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Record Group/Collection:	George H.W. Bush Presidential Records
Collection/Office of Origin:	Science and Technology Policy, Office of (OSTP)
Series:	Bromley, D. Allan, Files
Subseries:	General Science Files
OA/ID Number:	62044
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Folder Title:
Materials [1992]

Stack:	Row:	Section:	Shelf:	Position:
	0	0	0	0

TYPE: Information DOCUMENT NUMBER: 9203272
ORIGINATOR: 03 STATUS DIRECTORATE STATUS C
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FROM: LOGAN, J.G.:APPLIED ENERGY SCIENCES, INC.

TO: KARL ERB

DATE OF
CORRESPONDENCE: 10/21/92

SUBJECT: Copy of his letter to the President re: Department of Education.

****
DIRECTORATE ASSIGNED: STAFF ASSIGNED:

ACTION REQUIRED: STAFF ACTION:

****
SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 10/30/92

****

COPIES TO:

****

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:

REMARKS: No action necessary.

OSTP RECEIVED: DEPT RECEIVED: 10/30/92
FILE: MATERIALS--GENERAL

CENTRAL FILES:

OCT 30 1992

APPLIED

ENERGY

SCIENCES, INC.

DR. J.G. LOGAN, PRESIDENT

3652 OLYMPIAD DRIVE
LOS ANGELES, CALIF. 90043

(213) 291-2534

October 21, 1992

Mr. George W. Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20506

Dear Mr. Bush:

The purpose of this letter is to suggest that a recent unpublicized action by the Department of Education if properly exploited, as suggested in an attachment, could demonstrate that a very active role has been quietly undertaken by the Administration of President Bush to address the areas cited below.

President Bush is by now probably very aware that the current state of the economy suggests the need to alter the impression that the President stands for minimal government interference in the economy and in the lives of Americans, at levels much less than those proposed by Governor Clinton.

An image should be immediately projected that an active role is being taken by the President to: upgrade the economy; improve education in the public schools in order to achieve the stated goals by the year 2000; ensure continued dominance in technology; stimulate the creation of needed new manufacturing opportunities to counteract current trends producing enormous job loses in that vital sector; and so upgrade the domestic economy that an increased gross domestic product could produce the necessary impact on the national debt, simultaneously reducing the need for government action to ensure adequate health care.

Both the Secretary of the Department of Education and the Director of the National Science Foundation might now be aware that the significance of recent research carried out in a rather obscure branch of the classical theory of fields has not been recognized and its potential properly exploited.

The significance of the little noticed research has been described in the attached copy of recent correspondence with the National Academy of Engineering. The potential for exploitation of this fundamental research, stimulated by an engineering need in the missile and space programs and

carried out in the Applied Sciences Division of the California Institute of Technology, could only be realized as a result of the very explosive advances in computational capability provided by current supercomputers, as well as the display potential now existing even at the personal computer level.

Very briefly, as is described in the attachments including copies of recent correspondence with Governor Cuomo's Office, the classical field behavior in the neglected extremely rarefied gas domains, observable in any fluid field, provides a basis for constructing exact visual models simulating the behavior of the fundamental particles, the protons, electrons, and atoms. The behavior of the classical models can be designed to reproduce the physical processes observed in nature.

The particles comprising the systems can be designed to interact naturally because the forces produced by the fundamental particles are accurately simulated. Processes can be controlled and visually studied. The unique field phenomena provide the first bridge connecting the conventional Newtonian mechanics and the quantum behavior. This quantum behavior has been so well described by the quantum electrodynamics that this field has been considered to be complete and closed.

This connecting link provides the basis for a dramatic improvement in understanding and achievement in the sciences in the pubic schools and yields a basis for achieving dramatic new insights into physical behavior at fundamental levels. New advances in technology, requiring improved understanding of basic phenomena, can be achieved. Areas such as those identified with materials improvement, energy conversion, non-hazardous energy generation, molecular structure and chemical formation, pharmaceutics for health science applications, environmental control, and waste management can be impacted.

Please note that the impact on the domestic economy and leadership in both education and technology, when fully recognized and exploited, could potentially equal that resulting from the recognition of the potential and the exploitation of the energy generation capability achievable from nuclear fission and fusion. There has, unfortunately, been no "Einstein" to describe the potential and directly correspond with the President and emphasize the need for the Federal Government to undertake an active role in the exploitation.

However, the potential might even now be recognized by some states (and possibly by Mr. Perot). The President might wish to mention, in a very brief address from the Oval Office (in his capacity as President), that this is one of the results of a series of activities that have been initiated to demonstrate his immediate focus on the domestic economy and the identification of new approaches and activities that can offer almost immediate results for improvement of the economy. The focus was on education, technology, manufacturing, and industrial development.

This might even be mentioned shortly before the election to project the image of an active and effective President. This could easily be done by writing to the Governors and suggesting that the overlooked field phenomena should be examined for the possible potential for improving education and technology development.

A dramatic improvement, in the domestic economy, could result from the exploitation of the results of this little noticed research at the California Institute of Technology. The potential is now being recognized although this recognition is independent of any Federal action or support.

Sincerely yours,

Joseph G. Logan
President

Attachments

cc: J.D. Beason
K. Erb

APPLIED

ENERGY

SCIENCES, INC.

DR. J.G. LOGAN, PRESIDENT

3652 OLYMPIAD DRIVE
LOS ANGELES, CALIF. 90043

(213) 291-2534

October 21, 1992

COPY

Dr. Robert M. White
National Academy of Engineering
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Dear Dr. White:

The information presented in the attached copies of recent correspondence is for your interest and information only.

The purpose of the correspondence with Governor Cuomo's Office was to indicate the significance of the engineering-oriented results of recent investigations of the phenomena characterizing extremely low density fluid domains. The existence of a basis for creating a new form of engineering software, software able to produce the first accurate classical visual simulations of the natural behavior of systems of the fundamental particles, was suggested. These results are based on a complete and independent engineering-oriented development well-documented in the technical literature, a development essentially from first principles, and free of a large number of arbitrary assumptions.

It appears that the unique field phenomena can provide the basis to establish the first connecting link between the classical Newtonian mechanics and the quantum electrodynamics. The exact form of the quantum equations can be reproduced. This is what was pointed out to Dr. Dowling. A modeling basis can result that provides a critical missing link in current computational physics and chemistry and in molecular and materials modeling, the ability to accurately simulate the force fields produced by the fundamental particles.

The promise is offered for achieving new insight into physical phenomena at a microscopic level. An effective method is now needed for incorporating the published results of the research into the current curriculum for the improvement of the education of students in the sciences in the public schools. This could now occur through the current development of the new curriculum standards being carried out by the National Academy of Sciences.

The demonstrated, and justified, validity of the well developed branch of physical theory comprising the quantum electrodynamics has, with good reason, been assumed to represent a classic example of a complete and closed field.

Consequently, it has been relatively easy to ignore the work in classical field theory of H. Grad at New York University, the work of L. Lees and H.T. Yang at the California Institute of Technology, and the recent work of H.T. Yang at the University of Southern California, as well as the work of others such as S. Kosowski at the Institute of Technological Research in Warsaw.

Their work was identified with the behavior of classical bodies in the extremely rarefied gas domains. In these domains, the field particles are characterized by mean free paths so large that the possibility of collisions between field particles could be ignored, when compared with the probability of interactions occurring between the field particles and any bodies, or systems of bodies, immersed in the domain.

The unique field characteristics that result in these collisionless particle, or free molecule, (Knudsen) domains have been well documented. However, the unique characteristics have been overlooked by theoretical physicists and chemists. This is especially unfortunate because of the contributions that might have been made to the improved understanding of physical phenomena at microscopic levels in education, research, and engineering-related investigations for industrial applications.

Based on the published descriptions of the field phenomena, the potential is easily seen, and the significance and the modeling approach is easily described.

The emergence of the classical collisionless particle domains, and descriptions of some aspects of the unique field characteristics, have been described by Grad. He pointed out the similarity between the limit solutions of the thermodynamics-based Boltzmann equation and the single-particle distribution solutions of the kinetic-theory based Liouville equation. Independent Maxwellian particle streams exhibiting Galilean covariance result from idealized diffusive interaction phenomena, first suggested by Maxwell and later described in detail by Lees.

The unique stress field phenomena resulting from the change in the transport behavior of the shear and normal stress field phenomena, as a result of the change in characteristics of the descriptive equations from parabolic to hyperbolic, were indicated by Lees. Yang and Lees demonstrated that the first exact model of the behavior of the plane shear wave component of a light wave could be reproduced within the collisinless domain boundaries. The classical waves demonstrated Galilean covariance because the transport medium itself, the independent Maxwellian

stream, is well-known to demonstrate Galilean covariance.

Interchanges of energy and momentum between the field and bodies, when considering the first and second order disturbance transport phenomena that are created, reproduce the effects of "photons" when field particle mass is conserved in the interchange. Simply by assuming that absorption and emission can occur in successive steps in average interchanges (compression and expansion), an idealized Markov process step could be assumed to describe the Brownian movement phenomena first proposed by Einstein. In each step, after the emission process, all prior history of induced motion is lost. The product of the average time for such an exchange, and the energy exchanged in that time in a classical energy equipartition interaction, yields a field constant providing the first classical parallel of a Planck-like constant.

The Einstein diffusion coefficient, expressed in terms of the average root mean square displacement and the average interaction time, in the classical diffusion equation enables a duplicate of the form of the Schrodinger equation to be developed. This classical form yields descriptions of motion phenomena for rotating and non-rotating bodies when an appropriate classical total energy expression is constructed.

A parallel demonstration of the derivation of a classical Schrodinger equation by Nelson at Princeton only assumed the existence of the non-relativistic classical form. The collisionless domain behavior can be observed to satisfy his requirement for the existence of a Planck constant parallel. Nelson demonstrated the derivation based on the Markov process descriptions for Brownian movement phenomena.

When the internal structure of a typical body is assumed to be comprised of a stable group of particles, possessing random velocity distributions equivalent to those characterizing the emitted and absorbed Maxwellian streams, the total internal energy can be described by an average energy per particle that enables reproduction of the well-known Einstein internal energy relation. A total energy expression, comprised of an internal energy term and an expression for a kinetic energy of motion, can be compressed to create an approximate expression duplicating the relativistic form. When a structure is assumed to possess a single degree of freedom for internal rotational energy excitation, a stress field produced by the internal rotation can be identified with a classical body that might also be assumed to possess a small external solid body angular momentum value.

The coupling of the intrinsic spin, or rotation, and a translation motion has been shown in the literature to produce

side force behavior enabling duplication of the Lorentz force effect. Hence, the complete form of the Maxwell equations can be reproduced.

The collisionless domain energy and momentum exchange phenomena, producing body motions in the field, can be identified with Weisskopf's Schrodinger pressure and force concept, and the form of the Bohr relations can then be reproduced classically for the first time. The time duration for any repeatable process can be identified with the product of an integral number and the basic time value for an absorption (compression) and emission (expansion) process. An angular momentum term can be developed reproducing the form of the Bohr relation. The motions produced by the energy equipartition phenomena, at an equivalent "zero degree Kelvin" condition in a constant energy, and constant density, domain, coupled with an attractive central force field, reproduce the equilibrium repeatable standoff condition corresponding to an "s" state.

Coupled rotational and translational motions resulting from system excitation can produce shear disturbance phenomena that enable reproduction of the electromagnetic wave phenomena produced by the excitation phenomena identified with quantum systems. The classical pulse-like behavior yields both wave and particle-like behavior.

Assuming the existence of an excited random internal energy degree of freedom during energy equipartition, a steady repulsive force field of the type first described by Kosowski, that duplicates the effect of an electrostatic force field, can be created. This permanent force field resulting from momentum and energy exchange must be finite since a minimum length condition exists for the separation of bodies (the self-energy is finite).

When composite configurations are designed to reproduce the effects of an attractive normal force field, the Bohr atom model results. In the interactions with the field, mass accumulation effects and mass loss effects by bodies are easily modeled. The Maxwellian velocity distribution condition imposed on the independent streams and the background domain contain high energy components that enable tunneling and decay phenomena to be simulated.

A one-to-one correspondence with the equations and relations of the quantum physics can be demonstrated. The unique feature, as described in the Attachments, is the greater generality of the classical formulations. For example, any body motion can create a disturbance in the field. The continuous emission of classical field disturbances can be described because of the continuous

momentum and energy exchanges that take place in the medium.

After the fact, it is not at all surprising to observe that the unique field phenomena characterizing classical collisionless particle domains can provide the basis for constructing classical bodies whose behavior in these domains can yield the first classical visual simulations of the behavior of the fundamental particles described by the quantum electrodynamics (QED).

A basis would therefore appear to exist for dramatically improving interest and education in the sciences in the public schools. Classical visual models can be constructed.

The potential, when exploited for improving the understanding of basic physical phenomena at microscopic levels, could prove to be equally dramatic. The obvious unique feature is the ability to develop extremely accurate visual models with appropriately designed software, software that can also offer the potential for creating self-determining models of observed or desired materials and chemical systems.

This potential for contributing to the improvement of understanding of fundamental physical phenomena at the microscopic level has not, apparently, been widely recognized or appreciated. As a consequence, there has been little interest in incorporating descriptions of the classical collisionless (Knudsen) domain phenomena in the current educational literature even at a university level.

One unfortunate result, therefore, is the failure by computational physicists, chemists, and engineers to recognize the potential for developing new forms of simulation and modeling software, software yielding simulations that would have enabled accurate visual investigations of physical phenomena at microscopic levels in real time for the first time.

Sincerely yours,

Joseph G. Logan
President

Attachments

cc: F. Press
H. Frauenfelder

UNITED STATES DEPARTMENT OF EDUCATION
Office of the Assistant Secretary
for Educational Research and Improvement

OCT 16 1992

Dr. Joseph Logan
Applied Energy Sciences, Inc.
3652 Olympiad Drive
Los Angeles, California 90043

Dear Dr. Logan:

Thank you for your letter of September 22, 1992. I have reviewed your past correspondence with the U.S. Department of Education. As you know, the curriculum standards for school science are currently under development by the National Academy of Sciences. Among the members of the development committees are many distinguished scientists and mathematicians who will certainly give proper consideration to the importance of the classical collisionless particle domain to the teaching and learning of science in the schools.

Sincerely,

Conrad Katzenmeyer

Conrad Katzenmeyer, Ph.D.
Director, SSP
Office of Research

file

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9202535
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

****

FROM: MILLER, Daniel N.: AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS

JUL 22 1992

TO: DR. D.A. BROMLEY

DATE OF CORRESPONDENCE: 07/01/92

SUBJECT: HE IS WRITING TO EXPRESS THEIR CONCERN OVER THE MINERAL EXPLORATION AND DEVELOPMENT ACT OF 1991.

****

DIRECTORATE ASSIGNED: PHYSICAL SCIENCES

STAFF ASSIGNED:

ACTION REQUIRED: AS APPROPRIATE

STAFF ACTION:

****

SENDER'S DUE DATE:

OSTP DUE DATE: 08/04/92

STAFF DUE DATE

DATE COMPLETED:

DATE COMPLETED/DEPT:

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COPIES TO: D. Allan Bromley
PATRICK WHITE

****

WHITE HOUSE TRACKING #:

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REMARKS:

OSTP RECEIVED: 07/20/92 DEPT RECEIVED:

FILE: PHYSICAL SCIENCES

CENTRAL FILES: MATERIALS-GENERAL

2555

AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS

NATIONAL HEADQUARTERS
7828 Vance Drive, Suite 103, Arvada, Colorado 80003 • (303) 431- 0831 • FAX (303) 431-1332

RE

92 ... 28

MAIL

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EXECUTIVE DIRECTOR
William V. Knight
National Headquarters

July 1, 1992

D. Allan Bromley
Asst. to the President for Science and Technology and Director
Office of Science and Technology Policy
Room 360, Old Exec. Office Bldg.
Washington, DC 20506

Dear Director Bromley:

The American Institute of Professional Geologists (AIPG) is the only national organization which provides professional certification for geologists. Our membership includes 4,500 professional geologists from all disciplines of geology and all areas of employment, including academic, environmental, government and natural resource related fields. We are alarmed and concerned with some of the provisions of H.R. 918, "The Mineral Exploration and Development Act of 1991". We feel that, if passed as reported out of committee, it will seriously impact the nation's future exploration effort and the employment of geologists in the areas of mineral exploration and mining geology, and have a strong negative impact on the viability of the U. S. mining industry as a whole.

Specifically, we feel that many of the provisions of Title II of H.R. 918 are unnecessary. They are redundant with respect to existing statutes and agency rules and would only add another costly time delay to the already time consuming and expensive environmental requirements confronting the nation's exploration efforts. In addition, we feel that a royalty on hardrock minerals would be completely counterproductive. Many mines are now operating on a very marginal basis but they do provide jobs and other commercial activity that generates taxes which benefit the public. These marginal operations cannot survive if an additional royalty obligation were imposed based on gross proceeds.

The AIPG has consistently supported meaningful modifications of the present mining statutes since the early 1960's when necessary, recognizing that there are minor inequities and other provisions in the present law. We feel that environmental protection during mineral exploration and development is necessary and have testified to the Congress to that effect. We are however, opposed to the onerous requirements set forth in Title II of H.R. 918 as well as the royalty provision and urge you to take whatever action is necessary to eliminate these concerns.

Very truly yours,

Daniel N. Miller, Jr.

Daniel N. Miller, Jr.
President

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

August 4, 1992

Dear Dr. Miller:

I am writing in response to your letter to Dr. Bromley concerning H.R. 918, The Mineral Exploration and Development Act of 1991. I appreciate learning your views and those of the American Institute of Professional Geologists on this legislation.

T S Ary, Director of the Bureau of Mines, Department of Interior is much better equipped than I to respond to you, and therefore I have forwarded your letter to him for his consideration.

Sincerely,

Karl A. Erb
Associate Director for
Physical Sciences and Engineering

cc: T S Ary

Mr. Daniel N. Miller, Jr.
President
American Institute of Professional Geologists
7828 Vance Drive
Suite 103
Arvada, CO 80003

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

August 4, 1992

Dear T:

The attached letter appears to make a legitimate point, but I am afraid I know far too little about the topic to be able to respond intelligently. Would you please respond to Miller for the Administration.

Sincerely,

Karl

Karl A. Erb
Associate Director for
Physical Sciences and Engineering

Attachment

Dr. T S Ary
Director, Bureau of Mines
Department of Interior
810 7th Street, N.W.
Washington, D.C. 20245

"INVITATION FOR DR. BROMLEY"
DOCUMENT NUMBER: 9201318

TYPE: INVITATION-SPEECH
ORIGINATOR: 02
****
SPEECH: YES NO

FROM: HELLEM, Steven B.: USACA

DATE OF EVENT: 05/20/92 THRU:
TENTATIVE DATES:

LOCATION OF EVENT:

TIME OF EVENT: 9:25 A.M.-9:40 A.M.

SUBJECT: AN INVITATION TO BE A SPEAKER AT THEIR SPRING CONFERENCE.

****

RSVP: 04/28/92

CONTACT PERSON: ABBOUD, Jeff

CONTACT NUMBER: 202-638-1200
****

INVITATION ACCEPTED? YES NO

****
COPIES TO: PHYSICAL SCIENCES

REMARKS:

DATE OF LETTER: 04/03/92 DATE RECEIVED: 04/14/92

FILE: P-INVITATION

Dear Graham - FYI 1318 4/7

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92 APR 14 P3:34

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USACA

UNITED STATES
ADVANCED CERAMICS ASSOCIATION
Suite 300
1440 New York Avenue, NW
Washington, DC 20005
Telephone: 202 63 USACA (638 7222)
or 202 638 1200
Fax: 202 639 8685

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3M Company
Union Carbide Coatings Service Corporation

April 3, 1992

Dr. D. Allan Bromley
Assistant to the President for
Science & Technology
Old Executive Office Building
Washington, DC 20500

Allan - FYI, I have attached the USACA 6-point program. Karl

Dear Dr. Bromley:

On behalf of the United States Advanced Ceramics Association (USACA), I would like to invite you to be our speaker at our Spring Conference on Wednesday, May 20, 1992.

USACA is a trade association of 27 major manufacturers and users of advanced ceramics utilized in both structural and electronic applications. We are dedicated to identifying and supporting advanced ceramics programs that will speed the commercialization of advanced ceramics and support the domestic advanced ceramics industry.

Enclosed is information regarding USACA and our advanced ceramics development and commercialization program. Please note the wide range of applications for advanced ceramic materials and products.

Dr. Bromley, we hope you will be able to join us at 9:25-9:40 a.m. on May 20. We anticipate your comments to last about 10 minutes with 5 minutes for Q&A. Your contribution to the Advanced Materials and Processing Program is of great interest to the USACA members. Specifically, we would be interested in hearing your thoughts regarding the direction the program will take in the future.

If you would prefer another time slot on the 20th, we will do what is necessary to accommodate your schedule. Should you have any questions, please contact me or Jeff Abboud at 202-638-7222 or 202-638-1200.

Sincerely,

It was good seeing you in Utah.

Steven B. Hellem
Executive Director

(ACA):AC9472ACA

MTL's.

UNITED STATES ADVANCED CERAMICS ASSOCIATION

BRIDGING THE GAP FROM THE LABORATORY TO THE MARKET

Both the United States and its foreign competitors have identified advanced ceramics as critical to future employment, national security, gross national product and balance of trade. Many foreign governments are aggressively working with their domestic producers to develop and commercialize the technology. Likewise, the competitiveness and survival of the U.S. industry depends on the successful commercialization of these materials.

However, the time required to bring advanced ceramic products from concept to market can be more than 10 years, and the necessary long-term investment can be borne only by the country's strongest companies, many of which are unwilling to take the financial risk. To meet this challenge, USACA has developed a six-point Advanced Development and Commercialization Program, entitled the "Bridging the Gap Initiative."

These points are as follows:

Point One:

Create multi-year federal ceramic components demonstration programs that will support the domestic development, manufacture, purchase and in-use demonstration of advanced ceramic parts over a five-year period. This program should target military and commercial advanced ceramic areas, including automotive, aerospace structural, aerospace propulsion, electronics, machine tools, additional weapons systems, component applications and industrial processing equipment.

Point Two:

Create Defense Production Act Title III advanced ceramics programs. These programs would take the form of purchase commitments (guarantees) to buy ceramic components produced by domestic advanced ceramics manufacturers for incorporation into various military systems.

Point Three:

Create and expand investments in domestic advanced ceramics manufacturing science and technology programs aimed at demonstrating cost-effective production and reproducibility of advanced ceramic components focused upon specific requirements of end-users.

Point Four:

Recognize the capital-intensive nature of the advanced ceramics industry and promote industrialization in this area by allowing a more competitive return on advanced ceramic components purchased through the federal procurement system and by permitting a first-year write-down of those new capital investments made by the advanced ceramics industry during a 10-year period.

Point Five:

Provide tax incentives, such as government-funded rebates, for domestic advanced ceramics end-users who incorporate advanced ceramics components in products during the next decade, so as to provide "pull through" to the U.S. advanced ceramics industry.

Point Six:

Mandate the vesting of technology rights in advanced ceramics to domestic advanced ceramics manufacturing contractors when they participate in R&D, Man-Tech and demonstration on a cost-shared basis, in order to attract and promote the most commercially attractive and innovative technologies in these efforts.

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9201035
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

****

FROM: DIAMOND, George: GEORGE DIAMOND & COMPANY, INC.

TO: DR. D.A. BROMLEY

MAR 31 1992

DATE OF CORRESPONDENCE: 03/25/92

SUBJECT: HE REQUESTS ASSISTANCE IN SECURING FUNDING FOR HIS ADVANCED MATERIALS.

****

DIRECTORATE ASSIGNED: PHYSICAL SCIENCES

STAFF ASSIGNED: Dave Gamm 4/4/92
Please Draft response
(see note attached)

ACTION REQUIRED: DIRECT REPLY

STAFF ACTION:

****

SENDER'S DUE DATE:

OSTP DUE DATE: 04/06/92 STAFF DUE DATE

DATE COMPLETED: DATE COMPLETED/DEPT: 4/24/92

****

COPIES TO: D. Allan Bromley

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WHITE HOUSE TRACKING #: CONTACT PERSON:

PHONE: EXT:

REMARKS: Dr. [illegible] regarded.

OSTP RECEIVED: 03/30/92 DEPT RECEIVED:

FILE: P-PHYSICAL SCIENCES

CENTRAL FILES:

1035A

RECEIVED
92 MAR 30 P 5:11
MAIL ROOM

George DIAMOND & Co., Inc.

CONNECTOR DIVISION
METAL DIVISION

MARCH 25, 1992

MR. D. ALLAN BROMLEY
ASSISTANT TO THE PRESIDENT
FOR SCIENCE AND TECHNOLOGY
THE WHITE HOUSE OFFICE
1600 PENNSYLVANIA AVE N.W.
WASHINGTON, D.C. 20500

DEAR MR. BROMLEY:

WE ARE ASSOCIATED WITH ROBERT W. WARD, WHO IS THE DEVELOPER OF A PROCESS TO PRODUCE COMPOSITE METAL POWDER.

BOB WARD RETIRED LAST SEPTEMBER FROM GENERAL MOTORS WHERE HE WAS GRANTED THE PRESTIGIOUS "BOSS" KETTERING AWARD FOR DEVELOPING COMPOSITE IRON THAT IS NOW IN PRODUCTION IN GM FACILITIES. THIS TECHNOLOGY ENABLES MANUAFCTURERS TO REDUCE COSTS WHILE ALLOWING THEM TO PRODUCE SHAPES NOT POSSIBLE HERETOFORE.

ADVANCED MATERIALS WILL CHANGE THE BASIC ECONOMICS OF DOZENS OF INDUSTRIES. MORE THEN ALMOST ANY OTHER FACTOR, THEY WILL AFFECT THE COMPETITIVENESS AND PROFITS OF COMPANIES AROUND THE WORLD.

NEW MATERIALS WILL REWRITE BASIC PRODUCT SPECIFICATIONS, WHILE ADVANCED MATERIAL PROCESSES WILL SLASH MANUFACTURING COSTS AND TIMES.

AT THE PRESENT TIME WE ARE WORKING WITH A POWDER METAL MANUFACTURER TO PRODUCE A SECOND AND THIRD GENERATION OF THIS TECHNOLOGY, AND WITH A FEW MOTOR MANUFACTURERS AND BALLAST MANUFACTURERS.

108 WILMOT ROAD ◆ DEERFIELD, ILLINOIS 60015 ◆ 708-940-8100

HOWEVER, WE NEED HELP IN GETTING THIS TECHNOLOGY TO MORE MANUFACTURERS WHERE IT WILL HAVE THE GREATEST IMPACT AND OBTAIN THE BEST RESULTS. WE ALSO NEED HELP TO SET UP A LABORATORY TO FURTHER THIS WORK.

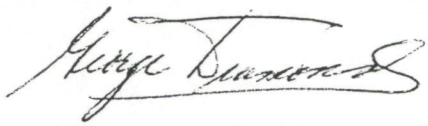
INITIAL COST FOR SETTING UP THE LABORATORY AND A PROGRAM TO PROPERLY DISSEMINATE THIS INFORMATION WILL BE APPROXIMATELY TEN MILLION DOLLARS. A SMALL PRICE TO PAY FOR GIVING AMERICAN INDUSTRY A TREMENDOUS BOOST AND HELP BRING BACK OUR MANUFACTURING BASE.

OUR COUNTRY CAN ILL AFFORD TO IGNORE THIS ADVANCED TECHNOLOGY BREAKTHROUGH. IT IS IMPERATIVE THAT WE ACT ON THIS IMMEDIATELY.

PLEASE CALL OR WRITE THE UNDERSIGNED FOR FURTHER INFORMATION.

SINCERELY,

GEORGE DIAMOND & CO., INC.



GEORGE DIAMOND, PRESIDENT.

GD/DL

CC: ROBERT W. WARD.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

April 29, 1992

Dear Mr. Diamond:

Thank you for your letter of March 25 to Dr. Bromley describing your company's advance in materials. I agree with you that advances in materials can change the course of many industries: In fact, this is an important reason for our recommendation that materials research be highlighted as a Presidential Initiative in the FY 1993 budget.

The Office of Science and Technology Policy develops policy concerning science and technology for the Administration, but does not provide funding for these activities. I would suggest that you contact the funding agencies directly. If basic research funds are needed for your effort, you could contact the National Science Foundation. For more application-oriented R&D, you might try the Department of Defense or the Department of Energy. You should also contact Dr. Schneider at the National Institute of Standards and Technology to obtain a copy of the report entitled "Advanced Materials and Processing: The Federal Program in Materials Science and Technology" which will provide some more insight into other Federal agencies which might be interested in the metals technology you mentioned. I wish you success in your endeavor.

Sincerely,

David C. Cranmer
Fellow

Mr. George Diamond
George Diamond and Company, Inc.
108 Wilmot Road
Deerfield, IL 60015

"Document Control"

TYPE: ACTION DOCUMENT NUMBER: 9201106
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS

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FROM: KANANAGH, Timothy E.: ATTORNEY AT LAW

TO: DR. D.A. BROMLEY

DATE OF CORRESPONDENCE: 03/20/92

SUBJECT: HE IS INQURING AS TO ANY POSSIBLE INTEREST OSTP MAY HAVE IN HIS CLIENT'S CORPORATION AND MATERIALS PROCESSING.

****

DIRECTORATE ASSIGNED: PHYSICAL SCIENCES

STAFF ASSIGNED: Dave Cranmer

ACTION REQUIRED: AS APPROPRIATE

STAFF ACTION:

****

SENDER'S DUE DATE:

OSTP DUE DATE: 04/16/92 STAFF DUE DATE

DATE COMPLETED: DATE COMPLETED/DEPT: 4/7/92

****

COPIES TO: D. Allan Bromley
INDUSTRIAL

****

WHITE HOUSE TRACKING #: CONTACT PERSON:

PHONE: EXT:

REMARKS: KAC responded

OSTP RECEIVED: 03/31/92 DEPT RECEIVED:
FILE: PHYSICAL SCIENCES-MATERIALS

CENTRAL FILES:

1106 A

TIMOTHY E. KAVANAGH
ATTORNEY AT LAW
14 MAY STREET
SALEM, MA 01970

TEL (508) 741-4417
FAX (508) 741-4473

RECEIVED
92 MAR 31 P1:13
OSTP
MAIL ROOM

March 20, 1992

White House Science and Technology Office
1600 Pennsylvania Avenue
Washington, D.C.

RE: Advanced Materials

Gentlemen:

I represent Advanced Ceramics Corporation of America ("ACCA"), which is a newly established Delaware corporation having a usual place of business at Centennial Park, 245 Lynnfield Street, Peabody, Massachusetts.

ACCA possesses certain proprietary technology by which it is capable of fabricating as fired aluminum oxide ceramic substrates that are flat and smooth on at least one major surface and have a one microinch finish. ACCA is capable of manufacturing ceramic substrates in any size (the width and length of the furnace and firing plate being the only limitations), net shape, and thickness down to .001".

In comparison, as you may know, companies such as Kyocera Corporation and Coors Ceramics fabricate substrates that look like potato chips when they come out of the furnace. These substrates require extensive grinding, lapping and polishing to achieve a two microinch finish and, as a result, contain microcracks and are contaminated by various fluids from the finishing processes. These deficiencies negatively affect the substrates functionality and ordinarily cause rejection rates on the order of 20%.

In addition to the tremendous commercial opportunities as fired substrates represent in connection with the microelectronic and semiconductor industries, ACCA's technology can be utilized to manufacture high energy ceramic capacitors capable of holding up to 13,000 times more charge inch for inch over plastic capacitors. Such high energy capacitors would have tremendously useful applications in connection with both commercial and military pulse power systems, for example, not to mention electrical distribution systems.

If you find any of ACCA's technology intriguing, please contact me and I can arrange an exploratory meeting between representatives of your office and my client. ACCA is in need of funding and is currently engaged in discussions to that end with a Japanese businessman. ACCA would prefer not to sell its technology to a foreign concern, but may be forced to do so.

I look forward to hearing from you at your earliest convenience.

Very truly yours,

Timothy E. Kavanagh

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

April 7, 1992

Dear Mr. Kavanagh:

Thank you for your letter of March 20 informing us of the products of the Advanced Ceramics Corporation of America. While the possibilities look exciting, OSTP is a policy organization that does not fund technology such as ACCA's. I suggest you contact those agencies such as the Department of Defense which might use your client's products. I have enclosed a brochure describing the President's FY 1993 Initiative on Advanced Materials and Processing, which may provide some further insights on where to search for government customers for your client's products. I wish you good luck in your endeavor.

Sincerely,

Karl A. Erb
Associate Director--Designate
for Physical Sciences and Engineering

Enclosure

Mr. Timothy E. Kavanagh
Attorney At Law
14 May Street
Salem, MA 01970

"Document Control"
TYPE: Information DOCUMENT NUMBER: 9200686
ORIGINATOR: 03 STATUS DIRECTORATE STATUS C
****

FROM: LOGAN, Joseph: APPLIED ENERGY SCIENCES, INC.

TO: KAE

DATE OF
CORRESPONDENCE: 02/21/92

SUBJECT: Sending more copies of his letter to Physical Review Letters.

****
DIRECTORATE ASSIGNED: STAFF ASSIGNED:

ACTION REQUIRED: STAFF ACTION:

****
SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 03/03/92

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COPIES TO:

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REMARKS: No response necessary.

OSTP RECEIVED: DEPT RECEIVED: 03/03/92
FILE: MATERIALS--GENERAL

CENTRAL FILES:

APPLIED ENERGY SCIENCES, INC.
1861 North Gaffey Street, Suite B
San Pedro, California 90731

Tel (213) 514-5513
Message (213) 514-5522
Fax (213) 547-1915

February 21, 1992

MAR 3 1992

Dr. D. Allen Bromley
Executive Office of the President
Washington, D.C. 20506

Dear Dr. Bromley:

An advance copy of a brief Communication being submitted to Physical Review Letters provides the background for the scientific software design innovation pointed out to you (in previous correspondence) that could substantially impact new technology development. A copy is enclosed for your interest.

The basis for the engineering capability that now exists to develop computer simulations of fundamental atomic phenomena that can be displayed, viewed, and (the behavior) controlled visually is demonstrated. The basis, provided by some overlooked research in the Applied Science Division at the California Institute of Technology, was mentioned to you in previous correspondence.

The primary purpose for writing to you was to point out again that if increased emphasis is placed on encouraging innovation at the White House level, a major step could be taken to improve technology capability, increase manufacturing opportunities, and upgrade the economy on both a short-term and long-term basis.

Sincerely yours,

Joseph G. Logan
President

Attachment

cc: G.W. Bush
✓K. Erb
J.D. Beason

APPLIED ENERGY SCIENCES, INC.
1861 North Gaffey Street, Suite B
San Pedro, California 90731
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February 18, 1992

COPY

Dr. Hans Frauenfelder
Chair of the Governing Board
American Institute of Physics
335 East 45th Street
New York, New York 10017-3483

Dear Dr. Frauenfelder:

You might enjoy reading an advance draft of a recent submission to Physical Review Letters. I think you will be interested.

Once it was shown, by the work at the California Institute of Technology, that a classical particle field model of an electromagnetic wave could exist, the necessity for the existence of Galilean covariance for the transverse wave was obvious. The Newtonian framework within which this could be described, however, was not so obvious. The early material, with the errors and fuzzy logic (Table A), showed that a capability seemed to exist to easily reproduce numerical results using a completely classical approach. The intriguing question was "What would be the results if a parallel, and completely equivalent, model of the special theory existed, and parallel models of quantum phenomena could actually be shown to exist within the framework of the Newtonian mechanics?"

The most surprising result, of course, was the recognition of the natural emergence of the quantum behavior in the extremely rarefied gas domain of classical fluid mechanics. It seemed important to record early thoughts based on the assumption that this alternate approach must exist. The primary problem was simply to identify the single innocent assumption that could provide the basis for an alternate and completely equivalent direction.

It was, of course, not obvious that only the placement of a source point could be involved. It would be most interesting to see what the theoretical physicists might be able to accomplish with a 3 + 1 world concept, based on the results of merging the capability and successes of the current three (or possibly four or five or more) very powerful descriptions of natural phenomena, when merged into a single comprehensive theory. The almost incomprehensible result might be that only very simple analytical descriptions based on the classical Newtonian mechanics might be needed to describe fundamental physical phenomena. Only a single basic equation might be required. The simplicity Einstein firmly

believed must exist could be demonstrated, but not in the direction he would have anticipated. However, the results of his theoretical investigations would be retained, merged into the classical Newtonian framework.

One unique result in the development of physical theory is that advances in theory that accurately describe physical phenomena are not reversible. Newtonian descriptions of transverse wave propagation phenomena are now firmly embedded in the technical literature. Avoidance of the consequences of this result does not reduce the validity. The problem was to determine the appropriate framework in which the significance could be demonstrated. The appropriate framework might be the one suggested in the enclosed advance copy of a submission to Physical Review Letters. Also see the copy of the letter to Dr. Press that is enclosed.

The single basic change was the movement of a source of a transverse wave from a fixed point in space (in an inertial frame at rest in a vacuum domain), to a source point fixed in any moving inertial frame in which the wave was created. The wave center would always possess the characteristics of its emission source at the instant of creation. Subsequent motion phenomena could not be altered because emitted streams could not interact. Changes could only result from subsequent encounters with material bodies in the domain.

Sincerely yours,

Joseph G. Logan
President

Attachment

APPLIED ENERGY SCIENCES, INC.
1861 North Gaffey Street, Suite B
San Pedro, California 90731

Tel (213) 514-5513
Message (213) 514-5522
Fax (213) 547-1915

February 18, 1992

COPY

Dr. Frank Press
President
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Dear Dr. Press:

In the continuing development of physical theory, significant discoveries not occurring in the physics mainstream, and often overlooked, can sometimes alter the course of future development in an irreversible manner.

One such development, the recognition, for the analyses of planetary motions, of the significance of a change in location from the center point of an orbiting planet to the center point of the central body of the planetary system required approximately one-half of a century. Even then, it was firmly rejected. The significance was recognized some one-hundred years later when a theory describing the interaction between classical bodies was formulated.

Recent widely accepted developments in physical theory, occurring approximately one-half of a century later, have now cast doubts on the complete validity of that proposed universal concept.

Unrecognized, but concurrent with present investigations of the overall validity of that concept, a new development occurred, not in the mainstream, that could prove to be of extreme significance for present considerations of validity of that concept and the continuing development of physical theory.

The significance of that new development is suggested in a recent submission to Physical Review Letters. An advance copy is attached for your interest.

That development, of course, was the demonstration, at the California Institute of Technology in the late 1950's, that in extremely rarefied gas domains a transverse wave propagation mode can be observed to emerge that provides the first exact classical parallel of the behavior of a light wave. The significance was not immediately obvious. The research was carried out to investigate phenomena in boundary layer flow regimes. The transverse disturbances, transported in individual streams, were known to be propagated in Galilean covariant Maxwellian streams.

The classical wave descriptions of the phenomena by the Newtonian mechanics required that the streams emitted in any moving inertial frame transporting the wave must propagate as if the inertial frame is at rest. Since the emitting bodies and instruments must be at rest in the moving frame, an observer also at rest can only measure a constant invariant value of the speed.

The classical behavior provides the first, and only, known exception to the wording of the second Einstein postulate. It implies that, if the source of a transverse wave with an invariant velocity in a domain is shifted from an assumed fixed point in space (independent of the motion of the source) to the source point fixed in any moving frame (acquiring the motion of the source at the time of emission), all observations could then occur as if the inertial frame is at rest. The physical vehicle for the transport would be required to exhibit Galilean covariance. Parallels of Einstein's relativistic formulations can then be shown to exist as indicated in the attached advance copy of the submission to Physical Review Letters.

The use of a simple transformation, very similar to the type of transformation employed in the consideration of radiation from moving point charges by Heaviside in 1889 (E. Whittaker, A History of the Theories of Aether & Electricity, Vol. I, 307, Harper & Brothers, New York, 1960), therefore enables the merging of the relativistic relations developed by Einstein into the framework of the classical Newtonian mechanics. The only requirement is the assumption of the existence of a Maxwellian distribution for the wave transport mechanism.

As suggested in the attachment to the transmittal letter, the results could be dramatic. Even the possibility for demonstrating the complete validity of the Newtonian concept is suggested.

Four centuries after the effect of a shift from a moving source in a space location to a "fixed" location was suggested, the striking effect of shift from a fixed point in space for analysis to a moving point is now being suggested.

In the early stages of the investigation of the existence of exact classical parallels, a very preliminary record (Table A) was developed to document some of the early considerations indicating the ability to develop simple analytical descriptions. The attached copy is the first formal paper that resulted. It is surprising that the result described above is only obvious in hindsight. The most significant additional development was the observation of the natural emergence of quantum-like behavior in a classical domain.

The members of the National Academy in the theoretical community might be interested in examining the results of the assumption of a shift in the analysis point, for investigations of wave transport phenomena, from a fixed point in space to a source point fixed in a moving inertial frame.

Sincerely yours,

Joseph G. Logan
President

Attachment

cc: R.M. White
H. Frauenfelder

APPLIED ENERGY SCIENCES, INC.
1861 North Gaffey Street, Suite B
San Pedro, California 90731
Tel (213) 514-5513
Message (213) 514-5522
Fax (213) 547-1915

February 12, 1992

COPY

Dr. Gene Wells
Editor
Physical Review Letters
1 Research Road – Box 1000
Ridge, New York 11961-2701

Dear Dr. Wells:

Attempts have recently been made to acquaint educators in the science community with the significance of the unique classical collisionless domain field phenomena described by scientists at the California Institute of Technology in the late 1950's. These unique field phenomena are inherent in all classical fields. They are characterized by the emergence of Galilean covariant transverse wave phenomena duplicating electromagnetic wave behavior, consequently suggesting the possible existence of an overlooked classical parallel to the Einstein approach.

In the preparation of a brief Note on the modeling of electromagnetic phenomena to demonstrate the existence of this parallel, it was observed that quantum-like behavior emerged naturally in this pure classical domain. The quantum-like behavior occurs when the density of any fluid medium is decreased sufficiently so that the average length of travel of a field particle (the mean free path) greatly exceeds the dimension of any system of bodies immersed in the domain. All disturbances created by the bodies are then transported by separate and completely independent Maxwellian streams.

The descriptions, based on the published literature, yield dramatic results. The existence of the first classical Bohr parallel and the derivation of a Galilean covariant parallel of the Schrödinger equation can be demonstrated. The constraints established by field limits on energy, momentum, and mass interchange between the field and submerged bodies provide the basis for the development of field constants paralleling the recognized fundamental constants. The remarkable capability to duplicate existing descriptions of mass spectra and energy spectra is demonstrated in Tables 1-4 in the submission.

For the first time, a potential can be suggested for designing software for investigations of fundamental phenomena based on the accurate modeling of fundamental body behavior. This potential is based on the ability to reproduce observed force relationships, enabling a visual investigation of the actual

behavior of modeled fundamental particles.

The resulting classical system models, multi-body configurations and complex multi-body systems, will be self-calculating and self-determining. As a consequence, this recent development, described in the attached submission, might be of interest to the general physics community.

The basis for the development of the dramatic new classical modeling capability described in the submittal is briefly summarized in the Attachment to this letter. The modeling potential for educational purposes is, of course, obvious.

If the length requirement is greatly exceeded, could publication in two separate brief submissions be considered? The general physics community should be made aware of the existence of the classical parallels resulting from the assumption of the shift of a transverse wave emission point, from a fixed source point assumed to be identified with an inertial frame also fixed in a vacuum domain, to a source point that is actually fixed in any inertial frame characterized by any constant velocity of motion in which it is emitted. This shifting is characterized, physically, simply by the assumption that the wave transport mechanism, the photon streams, might be characterized by Maxwellian distributions in velocity, a basic characteristic that is essentially demonstrated by all of the fundamental particles immersed in the vacuum domain. All observed distribution descriptions are derived from a basic Maxwellian distribution.

Sincerely yours,

Joseph G. Logan
President

Attachment

Collisionless Domain Phenomena

Please note that the descriptions of the classical collisionless domain mass and field phenomena include:

1. The existence of the first parallels of electromagnetic plane wave propagation phenomena;

2. The existence of Galilean covariance for the wave propagation phenomena based on the wave transport in Galilean covariant streams possessing Maxwellian velocity distributions;

3. Parallels of the special theory relations and mass formulations, in effect merging the Einstein relations into a classical Newtonian framework;

4. A parallel of the relativistic total energy relation;

5. Steady stress field relations duplicating electromagnetic stress field phenomena described by the Maxwell equations;

6. Non-steady stress field phenomena identified with coupled shear disturbances produced by Brownian movement translational and rotational motions duplicating the form of the coupled fields described by the Maxwell equations, a zero-point radiation not described by the Maxwell equations;

7. The identification of a motion normal to the direction of translation of a mass based on intrinsic spin that, depending on orientation of the spin vector, duplicates the Lorentz force motion;

8. The identification of the source of steady longitudinal stress field phenomena paralleling the field generated by electric charges;

9. Demonstration of the uniqueness of a mass possessing a "negative charge", a non-equilibrium thermal state duplicating electron characteristics;

10. Demonstration of the existence of a domain constant paralleling the Planck constant;

11. Demonstration of wave-like motions characterizing all stable fundamental masses in the domain;

12. Demonstration of the existence of a parallel of the Schrödinger equation, enabling description of the behavior of masses with intrinsic spin removing the need for solutions of the relativistic relation form developed by Dirac;

13. Demonstration of the existence of a classical Bohr model possessing a single stable state, n = 1, the first demonstration of the existence of classical quantum phenomena;

14. Demonstration of the existence of alternate "heavy" electron forms;

15. Demonstration that the parallel "positive" charge state must possess a structure;

16. Identification of a proton parallel;

17. Identification of a stability mechanism for charged and neutral mass configurations;

18. Identification of parallels of the Planck constant, the constant electromagnetic charge, and the invariant propagation speed with the fundamental characteristics of the background Knudsen domain;

19. Demonstration of a natural basis for the development of the observed force structure (the four fundamental interactions), and development of relations describing the observed force structure;

20. Identification of the mechanism for the transmission of stress field phenomena with a "photon" transport mechanism;

21. Identification of Brownian movement phenomena as the source of dispersion effects observed for classical radiation phenomena and classical small bodies;

22. Identification of a minimum uncertainty energy state with energy equipartition, and identification of the equilibrium energy state with the zero degree Kelvin state;

23. Demonstration of the existence of only two basic stable mass states, M^{+} and m^{-}, states that possess equivalent lifetimes in a constant energy background domain;

24. Identification of a basis for "exchange force" phenomena leading to the stability of (multi-body) positive and (single-body) negative mass configurations;

25. Development of relations describing observed mass spectra;

26. Extension of the classical parallel of the Bohr relation, by scaling, to enable description of energy spectra identified with classical structures duplicating the observed solar system structure;

27. Development of fundamental Knudsen domain constants paralleling the fundamental mass and length Planck constants;

28. Identification of a classical gravitational force and development of a force constant;

29. Development of an Einstein-Bohr momentum relation enabling description of solar system spectra and mass phenomena.

30. Identification of the potential for designing the first self-determining fundamental particle system models enabling visualization of system behavior at microscopic levels, possibly enabling simulated high energy interactions to be duplicated and observed visually in real time.

(ADVANCE COPY – FOR INFORMATION ONLY)

On the Classical Modeling of Electromagnetic and Quantum Phenomena

J.G. Logan
Applied Energy Sciences, Inc.
San Pedro, California

COPY

Abstract

Galilean covariant classical collisionless domain transverse wave propagation phenomena are shown to satisfy the intent of the second Einstein postulate. The Einstein mass and energy formulations are duplicated. Exact parallels of force and stress field phenomena described by the Maxwell-Lorentz equations and small body motion phenomena described by the quantum mechanics are exhibited. An improved understanding of fundamental physical phenomena at microscopic and macroscopic levels is demonstrated.

COPY

On the Classical Modeling of Electromagnetic and Atomic Phenomena

Recent publications of the results of fundamental and applied research based on investigations of the classical kinetic theory of extremely rarefied gas domains (variously identified as collisionless particle fields, Knudsen domains, and free-molecule flows in the literature)[1-17] suggest the appropriateness of a reconsideration of present assumptions concerning the inability of the classical Newtonian mechanics to provide accurate descriptions of observations of natural phenomena at microscopic levels. The modeling capability that exists has apparently been completely overlooked. The basis has been well described in the indicated literature.

The plane transverse wave propagation mode that emerges in constant energy Knudsen domains[2,3] has been shown to possess features identical with those characterizing the electromagnetic wave propagation mode.[7,18] The isothermal speed of transport of a plane wave component is an invariant in the domain. A background domain is not required to support the propagation. The unique feature is the propagation in an independent stream characterized by a Maxwellian distribution in velocity that, as is well known, is easily demonstrated to be invariant under classical Galilean transformation.[19] The Galilean covariance results because each Maxwellian velocity component $\mathbf{u}_i$ acquires the velocity motion $\mathbf{v}$ of the inertial frame in which it is emitted, satisfying the requirement of the classical Newtonian mechanics $\mathbf{u}_i + \mathbf{v}$ for each field particle mass m'. Since each individual particle of the

stream with velocity $\mathbf{u}_i$ satisfies the Newtonian criteria $\mathbf{u}_i + \mathbf{v}$, where $\mathbf{v}$ is the velocity of the inertial frame, integration over the Maxwellian stream components simply results in the well-known classical covariance exhibited by all Maxwellian streams. The complete mass stream m described by the distribution function $f_o(x,y,z,t)$ in a fixed inertial frame[1] is simply transformed in the preserved form to $f_o(x',y',z',t) + \frac{1}{2}mv^2$ in the moving inertial frame.[19] The stream physically moves as a whole with the velocity characterizing the inertial frame. The emitted stream, all observers, sources, measuring instruments, and all disturbances created and transported within such an independent Maxwellian stream, behave as if the inertial frame is at rest. All descriptions of transverse waves and other field disturbances are therefore identical in form with those developed in an inertial frame fixed in space in a background collisionless domain.

Statements in the literature[20] that Galilean covariance cannot be demonstrated for any wave motion based on the Newtonian mechanics because the preservation of the form of the wave equation describing the propagation cannot be demonstrated under Galilean transformation are obviously incorrect. The existence of this unique physical behavior was not recognized. The center of an emitted spherical wave in a collisionless domain, for example, remains fixed at the position of the source point in any inertial frame, acquiring at the time of emission the motion of the source point. The central point of the wave remains at rest in the inertial frame. It becomes independent of the source point only

if a subsequent motion of the source of the emitted stream occurs as a result of the action of local forces. The phenomena resulting from Brownian movement can produce small changes in the original source position. Hence, streams emitted over a very short period of time are characterized by a small dispersion effect in the position of the source point, a displacement described by a diffusion coefficient. The form of the wave propagation equation describing the transport in the independent stream is preserved. All measurements of transverse wave speeds in all inertial frames in constant energy collisionless background domains must yield the same invariant value. This propagation model represents the first exception to Einstein's wording of the second postulate,[20] and applies to wave motion described by a single coordinate.[21] It is the wording of this second postulate, and the validity of the resulting special theory of relativity descriptions based on this wording, that have prevented the recognition of the possible significance of an alternate, Galilean covariant, classical wave propagation model based on the kinetic theory descriptions.[20]

The existence of this classical model and the classical behavior was not known during the period of the Michelson-Morley measurements and the development of the special theory of relativity.[20] The kinetic theory investigations were not undertaken until the middle of the twentieth century.[2,3] The significance of the phenomena, initially identified with the characteristics of fluid boundary layers in extremely rarefied gas domains, was overlooked. We demonstrate in this Letter the

capability to duplicate the Einstein mass relations within the framework of the Newtonian mechanics, an initial step to establish the validity of the classical modeling capability based on the Newtonian mechanics.

The characteristics of these classical collisionless particle domains, termed Knudsen domains, have been well documented in the literature.[1-17] The domains appear from the descriptions of the one-particle distribution function solutions of the Maxwell-Boltzmann equation valid for extremely low density fluid regimes.[1] The distributions, limit function solutions of the (kinetic theory based) Liouville equation, are characterized by Maxwellian distributions in velocity.[1] The interactions between particles comprising the field and bodies in the domain can be described completely by the idealized diffusive interactions first suggested by Maxwell.[1,2] Mass, momentum, and energy can be exchanged between the field acting as a background domain and submerged bodies by means of separate and independent absorbed and emitted Maxwellian streams. For stable systems these streams provide stability and conservation of mass, momentum, and energy in the exchanges in the Knudsen domains.[2] A background medium is not required for wave transport by the independent, Galilean covariant, streams. With a classical collisionless (Knudsen) domain designed to provide a modeling background that parallels the vacuum domain, we demonstrate the existence of classical parallels of the basic quantum relations.[22-24] It might be noted that simply by converting from Einstein's second postulate requirement, the requirement for the existence of a source point

fixed in space, and assuming that the photon transport mechanisms for electromagnetic radiation might possess Maxwellian-like distributions enables Galilean covariance to be demonstrated for the plane electromagnetic waves described by the Maxwell equations. It then becomes possible to suggest that all of the features of the field phenomena identified by Einstein and Lorentz (including the Lorentz force[12]) can be modeled within a classical Newtonian framework based on the classical field descriptions existing in the current classical technical literature. This literature is identified with the kinetic theory of fields, statistical mechanics, statistical thermodynamics, and the classical Newtonian mechanics of particles and bodies.[1-19]

Our primary objective in this Letter is to demonstrate, within the framework of the classical Newtonian mechanics, the capability to reproduce, in the extremely low density or collisionless Knudsen domains, the quantum behavior described by the Bohr and Schrödinger equations. We demonstrate for the first time that quantum behavior emerges as a natural characteristic, at microscopic levels, of any classical particle system in a background field in which the field particle path (the classical mean free path)^2 greatly exceeds that of any dimension of an immersed body system, or extended configuration of classical body systems.

It is suggested that the course of the development of physical theory might have been irreversibly altered in the late 1950's by the published work of Lees and Yang.[2,3] The classical field

phenomena yielding parallels of basic electromagnetic radiation phenomena provide the basis for the demonstration of the existence of the classical quantum-like behavior.

The capability to duplicate the form of the Maxwell relations describing free-field electromagnetic phenomena has previously been suggested.[18] Limitations in the classical descriptions provided by the Maxwell equations are indicated. In particular, it should be noted that constant velocity motions, rotations, and translations of bodies in the collisionless Knudsen domain can generate both steady and non-steady stress field phenomena.[2,6,9,10,12] The interchanges of mass, momentum, and energy between the bodies and the background domain provide the basis for sustaining this classical radiation phenomena in any undisturbed equilibrium domain. These equilibrium field radiation phenomena are identified with classical energy equipartition. Idealized classical configurations or masses are assumed to evolve from aggregates of field particles and contain sufficient particle numbers to produce the characteristic Maxwellian distributions during exchanges with the field. Mass configurations are assumed to be stabilized by the continuous interactions and exchanges in the domain. A non-equilibrium internal, random velocity energy state, generated as a result of the excitation of an internal degree of freedom through classical energy equipartition, can generate steady thermal effects duplicating charge phenomena behavior.[8] The permanence of the localized random velocity "charge" source is ensured by the exchanges between the body and the field. The source is

contained and confined by the classical Newtonian surface interactions. The thermal force effects have been demonstrated to be independent of the internal state of the bodies acted upon by such forces.[8] The descriptions of the motions of these masses, comprised of localized random velocity (Maxwellian) distributions that act as finite point sources, also exhibit Galilean covariance.

We demonstrate that the form of the relativistic mass and energy formulations[20] can be duplicated classically. Classical energy equipartition phenomena are shown to yield a parallel of the Planck constant.[22] A classical parallel of the Bohr atom[23-27] is demonstrated based on Brownian movement phenomena.[28-30] A Galilean covariant parallel of the Schrödinger equation is derived demonstrating the validity for the achievement of relativistic solutions of the Schrödinger equation. A classical basis is demonstrated for the linking of the Dirac solutions with intrinsic spin phenomena.[26]

We demonstrate the new insight into the behavior of stable systems of fundamental particles in a background Knudsen domain that is achievable including derivations of mass relations that duplicate observed fundamental particle mass spectra, and identify development of scaling relations yielding descriptions of the orbit spectra exhibited by star systems such as the solar system. The potential for constructing accurate classical visual simulations of the behavior of systems of basic particles at a microscopic level is suggested.

In the demonstration of this modeling capability, a number of assumptions are made, including: the existence of an idealized constant density, constant energy, collisionless particle (Knudsen) domain composed of monatomic particles of mass m' and characterized by a preserved Maxwellian distribution in velocities, the energy condition being preserved by a parent continuum field; an equilibrium temperature T_o such that for the invariant isothermal speed c, the ratio of the pressure p_o and density ρ_o is defined by $c^2 = p_o/\rho_o$ and $\frac{1}{2}m'c^2 = \frac{1}{2}kT_o$, where k is the Boltzmann constant; and the existence of idealized diffusive interactions characterizing the collisions between the field particles and classical bodies immersed in the domain that aid in preserving the mass stability. Coupling of motion phenomena and energy sharing between external and internal motions is assumed to occur as a result of classical energy equipartition phenomena, augmenting the descriptions developed by Einstein.[28]

An assumption is made that a stable mass configuration can exist in which the thermal agitation motion is confined within a given volume and stabilized by the interactions with the field. This enables the description of field particle motions within this volume, and a small element of space, to be expressed in terms of the overall mass motion and the internal motions of thermal agitation. In an inertial frame with an arbitrary constant velocity v, an idealized mass m_o characterized by a confined random velocity internal energy can exhibit the same covariant behavior identified with emitted independent Maxwellian streams. Each internal component satisfies the Newtonian relation for the

addition of velocity components and the average energy of motion of a mass m_o in a moving inertial frame can be characterized by $m_oc^2 + \frac{1}{2}m_ov_c^2$ where m_o corresponds to a field particle density confined to a volume $(4/3)\pi a_o^3$, v_c is the constant velocity identified with the inertial frame, and a_o is the body radius.[31] In any inertial frame, m_o is at rest and the internal energy E_i can be expressed in the form $m_oc^2 + \frac{1}{2}I\omega^2$, where $m_o = \frac{1}{2}(6n')m' = 3n'm'$ (n' an integer) and $\frac{1}{2}I\omega^2$ is an internal energy identified with intrinsic spin phenomena resulting from energy equipartition. Since the intrinsic energy can be equated to the kinetic energy value $\frac{1}{2}mv^2$ as a result of the existence of classical energy equipartition, the internal energy can be approximated by $E_i = mc^2$, where $m_o/(1 - v^2/c^2)^{\frac{1}{2}} = m$. The total kinetic energy expression for a mass m acquiring a velocity v in any inertial frame can be expressed in the form

$$E_T = \Sigma E_i = mc^2 + \tfrac{1}{2}mv^2, \qquad (1)$$

where ΣE_i represents the total translatory kinetic energy of the particles per unit time per unit volume. E_T, the total kinetic energy of translation, then represents the sum of the kinetic energy due to observable microscopic mass motion, $\frac{1}{2}mv^2$, and the internal kinetic energy of thermal agitation, including intrinsic spin that is also transmitted by the motion of the body m, mc^2.

For the kinetic energy of motion $\frac{1}{2}mv^2$, $E_T = mc^2 + \frac{1}{2}mv^2$ and, to the second order, $E_T = mc^2/(1 - v^2/c^2)^{\frac{1}{2}}$. The square of this value is

$$E_T^2 = m^2c^4 + m^2c^2v^2 + m^2v^4/4. \qquad (2)$$

Neglecting the higher order term $m^2v^4/4$, and with $m = m_o/(1 - v^2/c^2)^{1/2}$

$$E_T^2 = m^2c^2v^2 + m^2c^4, \text{ or } E_T^2 - m_o^2c^2v^2 = p^2c^2 + m_o^2c^4. \qquad (3)$$

E_T^2 provides a classical parallel of the relativistic relation expressing the energy in terms of momentum.[20] The expression $E_T^2 - m_o^2c^2v^2$, where $m_o^2c^2v^2$ represents an internal energy, can be expressed as

$$E_T'^2 = (E_T - m_ocv)(E_T + m_ocv). \qquad (4)$$

Here m_ocv might be identified with a radial energy emission describing a finite, spontaneous first order energy and momentum longitudinal stress field identified with thermal agitation. The existence of positive and negative charge-like forces are suggested that are transmitted by independent streams in the domain. The phenomena identified with the expression $(p^2c^2 + m_o^2c^4)^{1/2}$ might therefore include thermal agitation phenomena resulting from classical energy equipartition in the domain. The classical parallel of the relativistic energy expression is E_T'.[20] The solution of the classical form (3) also suggests an identification of a fourth degree of freedom with intrinsic spin phenomena.[20] The square root of the neglected higher order term $m^2v^4/4$ suggests the existence of higher order effects that might be associated with energies identified with shear velocity motion

phenomena $\frac{1}{2}(c^2 + v^2)$. Longitudinal and transverse first and second order energy and momentum disturbances can be shown, for the individual components, to simulate photon effects $(E/p = c)$[20] recognizing that the average energy and momentum values, per unit field particle mass, are defined by expressions such as $\frac{1}{2}(c + u)^2$ and $\frac{1}{2}(c^2 + u^2)$ with corresponding momentum values u and $u^2/2c$.

Einstein[28] did not extend his descriptions of the Brownian movement phenomena to the extremely rarefied gas domains when the Navier-Stokes conditions were no longer valid, and did not consider in detail the internal energy sharing or energy equipartition phenomena that might occur internally as a result of energy exchanges between the fields and submerged bodies.[32-35] The idealized energy absorption phenomena can produce excitation of internal modes, or degrees of freedom, during classical energy equipartition. As a consequence, the excitation of an internal mode (a steady non-equilibrium internal energy state) can yield a steady normal force in addition to the observed rotational and translational states. The unique feature of the energy and momentum exchange for the idealized diffusive interaction is the loss of previous motion history as a result of the emission phenomena necessary to preserve conservation of mass, momentum, and energy between a body and the field.[2] The details of the typical stochastic Markov process phenomena have been provided by Nelson.[29,30]

Although Nelson[29] demonstrated the existence of a classical parallel of a Schrödinger equation based on statistical

mechanical reasoning and Brownian movement theory, it was not recognized that the classical medium need not be required to be frictionless in order to preserve Galilean covariance. In classical collisionless Knudsen domains, small bias (drag) effects as a result of friction might be observable based on the interactions of "free" bodies with the background domain. The bias effects might appear as small oscillations corresponding to any periodic rotation phenomena. Such bias effects are not considered here.

The uniqueness of the Einstein diffusion coefficient is that the description[28] can include the characteristics of both the stochastic and the random walk phenomena identified with the transport of a group of particles each moving according to a stochastic mechanism as well as a body of particles behaving as a thermal wave.[10] Accordingly, the motions that are described, the motions of classical bodies obeying the Newtonian mechanics, can also appear to possess wave characteristics.[6,22] The Brownian movement will be shown to yield a product (K.E.)(time) = h/2 where h is a classical field invariant. This yields the relation mvr = h when r is expressed as the distance traveled by the mass m during the average absorption and emission time characterizing an average Brownian translation movement, v = r/t. Since r can be identified with a "wave length" λ where the wave speed is identified with the mass velocity v, the classical relation λ = h/mv provides a classical parallel of the De Broglie relation.[23]

In the early development of the theory of Brownian movement

phenomena the interest was in describing the average translational motions of particles in classical fluids described by the Navier-Stokes equations. The behavior in extremely rarefied gas domains was not of interest. In such fields, the exchanges of mass, momentum, and energy occur through separate and independent streams. An average time corresponding to typical exchange can be described by a constant t_o. When the assumption is made that energy equipartition phenomena lead to excitation of translational, rotational, and internal degrees of freedom and that, during such exchanges, energy and momentum sharing occurs, the energy identified with an individual degree of freedom can be identified with $\frac{1}{3}kT_o$. Hence, expressions of the form $(K.E.)t_o$ = const. result, and an invariant field constant can be identified to describe this average field product resulting from the excitation. This can include translational motion, rotational motion or intrinsic spin, internal thermal and vibrational excitation, and angular motion about a fixed point in the presence of a force field. An expression of the form

$$(K.E.)t \geq n(K.E.)t_o = \tfrac{1}{3}kT_o(nt_o) \geq \tfrac{1}{2}k\,T_o t_o = \text{const.} \qquad (5)$$

results with $(K.E.)t \geq$ const. yielding a classical requirement paralleling a quantum uncertainty condition.[22]

The unique feature is that in the collisionless domain the phenomena can be idealized to assume that an average and separate absorption and emission process can occur during the average time t described by the Einstein diffusion equation. The Einstein

diffusion coefficient D for the motion can be represented by $\overline{x^2}/\tau$ with the Einstein time expression described by $2t = \tau$. The time τ can also be expressed by nt_o. Any time element in the average equilibrium stochastic displacement motion can be identified with discrete time intervals corresponding to the absorption and emission phenomena in which all history of prior motion is removed in the energy loss process. Then equilibrium energy equipartition, with an invariant field constant h defined by $h = kT_o t_o$, yields

$$\tfrac{1}{2}I\omega^2\tau = \tfrac{1}{2}mv^2\tau = \tfrac{1}{2}kT_o\tau = \tfrac{1}{2}kT_o nt_o = nh/2. \qquad (6)$$

The energy-time products defined by this constant $h = kT_o t_o$ can be identified with a quantity of "action" produced by the Knudsen domain, where h represents a parallel of the Planck constant. In the vacuum domain, Weisskopf[27] has termed the effects of the action identified with the Planck constant h as a Schrödinger pressure or force. The value of rotational motion identified with a mass m about a fixed point at a distance r under the action of a central force, identified with the kinetic energy of motion created by the action of the field in a given equilibrium Knudsen domain, can be described by

$$mvr = nkT_o t_o/2\pi = nh/2\pi, \qquad (7)$$

where $v = r/t = r\omega$ and $t = 2\pi/\omega$.

The kinetic energy associated with this angular momentum value[27]

can be expressed by $\frac{1}{2}mv^2 = (h/2\pi)(\frac{1}{2}mr^2)$ and the corresponding displacement by $\overline{(x^2)} = r^2$,

$$r^2 = (h/2\pi)^2/(2m)(\tfrac{1}{2}mv^2). \qquad (8)$$

A large number of particles each moving along a random path exhibit a diffusive type of motion. In this motion, there is a probability that a certain number of particles will arrive at a given point in space at a time t. We assume a form of a classical equation for which the position probability can be described by $\psi = \psi(x,y,z,t)$ and the appropriate classical form of the diffusion equation is $(\partial/\partial t - D\nabla^2)\psi = 0$.[36] Here the diffusion coefficient D can be assumed, primarily, to describe a stochastic process identified with the Einstein coefficient $D = \overline{x^2}/2t$ when a central field constrains the free field Brownian movement and the random walk process is dominated by the stochastic phenomena.[29] The physical picture is that of a particle undergoing random motions normal to a radius vector at a most probable value of a standoff distance r_o. With the definition $\psi = (\text{const.})e^{-t/\tau}\psi(x,y,z)$ and with $nt_o = \tau$, the diffusion equation can be expressed in the form

$$\nabla^2\psi + (1/D\tau)\psi = \nabla^2\psi + (1/r^2)\psi = 0. \qquad (9)$$

With $r^2 = (h/2\pi)^2/(2m)(\frac{1}{2}mv^2) = (h/2\pi)^2/2m(E - V)$ where E is the total classical energy identified with a particle system and V is the potential energy $V = V(x,y,z)$, (9) can be expressed in the form

$$\nabla^2\psi + (8\pi^2 m/h^2)(E - V)\psi = 0, \qquad (9a)$$

a Galilean covariant classical parallel of the Schrödinger equation. Implicit in this equation is the definition and solution condition $2t = \tau = nt_o$ where n is an integer. Since symmetry conditions and classical relativistic behavior can be introduced through the mass term in the equation, solutions based on the classical parallel of the Dirac formulations are not required.[37,38]

From a classical point of view, the Dirac solution described the behavior of a particle of mass m characterized by three degrees of freedom identified with the kinetic energy of motion and a single degree of freedom identified with an internal energy identified with intrinsic spin. The average intrinsic spin field energy characterizing each internal component per unit mass is $\frac{1}{2}u^2$, $u = \alpha c$, and the momentum E/c is given by $\frac{1}{2}u^2/c$. The energy of this intrinsic spin is equal to $\frac{1}{2}mv^2$ as a result of energy equipartition and can be expressed in the form $pct_o = h/2$ where p is a classical internal momentum. Expressing ct_o as $2\pi a$ where a is an appropriate dimension, the internal angular momentum becomes $I\omega = pa = \frac{1}{2}h/2\pi$. This intrinsic spin value $h/4\pi$ is one half of that characterizing the orbital angular momentum. The factor one-half has been identified with a g factor in atomic physics. It appears naturally in the relativistic solution[39] and also results naturally in the relativistic solution of the Schrödinger equation by Sommerfeld.[38]

The wave-like characteristics exhibited by small masses in the Knudsen domain are unique in the classical field theory. And similarly, the particle-like behavior exhibited by wave phenomena is unique. Normal sound propagation modes are damped.[1] Thermal wave propagation phenomena, the propagation of thermal pulses has been demonstrated.[10] The absorption and emission phenomena identified with the Knudsen domain suggest that the attractive and repulsive thermal "charge-like" phenomena[8] might possess a periodic character identified with the creation of the independent Maxwellian streams and a classical time t_o. Brownian movement phenomena, and the coupled rotational translational motions, can generate equilibrium field coupled transverse waves, producing a background "classical radiation" field. At microscopic levels, this radiation can appear to be produced in descrete units (quanta) identified with the time unit t_o. The average, periodic, motions of the small masses emitting the independent Maxwellian streams possess a wave-like behavior.

The relation between a one-dimensional random walk and thermal wave propagation in a collisionless domain has been demonstrated.[10] The classical motion along a radius vector of a mass m in a central field can be identified with the transport of a confined thermal wave possessing a velocity of transport identified with a diffusion coefficient.[10] The confined "thermal pulse" satisfies an equation identical in form with the thermal diffusion equation postulated by Morse and Feshbach,[41] the plane transverse disturbance transport equation derived by Lees,[2] and the electromagnetic wave equation for a lossy medium (the

Telegrapher's equation).[42] The relation to the Fokker-Planck equation has also been suggested.[10]

The wave-like character of the motion is easily indicated. Weyman[10] has demonstrated the relation between one-dimensional thermal propagation phenomena and a random walk process. For the positive and negative average velocity motions identified with a random walk process, separate equations describing the diffusion process for each step of the form $\partial f/\partial t = v\partial f/\partial r$ and $\partial f/\partial t = -v\partial f/\partial r$ for a mass m containing a confined motion of thermal agitation might be formulated, where $v^2 = \overline{v^2}$. The product of these equations yields a wave-like propagation equation for the process, $(\partial^2/\partial t^2 - v^2\partial^2/\partial r^2)f = 0$, where $f = \Sigma_i f_i(r \pm vt)$. Although the Galilean covariance was not suggested for the wave motion, a Schrödinger equation describing small body motion has also been developed from a wave equation.[40]

Additional insight into the behavior of stable classical systems at a microscopic level can be obtained by consideration of a stable two-body classical system, a parallel of the Bohr atom based entirely on classical energy equipartition phenomena and idealized classical thermal force assumptions. In a mutually attractive two-body system with masses M >> m such that higher order effects of the central body motions can be neglected, the total energy relation, for the two-body system based on the kinetic energy $\frac{1}{2}mv^2 = (h/2\pi)^2/(\frac{1}{2}mr^2)$ identified with the allowed values of angular momentum defined by $mvr = nh/2\pi$, can be expressed in the form

$$E_T = (h/2\pi)^2/(\tfrac{1}{2}mr^2) - q^2/r, \qquad (10a)$$

an alternate to the centripetal force relation employed by Bohr.[27] The fictitious mutually attractive thermal force effects can be expressed in terms of "charge" effects, q, $q_m = q_M = q^+(\Delta t)$, $q^+(\Delta T) = q^+(T_1 - T_o)$ where $T_1 < T_o$. Differentiation yields the allowed interparticle distance values and the allowed negative energy values[27]

$$-E_n = 8\pi^2 mq^4/n^2h^2 \qquad (10b)$$

for the classical system. This stable classical model is an idealized model because in the actual equilibrium constant energy domain, the only stable condition for the mass m is one in which the thermal "charge" is negative, i.e., $q^-(\Delta T_e) = q^-(T_e - T_o)$, $m = m^-$. As will be shown, the mass $m = m^+$ must be unstable unless the body possesses an internal structure enabling the stable condition q^+ to be achieved, or a stable classical configuration $m^+ + m^- = 2m^o$ to be formed. It might also be noted that the equilibrium Knudsen temperature T_o corresponds to a zero degree Kelvin temperature condition. The state n = 1 is the only stable state that can exist in the domain since the characteristic velocity identified by $v^2 = \alpha^2c^2$ cannot be altered by the force effect produced by q^2. The excited states described by (10) can only result from effects produced by external forces. Once these forces are removed, the classical particle system must always return to its original state defined by n = 1. For the mass m, α can be considered as an invariant field constant. The external

energy required to reach any higher potential state must be emitted as a combined rotational and translational shear wave, as a result of energy coupling, once the excitation energy is removed. The ground state kinetic energy is defined by energy equipartition phenomena. The combined kinetic energy of motion and the equal internal kinetic energy of intrinsic spin yields K.E. = h/t_o or $E_o = h\nu_o$. Hence, $E_n - E_o = h\nu_n - h\nu_o = h\nu$, the Bohr condition.

The classical Bohr model is unique in that stability of the body m in the two-body system is established by the field constant h, the field constant α ($\alpha = v/c$), and the related thermal "charge" effect q^2. In any other potential field G/r_g energy equipartition requires a scaling constant G/q^2 for h,

$$m\alpha^2c^2/2 = q^2/2r_o = G/2r_g, \tag{11}$$

$$m\alpha cr_g = (h/2\pi)(G/q^2) = h'/2\pi,\ h' = hG/q^2. \tag{12}$$

In the classical domain, the "charge" q^2 can be identified in terms of the basic domain parameters α and h, $q^2 = \alpha ch/2\pi$, $\alpha^2 = m'/m_o = 1/n'$ where m' is a basic field particle mass unit and n' represents the number of such basic field particle units. With $\alpha^2 = 1/n'$ and $h = kT_ot_o$,

$$q^2 = (\tfrac{1}{2}\pi)(1/n')^{\frac{1}{2}}(kT_o/m')^{\frac{1}{2}}(kT_ot_o). \tag{13}$$

The "charge" parameter can also be defined by a relation[8] of the

form

$$q^2 = (\pi k T_o/2)(t_o)(T_e - T_o)^{1/2} \qquad (14)$$

suggesting that the basic quantities are the field particle mass, the ratio of this field particle mass to the basic stable "negatively" charged mass m^-, the interaction time t_o, and the field particle root mean square speed c in the domain. This is to be contrasted with the quantum theory point of view[43] that the Planck constant h and the invariant speed c are fundamental while the electron charge e plays the role of an interaction strength between the charged matter and the electromagnetic field. In the Knudsen domain the components of the parallel of the Planck constant can be identified.

If a mass M satisfies $M_i > m$, energy equipartition requires $\frac{1}{2}M_i v_i^2 = \frac{1}{2}m\alpha^2c^2$. Hence, with $m\alpha^2c^2 = M_i\{(m/M_i)\alpha^2c^2\}$, (11) becomes $M_i v_i^2 = q^2/r_o$ with $v_i = (m/M_i)^{1/2}\alpha c$. The momentum condition requires $M_i v_i (m/M_i)^{1/2} r_o = h/2\pi$ or $r_M = (m/M)^{1/2} r_o$. The greater mass values with the charge q^- must lie closer to the nucleus. The constraining field energy condition cannot be satisfied. Only a single stable body of mass m^- can be identified in the Knudsen domain. Any single body $M^- > m^-$ must exhibit instability. The field cannot support the independent existence of a mass $M^- \neq m^-$. Similarly a mass m^+, for which $T^+ = (T_o - T_e)$, would be unstable in the field unless paired, for example, with m^-, $m^+ + m^- = 2m_o$, a neutral pair.

In the Knudsen domain, the stable masses exhibiting long lifetimes characterized by a positive "charge", M^+, must possess a composite structure. The sum of the internal (thermal) energies identified with "charge" phenomena characterizing the components of the mass configurations must satisfy relations of the form $\Sigma E(M_i^+ + M_j^-) + E(M^+) = E(m^-)$. Composite structures demonstrating an attractive charge characteristic M_o^+, in energy and momentum exchanges with bodies m^- characterized by a repulsive charge characteristic, can be shown to generate mutually attractive force effects,[44] $q^+q^- = q^2$. Such structures can be calculated.[44] They can also be designed, created by computer, and observed visually in modeled Knudsen domains.[44]

Scaling relations describing allowed mass and energy states are easily developed from the field constants establishing allowed values for the exchanges of mass, energy, and momentum with the background Knudsen domain per unit surface area and per unit time. Stability criteria can be developed. If the mass behavior described by a function f is a function of time only, $f = f(e^{-n})$. Computed, potential, mass configurations, not simultaneously satisfying the internal momentum and energy conditions established and constrained by the field, can exhibit successive decay patterns proportional to e^{-1} or 1/e until a stable mass configuration or state is reached. Excess energy is returned to the field in field particle mass groups containing the excess mass, momentum, and kinetic energy identified with both internal (spin) and external rotational and translational motions. Parallels of observed neutrino phenomena can be described.[44] If

the motion of translation is suppressed, the relation $\bar{v}^2 = (8/\pi)\overline{v^2}$ exists between the mean square values of v characterizing the internal energy acquired and the square of the mean value v characterizing the motion,[45] the allowed internal and external energies can be related by the respective values $(4/\pi)mv^2t_o = (n/2)(h/2\pi)$ and $mv^2t_o = nh/2\pi$. The corresponding momentum values are $(4/\pi)mvr_o = (n/2)(h/2\pi)$ and $m\alpha c = nh/2\pi$. Examples of mass calculations based on momentum and energy scaling, of mass effects on energy calculations for stable multi-body systems, and of mass independent energy spectra are provided below. A comparison with published values of fundamental constants and related experimental data[46-49] is made.

A capability to describe atomic and gravitational phenomena within the same mathematical framework was not achievable during the time period that relativistic gravitational effects were analyzed.[20,50] Corrections of the form employed to achieve improved descriptions of atomic phenomena $(1 + \alpha/2)$[51] when applied to the basic calculation of perihelion shift, in the form $(5557''.185)(1 + \alpha/2)^2$, yield the value $5597''.81$, an error of 0.034 percent when compared to the observed shift $5599''.74$.[50] The classical approach also suggests the existence of undetected asymmetrical neutral and charged (electron/positron) particle belts surrounding the sun capable of producing ray bending.[50]

Accurate descriptions of observed stable particle configurations can be developed from the scaled energy and momentum relations conforming to the field constants. An approximate description

(neglecting the small mass m contributions) of a proton configuration is given by the expression $7(4/\pi)(3/2)(m/\alpha) = 1832m$. The structure of a composite body whose internal motions might satisfy the field energy constraint is indicated in Table 1.[44] Additional examples of the modeling of other basic mass configurations are also indicated in Table 1.[44] A positive "charge" force, a negative "weak" force, and a "mass" force resulting from coupling of the "weak" force with an "orbital" body that "re-radiates" suggests the duplication of the observed force field phenomena.[47] Examples of classical energy and force field phenomena are provided in Tables 2, 3, and 4. The relation $mc^2 = q^2/\alpha^2 r_o = q^2/a_o$[23] yields a simple classical interpretation. Since the minimum length, from the center of the central body mass M to the center of m is equal to the radius a_M plus the radius a_m, when $a_m << a_M$, $a_m = (m/M)^{1/3} a_M$, a_o is approximately equal to a_M. At this distance, the maximum mechanical "action" or angular momentum value must equal $mc(\alpha^2 r_o) = \alpha h/2\pi$, $\alpha^2 r_o = a_o = a_M + (m/M)^{1/3} a_M$. The relation can also be interpreted as describing the internal angular momentum identified with the body m. The momentum relations identified with external motions can be scaled in the form $(4/\pi)mca_o' = h/4\pi$, to describe the internal intrinsic momentum value, where $a_o' = (\pi/8)a_o$. An unusual interpretation of the action relation also results with $(8/\pi)mca_o = (4/\pi)2mca_o = h/2\pi$. The relation $(4/\pi)(2m) + p$, where p is the mass of the proton, yields 939.5736 MeV/c^2. The observed mass of the neutron is 939.5656 MeV/c^2. The small mass coupling, or binding energy, can lead to a metastable state and exhibit instability in the Knudsen domain.

The mass increase occurs because of the effect of the positive force field. The stability should be demonstrated for the state (2p - 2m) when the excess mass is lost (Table 1). The examples are presented solely to indicate the modeling potential.

Table 1

Knudsen Domain Mass Calculation Examples ($m = 0.5109991\ MeV/c^2$)[53]

Proton (p)

$$\mu^{+,-} = (3/2)(m/\alpha) = 105.03789$$

$$\pi^{+,-} = (4/\pi)(\mu^{+,-}) = 133.7384$$

$$\pi^{\circ} = \pi^{+,-} + m^{-,+} = 134.2494$$

$$p = 4\pi^{\circ} + 3\pi^{+} = 536.9976 + 401.2152$$

$$p = 938.2128$$

p (observed) = 938.2723 ; $\Delta = -0.0063\%$

Neutron (n)

$$n = p + 2(4/\pi)m = 939.5736$$

n (observed) = 939.5656 ; $\Delta = -0.00055\%$

Deuteron (d)

$$d_1 = 2p - 2m = 1875.4036$$

$$d_2 = \{n + p - (4/\pi)m - 3m\} = 1875.5432$$

d (observed) = 1875.613 ; $\Delta_1 = -0.012\%$; $\Delta_2 = -0.0037\%$

J/ψ Non-Strange Meson

$$\pi^{\circ} = (4/\pi)(2m/\alpha) \ ; \ \pi^{+,-} = (4/\pi)\{2m/\alpha - 3m\}$$

$$(4n+1)\pi^{\circ} + (2n+1)(\pi^{\circ}+\pi^{+}) = 14\pi^{\circ} + 5\pi^{+} = 3397.80 \ ; \ (n=1)$$

J/ψ (observed) = 3396.9 ; $\Delta = 0.032\%$

Table 1 (cont.)

Knudsen Domain Mass Calculation Examples ($m = 0.5109991\ MeV/c^2$)[53]

Quark Models[56]

Basic Mass Scaling Relations:

Generation	Scaling	Range
	Bohr - m (External energy)	
1st	$nmca_p = nh_B$;	$m_o \le m \le m_o/\alpha$; $a_p = a_o/2$; $h_B = (\alpha/2)h/2\pi$
	Planck - M_p (Internal energy)	
2nd	$n(4/\pi)(m/\alpha)ca_p = nh_p$;	$(m/\alpha) \le M_p \le m/\alpha^2$; $h_p = h/4\pi$
	Knudsen - M_K (Internal energy)	
3rd	$n(4/\pi)(m/\alpha^2)ca_p = nh_K$;	$m/\alpha^2 \le M_K \le m/\alpha^3$; $h_K = h/4\pi\alpha$

Mass (MeV/c^2)		Particle Field Theory[56]	Knudsen
1st Generation:	u	5	4.56
	d	9	9.75
2nd Generation:	c	1.50×10^3	1.43×10^3
	s	180	179.0
3rd Generation:	t	$(30\text{-}50) \times 10^3$	48.9×10^3
	b	4.8×10^3	4.99×10^3

u:	(n=1),	$(2n+1)\{(4/\pi)(2m)\} + (4/\pi)m^{+,-}$ =	4.56
d:	(n=3),	$(2n+1)\{(4/\pi)(2m)\} + (4/\pi)m^{+,-}$ =	9.75
c:	(n=4),	$(2n)(4/\pi)(2m/\alpha) + (4/\pi)m^{+,-}$ =	1.43×10^3
s:		$(4/\pi)(2m/\alpha) + (4/\pi)m^{+,-}$ =	178.97
t:	(n=1),	$(2n)(4/\pi)(2m/\alpha^2) + (4/\pi)m^{+,-}$ =	48.87×10^3
b:	(n=14),	$(2n)(4/\pi)(2m/\alpha) + (4/\pi)m^{+,-}$ =	4.99×10^3

The classical configuration, Table 1, describing a proton model

suggests the description of a distribution of a positive, attractive, internal thermal energy state between three individual components, each providing one-third of the total. In the Knudsen domain, the fractional values might not be observable directly. Field interactions, upon break-up, could immediately convert back to a single observable neutral or "negative" state, from $E^{+/3}$ to $E = E^{\circ}$ or E^{-}. It is also suggested in this Table that the mass unit μ^{-} might be identified with the decay of a thermal state $\pi^{\circ} = (4/\pi)\mu^{\circ}$ relating a stable internal parent mass state with an observable metastable "negative" mass state. Modeling of quark states is also suggested in Table 1. The generations[56] can be identified with "quark-like" parallel classical configurations.

The structure of a composite classical configuration can be shown to generate force phenomena that enables the relative strength of the observed fundamental interactions to be duplicated.[44,52] The basic relationships $c^2\{1, \alpha, \alpha^2, (m/p)^4\alpha^{12}\}$ can be demonstrated. A very weak mass force, produced by random motions of large components, can result from the coupling of the "weak" force with an outer "orbital" mass that, in turn, can radiate a small longitudinal disturbance field. Neglecting small multiplying constants, this classical model yields the spectrum $c^2\{1, 1/137, 5.3 \times 10^{-5}, 2.01 \times 10^{-39}\}$.[44] The observed values based on current theory yield $g^2\{1, 1/137, 1.02 \times 10^{-5}, 5.9 \times 10^{-39}\}$.[52]

The procedures developed by Weisskopf to describe the ground states of multi-electron systems can be extended to approximate

the behavior of the classical two-electron configuration by means of a single-electron idealized two-body model. When the outer bodies are assumed to lie along a line passing through the center of mass, the classical field effects (to second order in α^2) can be described. The first term on the right in Table 2 in the energy expression describes the constant energy of the mass m resulting from energy equipartition during field exchange. The second is the energy identified with the intrinsic energy (spin)[9] field of the opposing charged body m. The third is the attractive field produced by the central bodies, the fourth the maximum repulsive potential energy effect that is produced by the second electron, and the fifth the small charge-like effect resulting from the motion induced by spin orientation, the side force produced by the mechanical spin motion of the outer body.[12] This effect might be identified with a small "magnetic field" force produced by a single classical body also identified with a mechanical spin.

Table 2

Knudsen Domain Calculation of the Helium Ground State E_o

$$E_T = \not{h}^2/2mr^2 + (1/4)\not{h}^2/2mr^2 - 2q^2/r + q^2/2r + \alpha q^2/2r$$

$$I.P. = -E_o = \{(2 - 1/2 + \alpha/2)^2/(1 + 1/4)\}I.P._H^{55}$$

$I.P._{He} = 24.5874$ eV; $I.P._H = 13.5984$ eV (observed)

$I.P._{He} = 24.596$ eV (calculated); $\Delta = -0.035\%$

The single degree of freedom identification for the intrinsic spin component, $h/4\pi$, in the Knudsen domain model is consistent

with theoretical results and experimental observations expressed by means of a g factor. It constitutes the primary moment of the "mechanical" moment identified with a classical parallel of the Bohr magneton. The small correction is of the form $(1/4)(4/\pi)\alpha = \alpha/\pi$ for the internal intrinsic spin contribution based on the available equipartition energy. Incorporating this value, a basic g factor $(g - 2)/2 = \alpha/2\pi$ results. The external mechanical spin contribution is of the form $(\alpha^2/2)(m/M)$. The proton parallel contributes a mechanical spin value ½ yielding the relation $(\alpha/\pi + ½)$. Neglecting higher order values,[44] classical g factors for m^-, m^+, a classical parallel of μ^-, and a classical parallel of the proton p^+ are also shown.

Table 3

Knudsen Domain g Factors

$(g - 2)/2$

Particle	Knudsen Domain	Observed[57]
e^-	0.0011598	0.00115965
e^+	0.0011616	0.00116030
μ^-	0.0011725	0.00116592
p^+ (Bohr magneton)	1.5023228	1.52099313

The scaling relation connecting charge phenomena with the very small force neutral body mass phenomena is based on the equipartition condition $m\alpha^2c^2 = q^2/r_o = GmM/R_o$ where M is a central

body mass and G is a parallel of the Gravitational constant. The scaling relation $R_o = (GmM/q^2)r_o$ results for the mass m. Masses with values $m_i > m$ satisfy the relation $R_i/R_o = m_i/m_o$. The resulting mass structure, dependent upon the velocity acquired from the background domain, suggests that increasing mass values can be observed to correspond to increasing stand-off distances. This behavior is just the opposite of the theoretical behavior described for negatively charged masses, decreasing stand-off distance with increasing mass. A gravitational Knudsen domain constant h_G describing the basic momentum relation for gravitational energy spectra for the mass m can be expressed by $m\alpha cR_o = n(h/2\pi)(GmM/q^2) = nh_G$.

Mean stand-off distances for the neutral and positively charged stable body spectra can be established from the energy equipartition requirements, $nm_i/nR_i = m_i/R_i$. The scaling relations also suggest that groups or series of mean planetary distances should exhibit a relationship described by a series of simple integers. The existence of this unique energy spectrum and the correlation of the mean planetary distances with the stand-off distances for the lightest elements are suggested in Table 4. Since mass change effects produced by the presence of fields are incorporated into the stand-off distance calculations, the spectra are termed Einstein-Bohr spectra.

The interaction phenomena identified with classical "negatively charged" and "positively charged" bodies in the domain would demonstrate rather curious characteristics. All of the

Table 4

Bohr Gravitational Relations

$$m\alpha cR_o = h_G;\ h_g = (h/2\pi)(GmM/q^2);\ GmM/R_o = Gm_iM/R_i.$$

Mean Distance Planetary Spectrum[54]

Basic Einstein-Bohr Orbit Structure
Mean Interparticle or Standoff Distances from the Sun[44,54]

Series A

Planet	Mean Orbital Distance x 10^{13} cm	Orbit Ratios	Einstein-Bohr n	Mean Density
Mercury	0.579	1.00	1	5.43
Venus	1.082	1.87	2	5.24
Earth	1.496	2.58	3	5.52
Mars	2.279	3.94	4	3.90

Series B

Planet	Mean Orbital Distance x 10^{13} cm	Orbit Ratios	Einstein-Bohr n	Mean Density
Jupiter	7.77	1.00	1	1.30
Saturn	14.29	1.84	2	0.70
Uranus	28.75	3.70	4	1.30
Neptune	45.04	5.80	6	1.50
Pluto	59.00	8.00	8	0.5-.08

Table 4 (cont.)

Mean Distance Planetary Spectrum[54]

Basic Einstein-Bohr Orbit Structure
Mean Interparticle or Standoff Distances from the Sun[44,54]

Series C

Planet	Mean Orbital Distance x 10^{13} cm	Orbit Ratios	Einstein-Bohr n	Mean Density
Jupiter	7.77	—	—	—
Saturn	14.29	1.00	1	0.70
Uranus	28.75	2.01	2	1.30
Neptune	45.04	3.15	3	1.50
Pluto	59.00	4.13	4	0.5-.08

Einstein-Bohr Mean Distance Planetary Spectrum[54]

Mean Distance Values for Planetary Orbits for Lightest Elements[44]

Planet	Mean Distances x 10^{13} cm	Observed Planet Ratios for Lightest Neutral Particles, n an integer[44]							
		n^2	H_1	n^2	H_2	n^2	HD	n^2	He
Mercury	0.579	1	0.516						
Venus	1.082			1	1.03				
Earth	1.496					1	1.55		
Mars	2.279	4	2.064					1	2.064

Table 4 (cont.)

Einstein-Bohr Mean Distance Planetary Spectrum[54]

Mean Distance Values for Planetary Orbits for Lightest Elements[44]

Planet	Mean Distances x 10^{13} cm	Observed Planet Ratios for Lightest Positive Ions, n an integer							
		n	H_1^+	n	H_2^+	n	HD^+	n	He^+
Mercury	0.579	1	0.572						
Venus	1.082	2	1.144	1	1.144				
Earth	1.496	3	1.717			1	1.660		
Mars	2.279	4	2.289	2	2.289			1	2.287

idealized mass structures, would exhibit oscillatory behavior, undergoing periodic oscillations in order to satisfy conservation requirements and execute the observed average Brownian movement phenomena characterized by a Markov process description. This pulsating-like behavior should be characteristic of all "active" bodies in Knudsen domains. Body pairs possessing positive and negative charge characteristics would exhibit attractive force effects as a result of the changes in the internal energy states produced by mutual energy exchange phenomena and the external Knudsen domain surface pressure. This behavior departs from classical theory assumptions.[8,44] Bodies with similar frequencies identified with exchange phenomena could also generate repulsive force effects dominating attractive steady field effects.[44,58,59]

The force phenomena that can be identified with idealized composite bodies with positive charge characteristics would be unique in all of the classical physical theory. At large separations along a line of centers, inverse distance square repulsive forces would dominate because the oscillatory forces could dominate.[44,58,59] At close range, with motion restricted, the external field energy exchange process could effectively reduce the magnitude of any internal energy defect state while, simultaneously, the pulsating behavior could be restricted, reducing any potentially attractive effects. With closer approach, the internal energies could increase to an equilibrium state with the field, yielding an approximately neutral configuration. These "metastable" neutral bodies could then slowly "drift" apart and, when sufficient separation occurred, immediately convert to the original state with the process being repeated.[44] Positively "charged" mass pairs should not be observed, except in the presence of a neutral body.

In idealized classical collisionless Knudsen domains, the constraints, restrictions, and allowable observable physical phenomena are defined by the form of the restrictions on momentum exchanges between the field and the stable mass forms. This constraining relation, first proposed by Bohr, is dramatically modified by the merging of the Einstein relations into the original Bohr formulation $m_o vr = h/2\pi$ and is easily shown to provide a completely new dimension to the analysis of microscopic phenomena identified with fundamental classical bodies within the framework of the Newtonian mechanics.

When only phenomena identified with a charge field q^2 are considered, the Planck constant parallel, without modification, applies only to the behavior of the mass m_o and only the solution forms $m_o(v_o/n)n^2r_o = nh/2\pi$ are allowable. In the classical domain, Einstein's Brownian movement investigations enable the identification of this constraint h with the domain constants identified with field energy, momentum, temperature, and interaction time. These field characteristics establish the value of the constant of "action" h in the Knudsen domain. As a consequence, with the mass restriction in the Bohr equation removed by incorporating Einstein's relations, the basis for the development of a single classical equation to describe all the allowed quantum-like energy states and stable mass configurations that can be identified in the unique Knudsen domains of an overall expanding classical continuum field can be demonstrated.[44]

The Einstein-Bohr relation $n'm'\alpha cr_o = h/2\pi$ enables the identification of the field action produced by average field particles. This relation can be interpreted in an alternate form as $(n'm'\alpha^2c^2/\pi a_o^2)(\pi a_o^2)(r_o/\alpha c) = h/2\pi$ suggesting an energy per unit area proportional to α^2 identified with a cylinder of length r_o. In the form $(n'm'\alpha c^2/\pi a_o^2)(\pi a_o^2)(r_o/c) = h/2\pi$, the energy is proportional to α. In the form $(n'm'c^2/\pi a_o^2)(\pi a_o^2)(\alpha r_o/c) = h/2\pi$, the factor of proportionality is unity. An allowed energy structure or momentum structure $E/c = p$ identified with $(1, 1/\alpha, 1/\alpha^2)$ is suggested, representing "strong", "weak", and "charge" effects respectively. These energy and momentum values acquired

by bodies would, in turn, be re-radiated into the field (appearing as a continuous stream), producing steady stress, force, and pressure field phenomena.

The angular momentum relation can be developed in the form $(n'm'c/8\pi)(8\pi\alpha r_o) = h/2\pi$, with a field particle group $m_p' = \alpha n'm'$ identified with the momentum c per unit mass, $m_p'cr_o' = h/2\pi$, $m_p' = 3.6245 \times 10^{-29}$ gm. Including a small correction $(1 + \alpha/2)$ for the total energy and momentum, m_p to this order is given by $m_p'' = m_p'/(1 + \alpha/2) = 3.61132 \times 10^{-29}$ gm. The molar mass becomes $M_p = m_pA = 2.1747 \times 10^{-5}$ gm, i.e., $(m_p''A)c(8\pi\alpha r_o) = Ah/2\pi$. The fundamental Planck constant value m_p^{46} is 2.1767×10^{-5} gm suggesting that the expression $(M_p)c(8\pi\alpha r_o) = Ah/2\pi$ or, with $M_p = m_p''|A|$, $M_pc(8\pi\alpha r_o/|A|) = h/2\pi$ can also define a parallel of the Planck length.[46] The expression $R_p = (1 + \alpha/2)8\pi\alpha r_o/|A| = 1.61747 \times 10^{-33}$ cm. The value of the Planck length is $r_p = 1.61605 \times 10^{-33}$ cm.[46] The classical relation $M_pcR_p = h/2\pi$ might be considered the Knudsen domain equivalent of the fundamental Planck mass and energy relation, $m_pcr_p = h/2\pi$. $M_p/m_p = 1.0009$ and $R_p/r_p = 1.0009$, a difference of 0.09 percent. The Planck values, for $\alpha^2R_o = a_o'$, can be scaled from the Knudsen domain relations $m\alpha cr_o = h/2\pi$ and $GmM/R_o = q^2/r_o$. Scaling yields $(m/\alpha)ca_o' = (h/2\pi)(GmM/q^2)$. When $a_o' = a_o$, the Knudsen conditions suggest a mass form (m/α), or a charge form $(q^2/\alpha)GmM$, or a modification of h, $h' = \alpha h$. In order to satisfy the field constraints produced by a constant h, the particles m, M must, in close approach, experience a strong force effect $q/\alpha^{½}$. This strong force can be identified with a mass (m/α). Since all quantities except G are known in terms of field parameters, G can

be defined by $G = (q^2/\alpha M)(2\pi/h)(ca_0)$ in terms of the known domain characteristics,[44] where M is the calculated proton mass.

Solar structure characteristics can also be determined. The stand-off distance for a negatively charged body suggests that a star outer radius characteristic could be similar to the stand-off distance characteristic (the outer radius characteristic) identified with the Bohr atom. $Gm_iM/R_i = (\frac{1}{2})m\alpha^2c^2 = (\frac{1}{2})m_iv_i^2$. The observed radius of the sun is 6.9595×10^{10} cm.[49,54] With the mass of the sun and the basic mass m ($m_i = m$), the R_o calculation yields $6.9396/(5)^2 \times 10^{10}$ cm. The value 6.9396×10^{10} cm results if m is assumed to be in an excited state n = 5, or if the Einstein-Bohr relation is satisfied by $G(5m_o)M_s/5R_o$, or Gm_1M_s/R_1 where $m_1 = 5m_o$. The Knudsen domain scaling suggests the existence of a $5m_o$ mass unit, possibly of the form, $m^{5+} = 3m_o^+ + 2m_o^-$.

The mass relation $n'm'/8\pi$ can be expressed in the form $2e\alpha n'm'$ leading to the relation $m_o = (\frac{1}{2})(m_o'/\alpha)/e$. The characteristic free mass m_o might be identified with a parent mass $2em_o = m_o'/\alpha = 4.95377 \times 10^{-27}$ gm $= 5.437m_o$, also suggesting a basic mass form $5m_o$ identified with a basic Einstein-Bohr momentum relation. The possible existence of other stable "heavy electron" forms including $2(m_o^+ + m_o^-)$ and $(4/\pi)m_o^+ + 4m_o^{+,-}$, can also be suggested.

In the Knudsen domain, the unique result, that similar mass and energy spectra might be identified with mass units on microscopic and macroscopic scales is suggested. Both mass units can be

described by modified forms of a basic Bohr angular momentum relation developed to incorporate mass effects. The behavior of the stable configurations and the emission and absorption of mass, energy, and momentum in interactions with the background domain, would also be similar. Periodic pulsations would characterize the exchanges with the background field. Centers of mass accumulation and aggregation would exist from which no radiation could be observed until stable states for single bodies or groups of bodies were attained.[44] Small bodies would produce low energy background radiation as a result of Brownian movement phenomena. Larger energy radiation values might be identified with the decay of metastable small mass configurations attracted by massive neutral body (star) configurations. For example, if a "heavy" electron configuration could be identified with star masses of the order of the sun, an outer ring of particles with, masses exceeding the basic mass, should be observable. These configurations would exhibit typical "metastable" state decay phenomena,[44] and "quanta" described by relations of the form $(\alpha/8)(\pi/4)(m_o/4) = 91.52$ eV (1.045×10^6 degrees Kelvin) should result. A shell surrounding such a star could exhibit observable temperatures of the order 10^6 degrees Kelvin.[44]

A unique modeling capability is indicated. Chemical and materials behavior could be modeled, reaction phenomena simulated, and fabrication and formation phenomena investigated first by computer modeling. The classical modeling approach would also offer the potential for examining fundamental physical phenomena under conditions of varying pressure, density, and

temperature. This could include simulation of mass creation and decay, and simulation of phenomena identified with an expanding universe concept.[44]

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Michael P. Finerty
Finerty Consulting
2930 E. 5th Street
Tucson, ARIZ 85716

Dr D. Allan Bromley
Presidential Science Advisor
The White House
1600 Pennsylvania Ave
Washington, DC

Dear Dr. Bromley,

I have previously written to you about a pulsed neutron source for cancer research. If the injectors on the TEVATRON and SSC are FRACs, the simple way to prove the technology is with their injectors dumping into a U(238) or Tungsten target at 800 MeV.

The injectors will be idle most of the time as it will take only a couple of minutes to ramp up the accellerators to fill the ring of the main collider. The main collider will coast for hours, while the injector linac stands idle.

If one bends the linac beam away from the injector synchrotron, it can be put to use for medical experimentation during synchrotron idle.

800 MeV protons impinging on U(238) spalate about 26 neutrons per proton. These can be thermalized with a heavy water or carbon moderator (or a combination of the two) to produce epithermal neutrons suitable for boron neutron capture therapy of the sort that was featured in an article in Scientific American (October 1991).

I'd like to thank Dr. Klaus Brendel for the suggestion of using the SSC injector for this purpose and for a discussion of Boron capture molecular candidates with me here at the University of Arizona. I would like to work on the wasted proton linac beam time at the SSC. It is possible that we could find a practical use for the FRAC (Fractional Wavelength Tuned Linear Accelerator) injectors that I proposed 4 years ago.

Sincerely yours,

Michael P. Finerty
Tucson, Jan 17, 1992

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January 9, 1992

JAN 13 1992

Mr. Karl Erb
Assistant Director
Office of Science and Technology Policy
Old Executive Office Building
The White House
Washington, D.C. 20506

Dear Mr. Erb:

This letter is to provide a follow-up to the recent letter to the Secretary of the Department of Commerce, Robert A. Mosbacher (copy enclosed). The attached copies of recent comments from the press may also be of interest because they correctly point out that the United States should focus on policies that foster innovation, efficiency, and new products and services produced at home as the primary basis for new job development and new manufacturing opportunities.

It is important that the current Administration, in its addresses to the public, emphasize the need to enlist the support of all sectors of the general public in making contributions leading to the revitalization of the economy of the nation.

Our interest is in encouraging and enlisting the large untapped sector of the general public that can make significant contributions to innovation, improvement in the technology base, and the creation of new products and services. Because of the structure of the current Federal requirements for supporting innovation in the small business private sector by the Federal Agencies, large segments of uniquely talented and innovative technical personnel in retirement and recently entering the ranks of the unemployed are essentially excluded because of "inadequate" educational background and the lack of the resources required to support start-up costs in the initiation of new businesses.

Suggestions could be solicited from this largely untapped sector, without the current proposal formalities. These suggestions could be screened and considered for support when they might be of interest to industry if and when demonstrated. Prototype development and demonstration could provide the basis for new business development.

Such innovative suggestions could be solicited at any time during the year by a central office to demonstrate the Administration's

interest in obtaining wide public support for innovation, technology improvement, and job-creation in the small business sector as well as in major industry.

Suggestions for educational improvement might even be requested by the Department of Education from parents and teachers to generate interest.

There is an urgent need for the Administration to enlist support from different segments of the general public in order to achieve greater interest in participating, by offering suggestions for improvement.

Among the suggestions now being offered, and as confirmed by the attached Commentary copies, it is evident that the primary need to improve the basic economy is the initiation of new manufacturing activities that stimulate the domestic economy, offer the potential for large new job creation, and lead to substantial new export opportunities.

Specifically, government activities encouraging a more effective exploitation of the results of recent fundamental and applied research might be stressed. One significant, potential, opportunity was cited in the prior correspondence.

Sincerely yours,

Joseph G. Logan
President

Attachments

APPLIED ENERGY SCIENCES, INC.
1861 North Gaffey Street, Suite B
San Pedro, California 90731

Tel (213) 514-5513
Message (213) 514-5522
Fax (213) 547-1915

January 3, 1992

COPY

The Honorable Robert A. Mosbacher
Secretary of Commerce
United States Department of Commerce
Commerce Building
14th Street and Constitution Avenue, N.W.
Washington, D.C. 20230

Dear Mr. Secretary:

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It is hoped that President Bush's Office will recognize the need that now exists for emphasis to be placed on the initiation of new technological developments that can lead to new manufacturing opportunities and substantial new job creation in future talks concerning the economy (other than the opportunities created in public works).

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It is obvious that an increase in the manufacturing area is needed to upgrade the economy. A number of articles have been written by leaders in industry to suggest appropriate approaches. A copy of one such article is enclosed.

A simple alternate to the suggested approaches is indicated below that could offer substantial contributions to technology leadership, new technological developments, initiation of new manufacturing enterprises, and substantial upgrading of the economy. This, as is suggested below, could be accomplished without any new funding.

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This is mentioned because the two programs, one at Defense (SBIR) SDI 92-16 and the other at Commerce ATP 91-01 provide the appropriate basis for the support of new and unrecognized developments that could make substantial contributions to the domestic economy. These programs can basically provide support for an idea and not for the background of a well-known researcher. The new developments that are sought are not recognized and supported by or through a peer review process.

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The demonstration to the public of the sincere interest of the present Administration in creating new manufacturing opportunities, ensuring technological leadership, upgrading the domestic economy, and creating new export opportunities in areas such as materials, chemicals, and energy could be a major step in overcoming the current negative reactions now existing concerning the national economy.

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Joseph G. Logan
President

Attachment

Time to Stop Living Off Capital

By W.W. Rostow

Most proposals for remedying the country's economic troubles are based on the assumption that we face a mild version of the Depression of the 1930s, and that what the economy requires is a sharp stimulus to consumption that would stimulate investment and bring us back to what now passes for full employment. An increase in investment is to be induced by an initial increase in consumption. That's what lay behind President Bush's pre-Christmas trip to J.C. Penney.

It was different in the 19th century. Then each major business expansion began with investment in new technological innovations: e.g., cotton textile machinery, railroads, steel, electricity, chemicals. Such investment expanded jobs and consumption. Then an increase in employment and consumption was brought about by an increase in investment.

The stimulus to consumption is unlikely to rescue the economy from its troubles; a 19th century-style stimulus to investment just might. The recent history of the American economy suggests why. A rising tide of unemployment, to an annual average of 7.3% in the 1980s from 4.5% in the 1950s, has depressed consumers' real incomes. This rise in unemployment helped cause a radical deceleration in productivity, exacerbated by mounting foreign competition and the devaluation of the dollar. The decline in earnings was cushioned to a degree by an increase in the number of two-job families, a decline in savings, and increased consumers' borrowing.

Perhaps some of the advocates of a tax cut are thinking of President Reagan's tax reductions of 1981-82. These yielded, of course, the extraordinary cumulative deficits of the 1980s that now constrain policymakers, but they were accompanied by a large increase in military outlays in the wake of the Soviet invasion of Afghanistan, which helped stimulate the economy. Military outlays are now declining.

An attempted repetition of 1981-82 is a bit like an alcoholic's plea that one more swig at the bottle will straighten him out. It is not a promising way to go. Any likely stimulus to consumption will provide only a limited, transient lift to the economy.

The prospects are better if we look to a large increase in investment as the catalyst. Governments as well as individuals have been living off capital. At every level, but especially in Washington, public authorities have met current expenditures by increased borrowing, by cutting outlays for roads, bridges, schools and other essential communal capital.

But a lion seems to stand in our path: the enormous federal deficit. If we can't afford a large enough tax cut to trigger a sustained recovery, how can we afford a large public program to rebuild our capital stock?

The answer is: Split the federal budget between capital and current expenditures as do more than 40 states and virtually all other advanced industrial countries. This will not only modestly reduce the federal deficit but also legitimately open the way to enlarged public sector investment. There is no stronger case for treating productive investment and current consumption expenditures in the same category in the public than in the private sector.

The lion in our path is simply a product of bad public bookkeeping in Washington.

The productive investments we might undertake to trigger the economy back to a sustained general revival include physical outlays for roads, bridges, pollution control, school building, and the modernization of university and other public laboratories. They should also include expansion of primarily non-physical forms of investment where there is serious reason to expect a high rate of payoff; e.g., key scientific and development areas on which major future innovations will depend and the Head Start educational program which, on its record, should be massively extended. The approach suggested here would also clear the way for the long discussed, widely approved National Service Corps, which could have major benign social as well as economic effects.

What about private investment?

First, from the moment the president goes to Congress and tells the nation we've been living off capital for 10 years and more; that it's going to stop right now, and that we're going to rebuild and modernize our capital stock—at that moment, when the truth every businessman knows is authoritatively uttered and a credible program is laid before Congress, private enterprise will begin to pick up.

Second, the much needed increase in public investment will trigger by several further routes an increase in private investment.

Third, it would be quite appropriate to include in the package an incremental investment tax credit for specified types of private investment including research and development or accelerated depreciation allowances similarly specified. As opposed to a cut in the capital-gains tax, we know with such measures how the private sector will spend the extra resources provided by the public at large.

What are the conventional arguments against splitting the federal budget between current consumption and investment and radically expanding the latter at a time of serious recession? They are two:

Congress might use the occasion to support low productivity pork-barrel investment; setting in motion a large scale infrastructure program might take an excessive amount of time.

On the first problem, Congress might assign to a trusted institution such as the Congressional Budget Office, the Joint Economic Committee or the General Accounting Office the task of providing objective assessments of the productivity of public investment proposals. On the second problem, there are, in the short run, a great many infrastructure projects quickly available. I doubt that it's beyond the capacity of a nation that mobilized a quarter of a million men and women in the Persian Gulf in six months to set in motion briskly a substantial public investment program.

There is a non-economic dimension to this problem. At the moment, the strains of protracted recession tend to divide our society, as each family faces mounting difficulties pretty much alone. A concerted effort to rebuild the nation's capital stock would be unifying. This is a program neither Democratic nor Republican, liberal, or conservative. It is, simply, a mature response to the certain knowledge that even a rich nation cannot go on living off capital indefinitely.

Mr. Rostow, national security adviser under Presidents Kennedy and Johnson, is a professor at the University of Texas, in Austin.

THE WALL STREET JOURNAL.
WEDNESDAY, JANUARY 8, 1992

Commentary

The American Century ended in 1980, and auto industry woes are but one result of our unwillingness to change.

By DAVID HALBERSTAM

PACIFIC PERSPECTIVE

Bush Tour's Message Invites Scorn

President Bush's trip to Japan, long overdue, is an important one. Ironically, among the people he brought along are the heads of the Big Three auto companies.

It won't work. It won't work at home, where there will be some residual sympathy for the workers but little for the men who head the companies. And there will be none in Japan, where bringing the auto executives as special guests on a trip designed to underline the unfairness of Japan's trade policies may generate some surface action, but will primarily create far greater private scorn for us as an economic power.

The Japanese protect new, ascending and, to them, more valuable industries. The Americans protect older, declining industries.

Automobiles are a case in point. Even if the Japanese make concessions here, they will do so with secret contempt for America. To them it is America at its worst, a victory they won the hard way by paying a higher price and producing better cars against all odds.

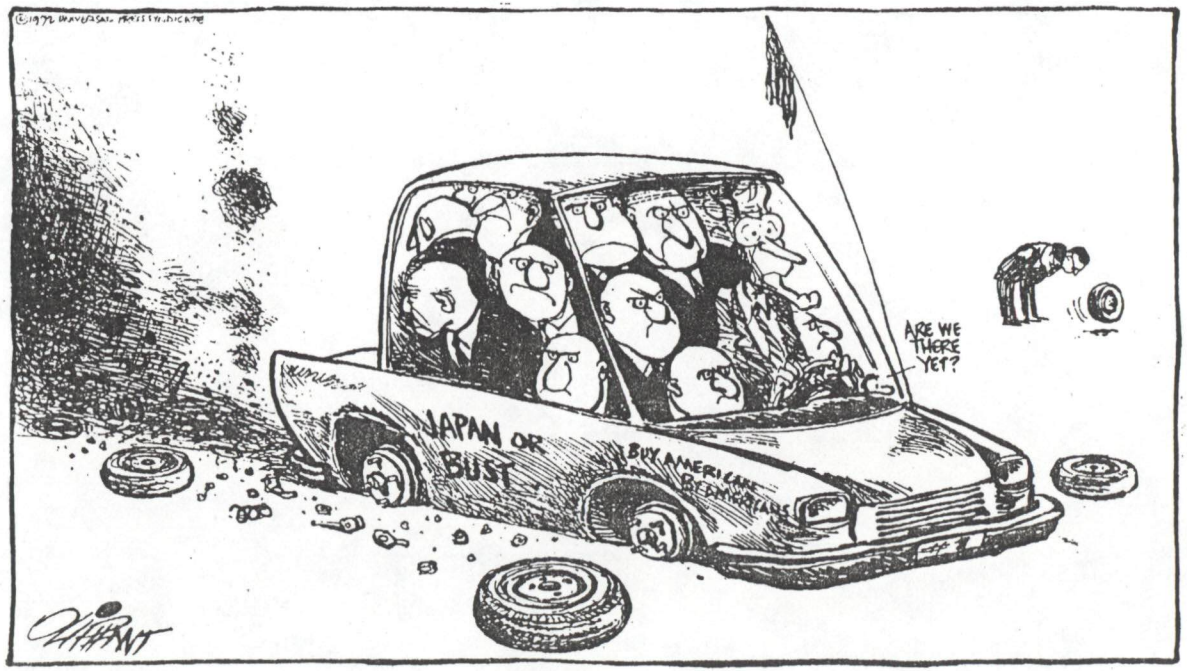
If we were once contemptuous of them, they now, albeit privately, return that contempt. To many Japanese, being pressured by America on autos becomes an example not of their own nation's lack of response to legitimate American trade grievances, but of the whining of overpaid executives in a nation whose best and most vigorous days are in the past.

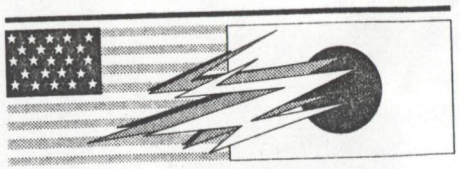
To the Japanese, this was an industry where the leaders were obsessed not with quality and modernity of product but with financial profit. Their customers were not the people who bought the cars but the people who bought their stock. They operated with great success for a long time in a de facto monopoly (with the unions as junior partners). They did not listen to their best engineers, and they did not seek engineering or manufacturing excellence.

To the Japanese auto men, though they are polite in public discussion, the American manufacturers are men who made almost every wrong decision, were distanced from their plants and their products, and remained oblivious to historic changes in their industry. And, worst of all, who rewarded themselves far too handsomely.

In recent years, the one manager who worried them was Lee Iacocca, because he was so smart, forceful and verbal; a man, in their eyes, with both significant industrial and political skills who could possibly change not merely a company, but an industry, and finally a country. In the mid-1980s, when Chrysler made its partial comeback and Iacocca took out $31 million in compensation in a two-year period, his Japanese peers relaxed. As far as they were concerned, for all his talent and brilliance, in the end he was like the others.

When he is talking about the Japanese, Iacocca likes to talk about the need for a level playing field. What he does not understand is that by 1980, for the





CRISIS POINT

The tense U. S. - Japan relationship

■ One in a continuing series.

first time in 35 years, the playing field had become in the larger sense level. The American Century was coming to a halt. There were other people out there who did things as well or better than Americans, albeit with different capital formation, different forms of labor relations and unions, and different forms of education.

The Japanese are not always good at doing the things we ask them to do. They are as poor at being Americans as we are at being Japanese. But in the case of the auto industry, they in fact responded (in no small reason out of self-interest) rather positively to a number of our demands.

We asked them to set a limit on their imports. And they did (going predictably to more expensive cars in the middle and upper range, with greater value added per car). We asked them to harden their yen. And they did. This was a profound change within an economy as narrowly based as theirs, and one that caused great hardship on their workers.

But they overcame it by making their industrial process better and even more efficient. And, finally, we asked them to set up manufacturing plants here in America. And they did, both reluctantly and fearfully. In the end, the ventures here have met with success that has surprised both them and us, and that, because of the hardening of the yen, they achieved at bargain-basement prices.

They are good because they are good. They are process-driven. They have given manufacturing excellence a far higher priority than we did in the years when we blew our great lead. Their work force is strong and well-educated. Their domestic competition remains fierce, so they pour resources back into their plants. If a given company makes a breakthrough in terms of technology, it goes into production immediately. Many of their top executives have run their companies' manufacturing lines.

If, in the last 10 years, some American companies, most notably Ford, have gotten the word and have dramatically improved their quality, then we have also learned that the Japanese are not a stationary target. We get better, but so do they.

It is important to remember that they beat us from a standing start, when we were rich and they were poor and we were vastly ahead of them in plant technology. Now they are ahead of us in plant technology and they are far more liquid than we.

What I am talking about here is, of course, not merely a company, General Motors, nor an industry, autos, but a country, the United States. What has happened with autos is just the tip of the iceberg. The world has changed, and the rest of the world has caught up while we remain on automatic pilot.

David Halberstam is the author of, among many works, "The Reckoning" (William Morrow, 1986) an account of the demise of the American auto industry and the rise of the Japanese auto makers.

COMMENT

Recession offers opportunity to mature as nation

Time for us to focus on long-term solutions

By William Neikirk

No pain, no gain, the old saying goes. This was a recession that we were destined to have, and if we are smart, it will be good for us. The "if" looms large. We may not be as smart as we think we are, and we may simply resume our old, losing way of economic behavior when the recession ends.

Not many people know it, but you can still go downhill while you are growing. It seems a paradox, but it is true. That's because people don't see the economic process as a race, which it is. Great Britain continued to grow even as it lost an empire. Other nations, most notably the United States, grew much faster and overtook it as the world's economic leader. The same thing could happen to us.

False prosperity, brought about by tax cuts that temporarily boost economic output, would be the worst thing that could happen to us right now.

It would merely lengthen the "denial" stage of economic illness. For the past few years, few people have wanted to admit that the U.S. economy is in deep long-term trouble and in need of some strong medicine.

Recessions are supposed to serve the purpose of wiping out all pretenses that the economic malaise isn't real, deeply rooted and of a long-term nature. For many, many months, the Bush administration and Congress served up these pretenses. But now that they have reversed themselves and understood there's a problem, they've reverted to their old reflexes: Let's give them one big tax bill to fix everything.

It won't, even if it contains some incentives for investment.

The slowdown in the American standard of living is a more complex matter. It is, perhaps least of all, a financial question. It is more of a cultural issue involving social, economic and political institutions.

Let's put it this way. When politicians in Washington want to "improve" the economy, they began to look at lower interest rates, lower tax

rates or various financial incentives. They rarely begin with people and the institutions they rely on.

If they took this approach, their programs would be different. The fear now enveloping families and individuals is based on the disturbing long-term trends of the U.S. economy and the lack of a strategy to deal with them.

It would lead them to an immediate, strong demand for educational reform, one that would guarantee turning the lackadaisical U.S. workforce into the world's finest. For a decade at least, people have pointed to this as our greatest economic weakness. But it's always been a good "talking point," never a good "doing point."

But if America wants to prevent itself from turning into a country with a vast cadre of low-paid, disposable workers, it should turn immediately to overhauling the way it educates and trains its workers.

Too many politicians live in the past and believe that we can regain those industrial jobs that did not require wide education and skills. But in today's world, even blue-collar jobs require workers with solid educational background.

What should one say of a corporate world that hires and nurtures workers and then spits them out on the street the moment their bottom line is threatened? One thing we can say is that it is only following the signals from Washington, that "human resources" are not a highly valued economic input.

Washington needs to recognize that aggressive layoff and cost-cutting policies do not constitute good, long-term productivity gains for the country. Companies may see their bottom lines improve, but the people who have been laid off become drags on our public resources, corporate and individual.

A poorly performing economy is divisive internally, touching off conflicts between class and race, between the haves and the have-nots. At the rate we are going, we are developing a Third World economy within our own country.

But it makes no sense to force companies to take on workers who would cut profits. Companies must be persuaded that additional hiring will improve their economic positions. For this to happen, the United States should focus on policies that foster innovation, efficiency and new products and services produced at home.

A more effective jobs policy would strengthen our companies and remove their obsession with the short term. It would encourage domestic investment on a scale not seen in this country since the 1960s. This would require a wide variety of tax and regulatory changes and even new forms of corporate ownership.

It must be recognized that the United States cannot have a well-functioning economic system with a broken financial system. If Bush and Congress are truly serious about a solid, long-term recovery, they should approve banking reforms as soon as possible.

Banks have become vast black holes that suck up money and hold it hostage from people who would like to start businesses and build up existing ones. This money winds up bidding up stock prices, rather than building companies that would hire people and provide a solid reason for a high stock value.

More than anything else, this recession should make all of us wake up and look at the long term. Bush and Congress will try to avoid it at all costs. It's up to us to keep their eyes properly focused.

William Neikirk is a Washington columnist for the Chicago Tribune.

Commentary

PERSPECTIVE ON COMPETITIVENESS

Nurture Technologies That Will Pay Big

Research choices should be made with payoffs firmly in mind. Government needs to take the lead.

By JOHN A. YOUNG

Our nation's ability to develop basic technologies—and then to turn them into products and services that consumers will buy—has a direct bearing on economic performance and our standard of living. By and large, American workers earn more than their counterparts abroad. This wage differential isn't a national right; we have to earn it in an increasingly competitive global economy.

We can do this in two ways. First, technology can make us more productive than our foreign competitors by enabling us to automate key business activities, such as assembling a product or processing a financial transaction. Nobel Laureate Robert Solow of MIT, Michael Boskin, chairman of the Council of Economic Advisers, and others have shown that perhaps half of America's productivity growth since World War II is attributable to better technology. In addition, technology can improve our standard of living by making it possible for us to provide unique and advanced products, processes and services that command a premium price in world markets.

Clearly, the private sector plays the central role here. It needs to make the investments and take the risks required to commercialize technology successfully. Government incentives, such as permanent tax credits for research and development and accelerated depreciation schedules for manufacturing equipment, can help. But such incentives aren't sufficient; American firms increasingly compete not just against each other but against companies in other nations that have science and technology policies promoting industrial growth.

Therefore, the basic recommendation by the Council on Competitiveness is for the government and industry to cooperate on a new national priority: keeping America at the forefront of technology.

What the council advocates is a technology policy. While industrial policy involves deciding which industries or products we should promote, a technology policy would identify and nurture technologies that span industries or business sectors. It is a strategy for developing, advancing and implementing generic, precompetitive technologies—that is, those with the potential to contribute to a wide range of yet-undetermined commercial applications.

President Bush has expressed his support for a national technology policy. Some people assert that the government can't make intelligent choices on supporting critical technologies, yet the government has been deeply involved in choosing R&D projects. In 1990 alone, the National Science Foundation funded about 17,000 research projects; the National Institutes of Health provided 34,000 research grants. The space program, the Human Genome project and the superconducting supercollider are government-funded.

These examples show that the government can and does work with the private sector to choose technology projects. The issue is whether it adequately considers the impact on competitiveness in making these decisions.

Current federal funding for R&D doesn't address this urgent need. Only a small percentage of what Washington earmarks for research has any direct relevance to industry. That's because military technology consumes two-thirds of the government's research funding. Another large chunk supports space and energy programs. These are obviously worthwhile endeavors, but the spillover to industrial technology is minimal because technologies relevant to military and commercial uses are widely divergent, much more so than they were 20 years ago. Any crossover from the military to the civilian sector is largely accidental. In fact, there is now heavier traffic in the other direction—from commercial to military.

The competitiveness report contains two key recommendations for federal action. First, the President should make technology leadership an explicit and urgent national priority.

The Administration's budget plan is a step in this direction. President Bush has proposed a 13% increase in the federal R&D budget in fiscal 1992, to just under $76 billion. His recommendation to create a high-performance computing network signals recognition of technology's contribution to competitiveness.

The competitiveness report argues that we must go even further if federally funded R&D is to improve America's standard of living. One way to foster such improvement would be to redirect our federal research laboratories. Although the nation spends about $20 billion on these labs, their current culture and direction don't adequately support technology development that improves economic performance.

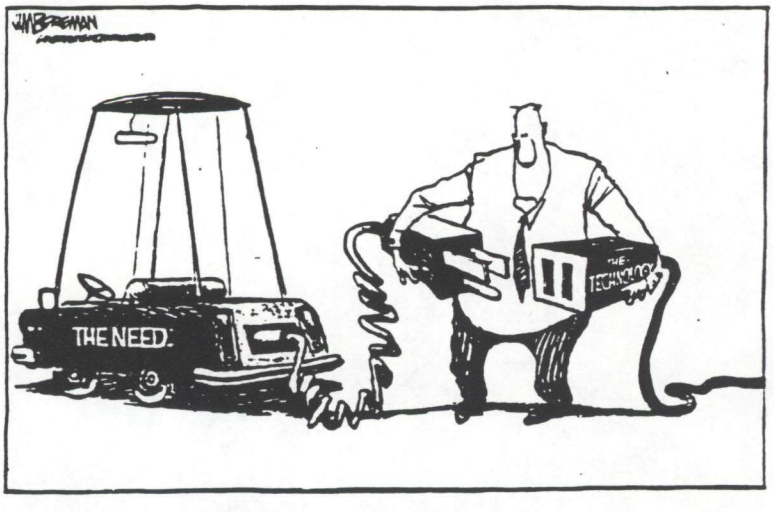
The report recommends stronger ties between industry and the labs. This collaboration would include benchmarks that measure industry's involvement in and the industrial relevance of the labs' R&D in the short term as well as the potential for applications of their work in generic technologies on a longer term. Accountability for meeting goals based on these benchmarks is also crucial.

The second recommendation concerns what the council calls America's technology infrastructure—our schools and research facilities, which are the source of the new ideas and technologies that can reverse our decline.

Federal and state governments have consistently led national efforts to build and improve America's infrastructure—whether it's interstate highways or research labs. Given the realities of the new global economic order, it's essential for the federal government to take the lead in enhancing the ability of the nation's technology infrastructure to contribute to competitiveness.

But, in the end, more money won't guarantee success. Our nation must awaken to the direct link between technology leadership and our standard of living. The same sense of mission and urgency that inspired our space program and the liberation of Kuwait should now be applied to the less spectacular but equally important issue of America's technology leadership.

John A. Young is president and chief executive officer of Hewlett-Packard and a member of the Executive Committee of the Council on Competitiveness.



JAN 13 1992

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January 4, 1992

Doug —
more
letter!
No original needed.

Mr. Karl Erb
Assistant Director
Office of Science and Technology
Old Executive Office Building
Washington, D.C. 20506

Dear Mr. Beason:

The attached copy is for your interest and information.

Sincerely yours,

Joseph G. Logan
President

Attachment

APPLIED ENERGY SCIENCES, INC.
1861 North Gaffey Street, Suite B
San Pedro, California 90731
Tel (213) 514-5513
Message (213) 514-5522
Fax (213) 547-1915

January 3, 1992

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United States Department of Commerce
Commerce Building
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Washington, D.C. 20230

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Joseph G. Logan
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1861 North Gaffey Street, Suite B
San Pedro, California 90731
Tel (213) 514-5513
Message (213) 514-5522
Fax (213) 547-1915

December 27, 1991

Mr. J. Douglas Beason
Senior Policy Analyst
Office of Science and Technology Policy
Executive Office of the President
Washington, D.C. 20506

Dear Mr. Beason:

Thank you for your letter of 18 December 1991 in response to my correspondence to Mr. Erb.

The material mentioned in your letter was merely provided as background material to point out the significance of a little noticed branch of the classical theory of fields, the classical collisionless particle regime. The impact, if the technological implications are considered, could be of major importance.

The audience for the development is not limited. Although the characteristics of the field were originally cited to improve the understanding of electromagnetic phenomena by students, it can be demonstrated for the first time that the phenomena provides the basis for the construction of exact models of atoms and other fundamental particles. The actual behavior of atoms can be visualized when the software modeling capability is developed.

In addition the ability, for the first time, to construct exact classical models of light waves yields the unusual result that a classical parallel of the Einstein-Lorentz relativistic model can be shown to exist. The transverse plane waves in the classical field must necessarily satisfy classical invariance conditions.

This is now being suggested to technical journals, as indicated in an attachment.

What could be at stake, if the potential is not examined and exploited in this nation first, is the leadership in new technology development. It is now possible to design scientific software so that the behavior of fundamental particles can be studied visually. The unique feature is that the force field phenomena are modeled so that the models perform in the computer systems exactly as they would behave in nature.

For the first time, if the capability is developed, it would be possible to design computer-based systems to carry out simulated experiments that could, for example, provide the basis for developing many types of new and improved material and chemical systems. The new capability could ensure leadership in technology.

Environments can be simulated and effects of particle substitution can be examined. Simulation based on the modeling of actual force field

effects allows the modeled systems to perform exactly as the actual basic particles would perform under similar environmental conditions. In effect a computer-based experimental laboratory can be developed. The only limitation of the simulation being the sophistication of the computer systems employed to achieve the simulation.

The dramatic new forms of software that could be developed for CAD/CAM applications and for scientific research would significantly improve the current hardware and software markets. New manufacturing opportunities could be created and the resulting economic impact could prove to be substantial under the present Administration.

The potential for the improvement of the technology base becomes obvious when it is recognized that each small firm engaged in development can have access to experimental tools that could easily exceed the current capability of even the major super computer networks carrying out basic investigations of physical phenomena.

Even though the existence of such a capability has not as yet been fully recognized by the scientific community it would be in the best interest of this Administration to at least examine the potential offered by the new modeling capability. There actually exists a much greater potential for the improvement of the domestic economy for the purposes of the Office of Science and Technology Policy than you have implied in your reply.

Because of this potential, similar information is now being provided to industry. Major organizations from the private sector, such as IBM, are being encouraged to explore the potential. The breakthrough aspect is also being suggested.

This technological advance provides a unique example of the type of "breakthrough" technology currently being sought by the Federal Government to improve technology capability. This development could result in a significant increase in manufacturing operations, and stimulate economic growth.

The Office of Science and Technology Policy could assume a lead role in encouraging the examination of the potential. That is the reason for the prior submission of the information to your Office and for the additional material furnished with this reply.

Sincerely yours,

Joseph G. Logan
President

Attachments

cc: D.A. Bromley
G.E. Brown, Jr.
K. Erb

APPLIED ENERGY SCIENCES, INC.
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San Pedro, California 90731

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December 28, 1991

COPY

Dr. D. Allan Bromley
Executive Office of the President
Washington, D.C. 20506

Dear Dr. Bromley:

A copy of recent correspondence, initiated with the Office of Science and Technology Policy to describe a new development in the classical theory of fields that now provides the basis for the creation of a dramatic new form of scientific software, is attached for your interest and information. The impact on new technology development, manufacturing, and the domestic economy could be substantial if the new capability is rapidly exploited.

Dramatic new developments in applied science and engineering can always lead to substantial improvement in the domestic economy as a result of the new investment opportunities, new product development, and the stimulus to manufacturing that can result. A basic description of the new development is summarized below.

The new development that was described to Mr. Erb fits the above category. Classical models can be constructed to behave in a classical particle medium exactly as the fundamental particles have been observed to behave in the vacuum domain. This adds a new dimension to the investigation of physical phenomena at a microscopic level.

Employing the new forms of software designed to enable visualization of simulated atomic phenomena, computer-based "experimental facilities" can be developed to duplicate the phenomena occurring in actual experimental facilities, with the single important difference that the actual particle behavior can be observed.

Investigations can be carried out economically that would require enormous expenditures to duplicate in actual experimental studies.

Small businesses engaged in research and development can have access to facilities for experimental investigations that previously would only have been available to the major corporations capable of large investments. The potential would exist for major improvement in the technical capabilities of businesses engaged in the frontiers of research. Technological capabilities in such fields as materials, chemicals, and energy

would be substantially improved.

It is unfortunate that up to this time, funds have not been made available to enable the demonstration of this new software development capability for industry. This is especially true when it is recognized that the background research that enables the development has been well-documented and described in peer-approved technical papers.

The support for the prototype software demonstration would provide an outstanding example of the importance of transitional funding to support exciting new ideas that can revolutionize technological development.

The required transitional activities to enable the demonstration of the significance of the development would be ideal for consideration by a Federal program such as the Advanced Technology Program being initiated by the National Institute of Standards and Technology.

The need for a prototype demonstration is suggested in the attached copies of recent correspondence with industry. Attempts are now being made to interest major corporations in supporting such prototype development. Encouragement by the Office of Science and Technology Policy could greatly accelerate the demonstration of the potential offered by this dramatic advance in scientific software development.

A copy of recent correspondence with the Editor of <u>The Sciences</u> is also enclosed for your interest.

Sincerely yours,

Joseph G. Logan
President

Attachments

APPLIED ENERGY SCIENCES, INC.
1861 North Gaffey Street, Suite B
San Pedro, California 90731

Tel (213) 514-5513
Message (213) 514-5522
Fax (213) 547-1915

December 28, 1991

COPY

Gloria B. Lubkin
Editor
Physics Today
335 East 45th Street
New York, New York 10017

Dear Ms. Lubkin:

The attached Letter might be of interest for publication in the Letters Section.

Sincerely yours,

Joseph G. Logan
President

Enclosure

More on Lessons in Humility

In a recent Reference Frame article in Physics Today (December 1991, p. 9), Daniel Kleppner emphasized the need for humility when trying to forecast the future of physics. He suggested that the only thing that scientists can forecast with much accuracy is an eclipse, and pointed out that veteran science forecasters invariably qualify their discussions with cautionary statements to the effect that because the exciting discoveries are unpredictable, their predictions cannot pretend to do justice to the glorious potential of their particular fields.

He then listed a number of significant advances that were missed hardly more than five years after the last ten year forecast of the Brinkman committee. The listing included nonlinear dynamics and chaos theory. It was mentioned that the last Brinkman physics survey hardly noticed that classical mechanics was on the threshold of a renaissance.

It is unfortunate that Daniel Kleppner did not also point out that very significant developments in physical theory, and in classical mechanics, are frequently overlooked when they are first described. One such development occurred in the classical mechanics in the latter part of the fifth decade in this century that, if recognized at that time, might have changed the course of the development of physical theory.

That development was the little noticed discovery that a plane transverse disturbance propagation mode was observed to emerge as the dominant wave propagation mode in extremely rarefied (collisionless) particle domains.

In a recent publication (J. Appl. Phys., 66, 15, October 1989, p. 3947) one of the early authors, Hsun-Tiao Yang, provided additional details concerning the discovery. The significance, of course, is that this provided the first description of a transverse propagation mode that could duplicate the behavior of a plane electromagnetic wave. Such a transverse disturbance in the classical field must exhibit invariance under Galilean transformation. In a collisionless domain, as a consequence, only the invariant speed of the transverse wave can be measured.

This provides the first model of classical wave propagation that satisfies the Einstein postulates. The center of a spherical wave emitted in an inertial frame moving with an arbitrary constant velocity acquires the velocity of the emitter. The only wave propagation speed that can be observed is equivalent to the speed that would be observed if the inertial frame in which it was created was at rest. The overall emitted stream behaves just as any observer and any measuring instrument in a moving inertial frame.

This is easily shown because the independent streams created in

an idealized domain possess Maxwellian distributions in velocity. Classical Maxwellian streams are known to be invariant under Galilean transformation. All components of the stream acquire the same velocity increment and the center of a spherical stream therefore appears fixed within the inertial frame. The speed of propagation of the wave is determined from the normal averaging process over the energies of the components for the calculation of the constant wave speed.

This classical model satisfies the requirements of the Einstein postulates because only the speed of the wave carried within the independent stream can be observed or measured in an inertial frame. As a consequence, the description of all field phenomena in classical collisionless particle domains can be described within the framework of the classical Newtonian mechanics.

Simply by assuming that the vacuum domain can be characterized by photons that do not interact, but possess a Maxwellian distribution in velocity when photon streams are produced as a result of absorption and emission processes, a transition can be made from the Einstein-Lorentz framework for the description of electromagnetic wave propagation to a framework that enables an equivalent description within the classical Newtonian mechanics.

Alternate and parallel classical descriptions and interpretations of the Einstein developments should therefore exist. This would truly place classical mechanics on the threshold of a renaissance.
Should not this discovery and description of the classical particle field parallel of a light wave be considered as a significant, but ignored, advance?

Joseph G. Logan
Applied Energy Sciences, Inc.
San Pedro, California

"Document Control"

TYPE: INFORMATION DOCUMENT NUMBER: 9200028
ORIGINATOR: 02 STATUS C DIRECTORATE STATUS
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FROM: KOSTER, William P. and COPLEY, Stephen M.: ASM INTERNATIONAL

TO: DR. D.A. BROMLEY

DATE OF
CORRESPONDENCE: 01/06/92

SUBJECT: A LETTER EXPRESSING THEIR SUPPORT OF THE BUDGET CROSSCUT AND PREPARATION ACTIVITY CONDUCTED BY FCCSET FOR THE FIELD OF ADVANCED MATERIALS. THEY OFFER THEIR SERVICES TO ASSIST IN THE DEVELOPMENT AND IMPLEMENTATION OF A STRATEGY TO PROVIDE PRIVATE
****

DIRECTORATE ASSIGNED: STAFF ASSIGNED: Dave Cranwell - 1/28/92
Please draft reply for DAG's signature.

ACTION REQUIRED: STAFF ACTION: C

****

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT:

****

COPIES TO: D. Allan Bromley
FCCSET
INDUSTRIAL
PHYSICAL SCIENCES ✓
****

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS:

OSTP RECEIVED: 01/06/92 DEPT RECEIVED:
FILE: FCCSET Materials

CENTRAL FILES:

"Document Control"

TYPE: Information DOCUMENT NUMBER: 9200128
ORIGINATOR: 03 STATUS DIRECTORATE STATUS C
****

FROM: BARTHOLD, Gregory: AMERICAN SOCIETY OF MATERIALS

TO: KAE

DATE OF
CORRESPONDENCE: 01/13/92

SUBJECT: Confirming visit with Bill Owczarski scheduled for 1/21 at 11:00. Attaching letter they sent to DAB previously.

****

DIRECTORATE ASSIGNED: STAFF ASSIGNED:

ACTION REQUIRED: STAFF ACTION:

****

SENDER'S DUE DATE:
OSTP DUE DATE: STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 01/15/92

****

COPIES TO:

****

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS:

OSTP RECEIVED: DEPT RECEIVED: 01/15/92
FILE: MATERIALS--GENERAL

CENTRAL FILES:

ALUMINUM COMPANY OF AMERICA
1615 M STREET NW, SUITE 500
WASHINGTON, D.C. 20036

ALCOA

T
1/21
11:00

JAN 15 1992

January 13, 1992

Dr. Karl A. Erb
Office of Science and Technology Policy
Old Executive Office Building
Washington, DC 20506

Dear Dr. Erb:

This is to confirm our visit with you 11 AM, January 21. Bill Owczarski and I who are representing the American Society of Materials wish to discuss the attached letter which was sent to Dr. Bromley earlier.

ASM is most interested in being of assistance in the development and implementation of a materials initiative. We look forward to discussing this with you.

Gregory B. Barthold
Director, Government Marketing
202/956-5320

GBB:ncs(658)

Attachment

cc: W. A. Owczarski

DOB: 11/4/32

ASM INTERNATIONAL®
The Materials Information Society

ASM WORLD HEADQUARTERS

Dr. William P. Koster
President (1991-1992)
Materials Park, Ohio
44073-0002
216 · 338 · 5151
FAX: 216 · 338 · 4634
TELEX: 98 · 0619 ASMINT

6 January 1992

COPY

Dr. D. Allan Bromley
Assistant to the President for
Science and Technology
Executive Office of the President
Washington D.C. 20500

Dear Dr. Bromley:

ASM International welcomes and applauds the budget crosscut and preparation activity which is being conducted by the FCCSET process for the field of advanced materials and related processes. We recognize and completely support the premise that advanced materials and processing is a critical and enabling technology for future American national security and economic prosperity. We also welcome and encourage the development of a major initiative on materials which has been indicated would be part of the President's FY 1993 budget proposal.

For this initiative to have maximum effect, the technical benefits must flow easily to commercial implementation by U.S. industry. It is because of this that we urge the earliest possible involvement by industry both large and small and, of course, the academic communities in the formulation and development of the initiative.

ASM International is the largest technical society devoted to the science and technology of materials. Through its 52,000 members, nearly 200 committees, and more than 200 chapters, ASM is the leading provider of materials information to the materials community.

ASM International would be pleased to offer its services to assist in the development and implementation of a strategy which can achieve early and effective private sector input into this very important initiative. May we compliment you on your personal leadership in beginning this effort.

Sincerely,

ASM International®

William P. Koster
President, 1991-1992

Stephen M. Copley
President, 1990-1991

JRC/ds/msestudy

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

STAFFING SHEET

SUBJECT: 2 letters to Kostu + Copley: ASM International

ORIGINATOR: Karl Erb **PHONE:** 5130

DATE ORIGINATED: 2/3/92 **DATE DUE:** ASAP **CORR TRACKING NO:** 920024

EXTERNAL COORDINATION:

	COMMENTS	DATE
DIRECTOR		
GENERAL COUNSEL		
EXEC. ASST.		

ACTION REQUESTED: Jacklyn, after DAB signs both letters, please return all to D will send out. Thanx. Priscilla

COORDINATION	COMMENTS	DATE
Henderson, D. A. Concur: Non Concur:		
Erb, K. Concur: Non Concur:	Drafted Reply for DAB's Signature	2/3/92
Ratchford, J. T. Concur: Non Concur:		
Wong, E. Concur: Non Concur:		
Concur: Non Concur:		
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THE WHITE HOUSE

WASHINGTON

February 3, 1992

Dear Dr. Copley:

Thank you for your letter of January 6, 1992 concerning our efforts to strengthen the Federal materials R&D program. We appreciate your support, and we will be sending you a copy of the report describing the new Advanced Materials Processing Program (AMPP). As the report emphasizes, we hope to strengthen the interfaces between the Federal program and the R&D efforts of the private sector, and we would welcome comments from your organization.

You can send your suggestions to Dr. Karl Erb, who is the Acting Associate Director for Physical Sciences and Engineering, and has responsibility for OSTP coordination of AMPP, or to the Federal Agency most strongly connected to your areas of interest.

Sincerely,

D. Allan Bromley
The Assistant to the President
for
Science and Technology

Dr. Stephen M. Copley
President, 1990-1991
ASM International
Materials Park, OH 44073-0002

THE WHITE HOUSE

WASHINGTON

February 3, 1992

Dear Dr. Koster:

Thank you for your letter of January 6, 1992 concerning our efforts to strengthen the Federal materials R&D program. We appreciate your support, and we will be sending you a copy of the report describing the new Advanced Materials Processing Program (AMPP). As the report emphasizes, we hope to strengthen the interfaces between the Federal program and the R&D efforts of the private sector, and we would welcome comments from your organization.

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Sincerely,

D. Allan Bromley
The Assistant to the President
for
Science and Technology

Dr. William P. Koster
President, 1991-1992
ASM International
Materials Park, OH 44073-0002