planning

Important that good science inform policy

You must know, however, that I am <u>not</u> engaged with domestic policy -- e.g. reform of health care delivery and financing including such as abortion policies; 2 MD's in the White House -- Burton Lee and D.A. Henderson;

Whether role will be changed remains to be seen.

Our agenda is constantly in flux -- that which exists in the morning could be different by nightfall.

The core of our interest, concern and responsibility is research and science -- and your interest today is research and trends in funding. Let me be perfectly candid is saying to you that this has not been an easy or comfortable year for science. In part, one can attribute this to a credibility gap which appears have opened between the public and the science community -- a gap in confidence and respect. Efforts are being made to close it but there is some way to go.

- **Stanford and its indirect cost problems raised the curtain. I am told that many were not surprised; that, comparable to a taxpayer dealing with the IRS, Stanford had pressed and stressed the system. Whether or not they transgressed appropriate boundaries, they succeeded poorly in endeavoring to present a public explanation. Other investigations followed and those who craved publicity presented a case in startling, tabloid style. Totally lost in the feeding frenzy was the fact that less than 1% of indirect costs proved to be in contention.**

- **Before the facts were in the scientists then regrettably checked in with allegations that they knew all along that fat cat administrators were ripping them off and that the country would be far better served if more money were to be taken from indirect costs and put into basic research (garage, e.g.).**

- **Meanwhile, it was evident to all that a squeeze in research funding had developed -- in substantial part resulting from the Federal government trying to be responsive to investigator demands that research grants be extended beyond 3 years. This effort began but it committed more resources out into the future leaving much less for new R01s.**

- **There were other contributing factors such as the cost of individuals grants increasing disproportionately (instruments?). However, the bottom line is that funds have been and are tight and internecine warfare has inhibited rational discourse.**

- **There were thus two problems -- inadequate research funds and the indirect cost problem -- A veritable feeding frenzy of "quick fixes" emerged as Congressional staff and some in the Executive Branch responded by trying to solve both problems simultaneously, proposing simply that indirect costs be cut in order to expand the base of new R01s. Simple solutions were foreseen for complex problems to the detriment of both scientists and their institutions. Happily OSTP/OMB has been able to assume control.**

As if this were not enough, the David Baltimore and Bob Gallo problems emerged and, like the indirect cost quandary, they were not terribly well-handled. I personally do not believe that fraud in science is common or widespread but, as one event followed another the principles responded poorly or inadequately, and scientists and science became increasingly suspect. It has not been a vintage year.

Would you as a Congressman be apt to respond by conferring yet more largess on what is perceived as a flawed system?

Whatever current perceptions, you should know that my colleagues and I in the Executive Office of the President remain in awe at the wonder of contemporary research in the life sciences, and we recognize its import for the future well-being of our nation. Whether the focus is improving health, enhancing our standard of living, protecting the environment, or bolstering the economy, our national leaders find themselves looking again and again to the biological sciences for new means to those ends. And they seek not just marginally better means; they seek novel technologies with scope and power far beyond anything envisioned even a decade ago.

These new technologies derive from investigator-initiated research, especially those inquiries that probe the most fundamental functions and forms of the living state. To many, including probably everyone in this room, this fact is self-evident and therefore adequate justification for continuing to spend public and private dollars on self-starting scientists.

Others, however, question the efficiency, if not the efficacy, of this investment strategy. They are skeptical about expecting a collection of asynchronous, independent initiatives to achieve particular societal goals. They are more comfortable with consensus than with idiosyncracy. They favor pert charts over serendipity. And they find disquieting the apparent paradox that, in science, the one who aims most intently at the target is often the one least likely to hit the bull's eye!

Laypersons, including some of our elected representatives, tend to harbor such thoughts and feelings. That should come as no surprise.

I sense, however, that we to often overlook the necessity of communicating with our principal patrons, the taxpayers as to what return they are getting on their investment. Or, almost as risky, we have assumed that a few knowledgeable opinion

leaders in the national government and elsewhere can bring everyone else along. We should be thankful that the latter approach has worked as well as it has.

But times are changing. Our representative democracy does not work well without an informed electorate. One of our most important collective responsibilities in the 1990s must be to enhance public literacy about science and technology. Laypersons need help to understand better what to expect from the research they finance. This task warrants much more serious attention in the years immediately ahead than what we have been accustomed to giving it.

The US government long has been uniquely generous in its support of the life sciences but the growth in the ranks of qualified investigators and meritorious proposals is outpacing the growth in funds. Thus, although the number of funded projects is at an all-time high, so is the number of unfunded-but-deserving ones. Many mid-career scientists consequently are experiencing more difficulty in keeping their laboratories going; and many novice investigators, awash in the runoff of their mentors' anxieties, have new reasons to be uncertain about their own career prospects. No wonder even some of the staunchest advocates of science and technology are calling for clear-cut goals, detailed plans, and sharply delineated priorities to guide the enterprise.

That the United States has led the world for the past fifty years as a sponsor of science and technology is a source of considerable national pride. We must never forget, however, that the operative word inside the Beltway has been - and continues to be - "utility". If research had not proved uniquely valuable to the Allied cause in World War II, President Truman and the Congress would not have moved as quickly as they did in the postwar era to harness scientific and engineering talent for the domestic agenda as well as defense. Broad-based support for research, especially within the universities, thus became and remains a national policy on the presumption that a stream of social benefits will ensue.

Complementing these trends is a generic one: biotechnology. The molecular and cell biologists funded by the NIH and other agencies over recent decades bequeathed us a well-stocked bag of powerful tools for altering the genetic makeup of animal and plant cells so that they fulfill new uses or serve old ones better. This legacy from investigator-initiated basic science is now revolutionizing the ways that industry manufactures drugs, diagnostics, and vaccines. And the "New Biology" seems destined to make an indelible mark on additional arenas before the end of the century as scientists apply biotechnology to create more renewable energy resources, boost agricultural production, and protect the environment.

Already the vista of applications is impressively wide. It stretches from genetically engineered microbes that synthesize human insulin or degrade oil spills -- to genetically engineered plants that grow more efficiently or produce their own pesticides -- to genetically engineered human white blood cells that dissolve malignant tumors and new families of vaccines.

The promise for tomorrow is so vast as to defy description. The knowledge and technology soon should be in hand, for example, to develop microbes that will exhibit luminescence upon encountering a particular toxic chemical - or that will liquefy coal - or that will catalyze nitrogen fixation at unprecedented rates. Transgenic animals and plants soon will be mainstays in the production of pharmaceuticals, foods, and fibers. And genetic engineering now gives credibility to the long-held dream of a single multivalent vaccine with which to immunize children soon after birth against 20 or more of the most common disorders of childhood. Biotechnology is our best answer yet to the question, "What has life-science research done for me lately?".

Biotechnology this year is one of five special Presidential initiatives -- calling for a basic research budget of $4 billion. This is detailed in Biotechnology for the 21st Century.

HIGHLIGHTS OF THE BUDGET REQUEST FOR FY 1993

The President's budget request for FY 1993, I am pleased to report, offers a good prognosis for investigator-initiated research. To be sure, the Executive and Legislative Branches never are of one mind on all the financial details where science and technology are concerned. Moreover, with a Presidential election in the offing, the current legislative session undoubtedly will subject the budget proposal to some fascinating perturbations. But I predict that, when the dust settles, the areas of agreement will outnumber by far the areas of disagreement.

If you ever have sat through a budget briefing, you probably are looking to the next few minutes with trepidation. I will do my best to keep the figures sparse and comprehensible, and hope the basic message gets through before your corneas glaze over!

The President's budget for FY 93 calls for $77 billion for research and development (R&D). Defense R&D accounts for $43 billion and civilian R&D for $30 billion. Budget analysts estimate that these expenditures will make up 44% of the spending on R&D next year from all sources public and private.

One must examine the ground rules and trends to appreciate the full significance of these figures. This request had to be developed within the constraints of the Omnibus Budget Reconciliation Act of 1990, which treats defense, domestic, and

international spending as three separate, walled-off compartments; that is, reductions in one cannot be used to increase the others. Moreover, for FY 1993, the Act requires that total domestic discretionary spending be no greater than for this year. That creates a zero-sum game, meaning that a proposed increment anywhere in the domestic discretionary budget must be offset by a corresponding decrement. Accordingly, the President had to make a host of tough choices to favor civilian R&D as he did.

The $77 billion total for R&D is only 3% over FY 1992, but the $30 billion for civilian R&D is an increase of 7% or $2 billion. This is because defense R&D is virtually no growth. The emphasis on the civilian side continues a trend of recent years, with the result that, if the Congress agrees, the budget for civilian R&D will have increased 43% or $9.1 billion since FY 1989.

Another perspective may be helpful to you. If funded as proposed, civilian R&D will account for 15% of all domestic discretionary spending by the Federal Government next year.

Within the $30 billion allotted for civilian R&D, the division between applied research and basic research is $17 and $13 billion, respectively. Of the two, however,

basic research is to grow more rapidly. The proposed increase for basic research this year is 9%, whereas that for applied research is 6%.

Among the noteworthy features within the budget for civilian R&D are the following:

- support for individual investigators through the NSF, the Department of Energy, and the Department of Health and Human Services is to grow by 9%;

- the budget for the NSF is to increase 18% overall, thereby maintaining a trajectory for doubling by 1994;

- biotechnology research, designated for the first time this year as a Presidential Initiative, is proposed for a 7% increase to over $4 billion distributed across the budgets of 12 different agencies;

- the Human Genome Project, a joint venture of the NIH and the Department of Energy, is recommended for a total budget of $175 million -- a 7% increment; and

- **the National Research Initiative in agriculture is proposed to have a 53% increase to $152 million, accompanied by a strong recommendation to the Congress to allow the money to be awarded on a competitive basis rather than earmarking it for particular institutions or projects.**

All in all, the R&D budget is, I believe, as positive as it could be, striking a careful balance between short-term and long-term objectives.

The bottom line to all of this is that there continues to be strong support both in the Executive and Congress for investment in research, especially civilian R&D as a prudent, long-term investment in the future of America. As I noted earlier, however, general support for research has been shaken during the past year. Reassurance is needed that the invested funds are being used wisely and that the integrity of the research establishment is sound. All of us need to participate fully in this exercise.

This is compounded by a second problem of which you are well aware, i.e. increasing public questioning of the relevance of our academic institutions. Both academic institutions and the research they do need to be seen to have a greater tangible relevance to society and societal issues. Excellence in an ivory tower is not

sufficient. In part, this can be accomplished by better communications with those we serve and who pay the tariff. In part, I believe it will require that changes be made in existing relationships between the university and the community, be it the public at large, state and local government or private industry. Better bridges need to be built between our basic research enterprise and private industry. This has begun but I sense -- and indeed know from my years at Hopkins -- that we have not yet done well. For those in academic health centers, there are special challenges. Too many centers today remain isolated from their own communities -- performing magnificent feats of research and rendering exemplary sickness care. How many are concerned about the health of the communities wherein they reside? How many are sufficiently broadly engaged in primary care to be able to instruct students? How many are participating actively in shaping health care planning and finance within their own community and the state so as to assure an affordable and sustainable health system? From any number of meetings with Academic Health Center directors, I can only tell you -- very few. I find this astonishing given the turmoil surrounding the provision of health care and the countless proposals for radical restructuring being advanced on every side. Fiscal austerity results in probing questions regarding relevance being put to all institutions and this questioning is unlikely to abate in the foreseeable future.

As we look beyond the near term, what is the future for support of research. My personal belief is that it is highly favorable but with qualifications. It requires that

trust in the integrity and fiscal prudence of our research institutions be reestablished and the scope and nature of their contributions to society must be more readily seen as relevant to coping with societal issues.

Over the longer term a substantial increase in fiscal support for research will require that added discretionary funds be found. A peace dividend would accomplish this but all such savings could rapidly vanish in the continuing escalation of sickness care costs, most of which are being devoted to Lew Thomas' category of costly half-way sickness care technologies.

To date, we in medicine have been allowed to operate as a demand-driven sickness-care program; we have seldom been called upon to set priorities. And such efforts as have been made to set priorities have been strictly resisted.

Should we, can we make a case to augment funds for developmental research directed toward preventive measures and toward community-based health initiatives? Might not the time be ripe to examine the question as to how best medical research institutions -- most notably academic health centers -- could better relate both to their own communities and to the private sector which is the ultimate medium for the translation of basic research into practice?