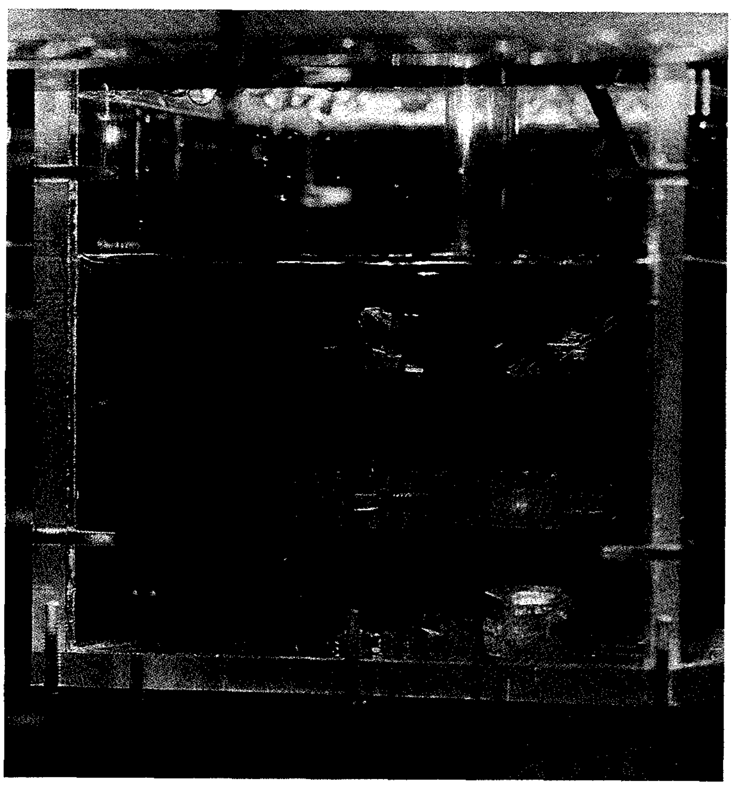
ANNUAL REPORT 1993

DOE/ER/75833--T3

Science and Engineering Alliance, Inc.



AAMU o JSU o PVAMU o SUBR o LLNL
JSU o PVAMU o SUBR o LLNL o AAMU
PVAMU o SUBR o LLNL o AAMU o JSU
SUBR o LLNL o AAMU o JSU o PVAMU
LLNL o AAMU o JSU o PVAMU o SUBR
AAMU o JSU o PVAMU o SUBR o LLNL
JSU o PVAMU o SUBR o LLNL o AAMU
PVAMU o SUBR o LLNL o AAMU o JSU
SUBR o LLNL o AAMU o JSU o PVAMU
LLNL o AAMU o JSU o PVAMU o SUBR
AAMU o JSU o PVAMU o SUBR o LLNL
JSU o PVAMU o SUBR o LLNL o AAMU
PVAMU o SUBR o LLNL o AAMU o JSU
SUBR o LLNL o AAMU o JSU o PVAMU
LLNL o AAMU o JSU o PVAMU o SUBR
AAMU o JSU o PVAMU o SUBR o LLNL
JSU o PVAMU o SUBR o LLNL o AAMU
PVAMU o SUBR o LLNL o AAMU o JSU
SUBR o LLNL o AAMU o JSU o PVAMU
LLNL o AAMU o JSU o PVAMU o SUBR
AAMU o JSU o PVAMU o SUBR o LLNL
JSU o PVAMU o SUBR o LLNL o AAMU
PVAMU o SUBR o LLNL o AAMU o JSU
SUBR o LLNL o AAMU o JSU o PVAMU
LLNL o AAMU o JSU o PVAMU o SUBR
AAMU o JSU o PVAMU o SUBR o LLNL
JSU o PVAMU o SUBR o LLNL o AAMU

Cover Caption

On the cover are crystals grown in a crystal growth chamber in the laboratory of SEA member, Alabama A&M University (AAMU). The researchers are studying room temperature infrared detector and second harmonic generation crystals. Crystals from the laboratory have been part of two NASA Space Shuttle Missions, i.e., Spacelab 3 Mission in 1985 and the First International Microgravity Laboratory (IML-1) Mission in 1992. These experiments are providing greater insights of how fluids behave and crystals grow in a low-g environment.

ANNUAL REPORT 1993

Science and Engineering Alliance, Inc.

Contents

AAMUoJSUoPVAMUoSUBRoLLNL
JSUoPVAMUoSUBRoLLNLoAAMU
PVAMUoSUBRoLLNLoAAMUoJSU
SUBRoLLNLoAAMUoJSUoPVAMU
LLNLoAAMUoJSUoPVAMUoSUBR
AAMUoJSUoPVAMUoSUBRoLLNL
JSUoPVAMUoSUBRoLLNLoAAMU
PVAMUoSUBRoLLNLoAAMUoJSU
SUBRoLLNLoAAMUoJSUoPVAMU
LLNLoAAMUoJSUoPVAMUoSUBR
AAMUoJSUoPVAMUoSUBRoLLNL
JSUoPVAMUoSUBRoLLNLoAAMU
PVAMUoSUBRoLLNLoAAMUoJSU
SUBRoLLNLoAAMUoJSUoPVAMU
LLNLoAAMUoJSUoPVAMUoSUBR
AAMUoJSUoPVAMUoSUBRoLLNL
JSUoPVAMUoSUBRoLLNLoAAMU
PVAMUoSUBRoLLNLoAAMUoJSU
SUBRoLLNLoAAMUoJSUoPVAMU
LLNLoAAMUoJSUoPVAMUoSUBR
AAMUoJSUoPVAMUoSUBRoLLNL
JSUoPVAMUoSUBRoLLNLoAAMU
PVAMUoSUBRoLLNLoAAMUoJSU
SUBRoLLNLoAAMUoJSUoPVAMU
LLNLoAAMUoJSUoPVAMUoSUBR
AAMUoJSUoPVAMUoSUBRoLLNL
JSUoPVAMUoSUBRoLLNLoAAMU

Science and Engineering Alliance, Inc.

SEA is a not-for-profit corporation formed by four Historically Black Colleges and Universities (HBCUs) and a leading national laboratory.

The four HBCU institutions are:

- *Alabama A&M University, Normal , AL (1890 Land Grant University)*
- *Jackson State University, Jackson, MS (Comprehensive Urban University)*
- *Prairie View A&M University, Prairie View, TX (1890 Land Grant University)*
- *Southern University and A&M College, Baton Rouge, LA (1890 Land Grant University)*

The national laboratory is:

- *Lawrence Livermore National Laboratory Livermore, CA*

By combining their resources and with support from the U.S. Department of Energy (DOE), SEA has worked for the past three years to increase the participation of African-Americans in science, engineering, and related fields. At the core of the SEA is a combined population of over 33,000 African-American students, and a combined HBCU research faculty and staff of nearly 400 individuals that specialize in several major areas of science and engineering. SEA views its approach as a constructive, long-term solution to increasing the nation's technical manpower talent pool.

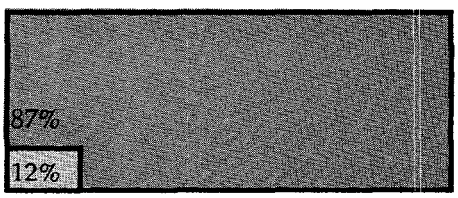
For the faculty and students, SEA develops new collaborative research opportunities, creates new summer research internships and coop programs, strengthens existing programs, provides student for participation in technical conferences, workshops, and seminars, and grants scholarships and incentive awards to future scientists and engineers.

SEA relies on the collective talents of its members to build partnerships with the Federal government and private industry that help create opportunities for African-American science and engineering students, and promote activities that advance our mission. As the number of science and engineering students graduating from SEA institutions continues to rise, we are pleased to report that the SEA program is making a difference.

- SEA submitted two proposals to DOE for funding consideration: "*Installation of A Synchotron Radiation Beamline Facility at the J. Bennett Johnston, Sr. Center for Advanced Microstructures and Devices for the Science and Engineering Alliance" and High Performance Computing and Communications (HPCC) Initiatives;*"
- SEA extended support to three smaller HBCU institutions that resulted in development of a framework for conducting "*A Needs Assessment to Assist with Strategic Planning for the Long-Term Development of Natural Science Departments at HBCU Institutions;*"
- SEA's scholarship and incentive awards program has helped *over 30 high school students and over 50 undergraduate students since 1991*; and
- SEA's eight teacher enhancement workshops have benefited *over 180 teachers who annually have direct or indirect contact with over 15,000 students, 65% of whom are minorities.*

SEA enters its fourth year with a solid and focused program for helping build the nation's future science and technology work force. By enhancing the collective capability of its member institutions, SEA is creating a collaborative model that would ensure increased participation of African-Americans in science, engineering, and related fields. This participation ultimately will lead to a more well-qualified and diverse talent pool that can meet the technical needs of our nation.

Financial Highlights



Program Services	$157,806
Management & Gen.	$ 23,028

Letter from the Chairman

As the underrepresented population continues to increase rapidly, the number of students from this population that choose to pursue careers in the science and engineering fields is not keeping pace. This critical problem comes at a time when projections show that by the year 2000, the underrepresented population will account for over 40 percent of all primary and secondary students in America's classrooms. And the reality is that our future competitiveness as a nation is linked to the quality of our future work force, which is inescapably coupled to the education we provide for all of the children in America's classrooms.

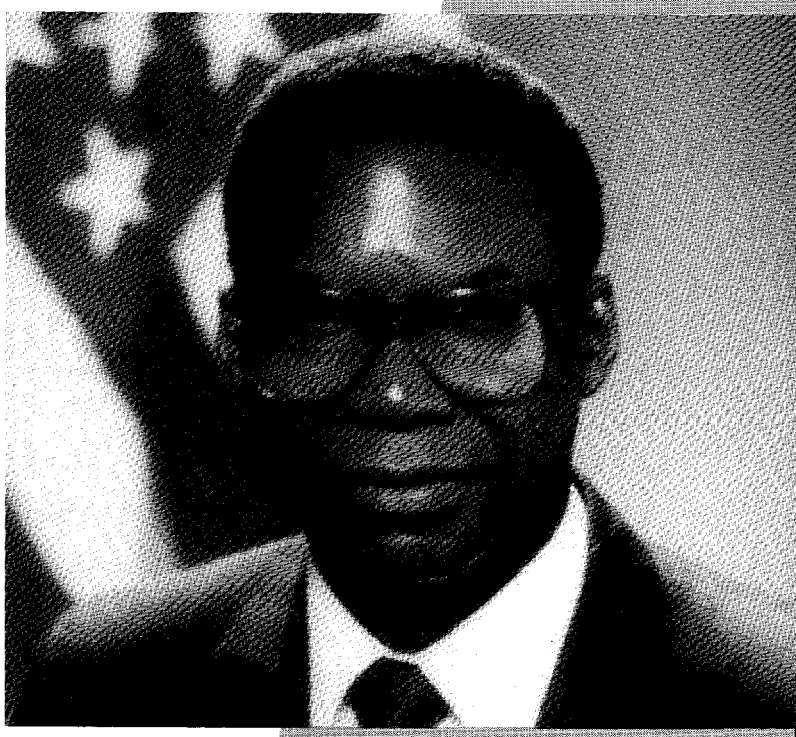
If America is to maintain its leadership position in science and engineering, and continue to thrive competitively in the world marketplace, the nation's educational pipeline must be filled with young men and women from all ethnic groups who are aware, at an early age, of the intellectual challenges and excitement offered by courses of study and careers in science, engineering, and related fields. Therefore, there is a need for greater participation of underrepresented groups in science, engineering, and related fields, as a constructive, long-term solution to increasing the nation's technical manpower talent pool. During my association with SEA since its inception in 1990, and as SEA's chairman for the past two years, I am confident that we have put a program in place that will make a positive difference in helping provide a solid technical education for the underrepresented segment of the pipeline that we serve.

Over the past 36 months, I have watched the SEA, one of the youngest academic research consortia in the nation, mature into a strong, well-focused organization that develops effective programs to enhance our ability to provide African-American students with a strong technical education. SEA maximizes its use of the design team concept, and I have witnessed the utilization of our science and engineering faculty and the technical staff of our partners at Lawrence Livermore National Laboratory (LLNL) in a manner that continues to produce measurable results. This unique interaction has already produced two new research collaborations involving SEA faculty and students and LLNL researchers.

Clearly, the development of SEA scholarship and incentive program, the outreach to the K-12 schools through the SEA's teacher enhancement workshops, and the visibility of the alliance within the federal community bodes well for all concerned.

As one of the SEA's members, Prairie View A&M University (PVAMU) strives to deliver a quality science and engineering education to our students. We live up to our motto of "*teaching, research, and service.*" As I retire on August 31, 1994 after four and a half years as president of PVAMU, and relinquish the chairmanship of the SEA, I feel privileged to have had the opportunity to serve the SEA. Working with the dedicated board of directors, the steering committee, the fine staff, and those who have been in partnership with us has provided an exciting opportunity to help prepare a cadre of scientific and engineering talent for the future.

Julius W. Becton, Jr.
Chairman, SEA
President, PVAMU



Message from the Executive Director

This was a year of continued focusing for SEA. Guided by the belief that involving faculty and students in high-quality research, coupled with implementing action plans to enhance the research infrastructure of our universities will lead to the production of well-qualified African-American scientists and engineers, SEA research agenda became one of the primary focus. Our Research Design Teams represents SEA's vanguard activity, and their work this past year reflected our commitment to producing technical talent of the highest quality.

With more than 60 education programs, anchored by its world-renowned R&D center as a national resource in applied science and engineering to meet America's needs, Lawrence Livermore National Laboratory (LLNL) continues to work very hard to strengthen the scientific and engineering programs at the SEA institutions as well as the programs at LLNL. The Laboratory's dynamic involvement in the growth and development of SEA is reflected in the *summer research program* that it started for our faculty and students. Since its inception in 1991, nineteen of our faculty and students have participated in the summer research experience. The working relationship fostered by the summer program has generated two new collaborative research projects between LLNL and SEA faculty and students (see detailed discussion under the Research section). By developing new methods to stimulate and inspire the minds of our faculty and students, we constantly search for ways to improve the program and create additional slots for greater participation. We view the participation of faculty and students in the summer research program at LLNL as development.

SEA's Scholarship and Incentive Awards Program (SIAP) helps to produce the researchers of tomorrow. In the past three years, the SIAP has encouraged and motivated more than 50 undergraduates and more than 30 high school students to pursue science and engineering. Building on the success of SIAP, we introduced the *Continuing to Graduate School Workshop (CGSW)*. Bringing three related groups together for the first time, i.e., National Physical Science Consortium, National Consortium for Educational Assess, and Graduate Degrees for Minorities in Science and Engineering (GEM), provided guidance for sixty-five SEA students and students from other HBCU institutions through the rigorous paperwork associated with securing financial support for graduate education.

To date, the *Teacher Enhancement Program (TEP)* has been the cornerstone of SEA's outreach activities. The importance of the SEA program, and the need for expansion of the outreach efforts was magnified this year by the many requests for assistance from other HBCUs. In fact, the needs assessment that was conducted for a small, private HBCU in North Carolina has lead to concentration on some new initiatives. These need-based initiatives will evolve over time.

As we prepare for the new century, SEA's role is clear. We will continue developing programs to aid in the production of a cadre of technical talent that is capable of helping the nation remain competitive. Recognizing that in the midst of uncertainty in the future and the many challenges that will come with tomorrow's world, we are confident that the SEA mission is an important one. With this knowledge, we move with the assurance that new partners will step forth to help us continue to demonstrate that the shared commitment of four HBCUs and a national laboratory, spread over five states, can make a difference.

Robert L. Shepard
Executive Director, SEA

Research: *Enhancing the Infrastructure*

The goal is to enable SEA institutions to produce talent capable of successfully completing the rigorous requirements of a graduate research program in pursuit of the Ph.D., and becoming productive members of the U.S. technical work force. Another primary goal of the research program is to provide for continued development of SEA's faculty and students. Enhancing the research infrastructure of its academic institutions is SEA's primary approach in meeting this goal.

Using "*SEA's Research Capability Profile*," a document that describes ongoing and proposed research that our faculty and students are engaged in, and information on funding initiatives within the Federal government, we move on enhancement of the research infrastructure at our academic institutions. This process helps us establish our collaborative research linkages by sharpening the special project development activities of our technical design teams (*a collection of research faculty from our academic institutions and research staff from LLNL that interact to create and focus research ideas*).

The Lawrence Livermore National Laboratory summer program for SEA faculty and students continues to be productive. Since its inception in 1991, the program has generated creative research ideas for both SEA and LLNL. At present, the LLNL/SEA summer research program represents the cornerstone of the SEA research enhancement process. While the collaborative interactions generally require that the work be conducted at LLNL, spin-off activities are a by-product that serves as a catalyst for initiating research at our academic institutions.

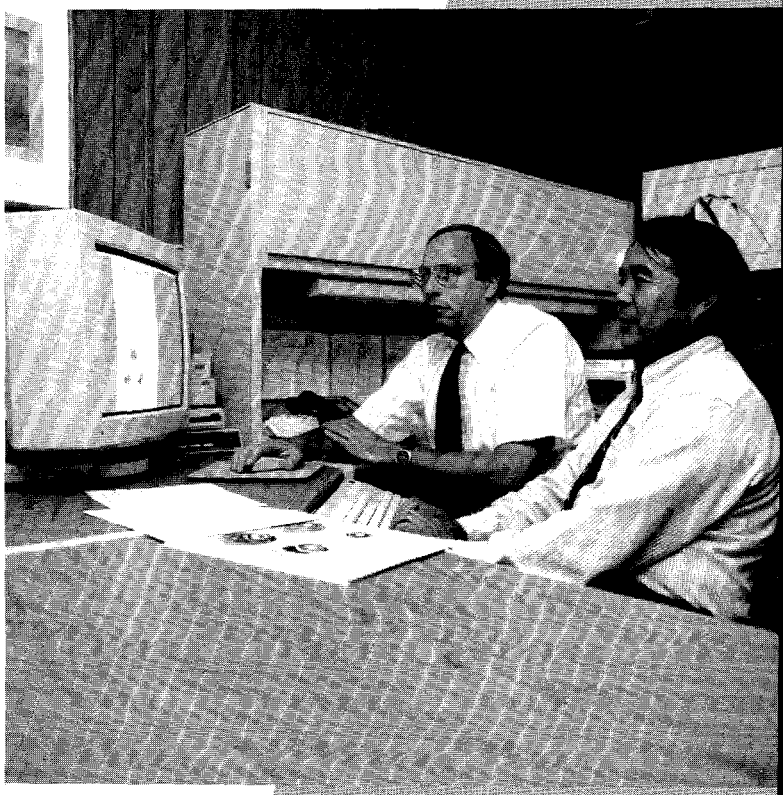
1993 Accomplishments

Nine SEA students and three SEA faculty members participated in the research program that is sponsored by LLNL. Two spin-off research initiatives were implemented.

Coordinated Research in Studies of the Global Atmosphere

This collaboration is between SEA's Southern University (SUBR) faculty and students and LLNL's Global Radiative Chemical and Dynamical Interactions (GRCDI) Group. The collaboration was organized to facilitate our faculty and student's understanding of GRCDI's global chemistry modeling and to provide a basis for future projects and collaboration. It is a model demonstration of the productivity of the LLNL/SEA summer research program.

The SEA research team at SUBR became familiar with the atmospheric chemistry models at LLNL by examining a problem using a simple Chapman chemistry. This approach allowed the SUBR team to become familiar with the chemical equation solution process independent of transport and radiation processes, based on work done by LLNL using a complete set of chemical equations to produce parts of their input to international assessments on ozone and climate. The LLNL one-dimensional (1-D) model is complex enough to allow realistic studies of radiative-chemical feedback processes occurring simultaneously with parameterized transport. It is also small and fast enough to execute on a workstation. These properties made the 1-D model a preferred tool for initiating a collaborative effort between SEA's SUBR research team and LLNL.



By use of the 1-D model as a single grid-cell or sub-grid-cell of a climate model, the parameterization of radiative-chemical effects can be studied. In particular, by operating the 1-D model with different cloud optical properties simulating independent pixels within a GCM-sized grid-cell, nonlinearities in the effects of cloud spatial inhomogeneities can be modeled. Such studies can provide a rewarding format by which the SEA research team at SUBR can contribute to current efforts in atmospheric research. The coordinated research project outlined below utilizes the LLNL modeling capabilities by the SEA research team at SUBR in studies that benefit research capabilities at both institutions.

The effects of cloud-aerosol-radiation interactions is a major area of current research. While many topics in this area of research require substantial computational resources, sometimes substantial insight can be gained from relatively simple calculations. One such area of study is the effects of spatial inhomogeneities in cloud properties on tropospheric chemistry. If all the processes involved were linear calculations done with average cloud, optical properties would produce the average chemical effects. Since both chemical and radiative processes are highly nonlinear, such simple average may yield biased results. Such nonlinearities can be investigated by using the LLNL 1-D model for independent pixel calculations. By doing a number of calculations with a cloud physical or optical property (e.g., cloud altitude) varying, a distribution of concentration profiles for selected species can be obtained.

By comparing the averages of the concentration profiles with the profiles for the average optical property, an estimation of the importance of nonlinear effects can be obtained. The SEA research team at SUBR is following this procedure for a number of optical properties in an effort to produce data useful for improving radiative parameterization.

Energy Management Study

Water source heat pump application studies were initiated between an SEA research team at SUBR and LLNL. A comprehensive literature review of heat pumps and applications, market survey, thermodynamics/hydraulic analysis, and life cycle cost analysis comprises this effort. Retrofitting water source heat pumps in certain facilities at LLNL is being examined, and the SEA research team at SUBR is generating data useful for exploring the feasibility of implementing such a program.

We view faculty and students presenting their research results at technical meetings as a central part of the SEA research focus, as well as key to faculty and student development. SEA supported five students and three faculty members to take part in several research conferences, workshops, and seminars.

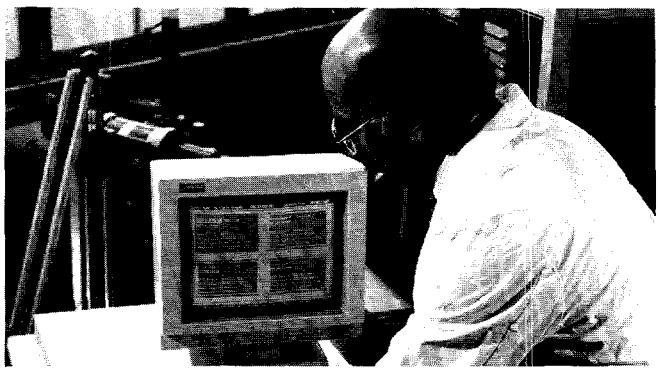
Other Special Projects Initiated

Installation of a Synchrotron Radiation Beamline Facility at the J. Bennett Johnston, Sr. Center for Advanced Microstructures and Devices for the Science and Engineering Alliance

High Performance Computing and Communications (HPCC) Initiative

Unified Formulas for Electron-Impact Excitation Cross Sections and Rate Coefficients (Data Fitting Part)

The summaries for these research initiatives were circulated to various funding agencies for comment and feedback. These initiatives supports the long-range research objectives of the SEA member institutions, and serve as the focal point for a broad range of research projects spanning many science and engineering disciplines. We expect that if funded, these projects will factor heavily into projected doctoral research programs that are under discussion by SEA universities as they prepare for growth and survival now and into the twenty-first century.



Teacher Enhancement: *A Partnership that's Working*

Now entering its third year, the workshop activities continue to serve as a valuable motivator for high school science and mathematics teachers. For example, after spending the summer of 1992 in an SEA teacher workshop, Ms. Donna Harrison, a high school mathematics teacher from Baton Rouge, Louisiana, spent the summer of 1993 working as a researcher at Battelle Pacific Northwest Laboratory (PNL) in Richland, Washington. Ms. Harrison reported to SEA that she attributes her *"new found interest in science"* to the refreshing experience she gained as a participant in the SEA teacher enhancement program.

1993 Accomplishments

An additional 100 teachers participated in SEA teacher enhancement workshops, bringing the total number to 180 teachers that have participated since the workshops began in 1992. Each year, these teachers interact directly or indirectly with over 15,000 high school students, of which roughly 65% are minorities. Lawrence Livermore National Laboratory (LLNL) augmented the SEA efforts by conducting several lectures and hands-on sessions at the Southern University workshop site.

LLNL trained California teacher leaders conducted hands-on sessions on global climate change. SEA participants began implementing the lessons about global climate change into their curriculum during the academic year. During the summer of 1994, a group of SEA participants will spend three weeks at LLNL to prepare to conduct workshops on global climate change for other teachers in Louisiana. As a result of its affiliation with SEA's workshops, LLNL is now a member of the Louisiana Systemic Initiatives Program (LaSIP). LLNL's input will be expanded to include other SEA sites during the 1994 workshops.

The workshop results, as reflected by participants' evaluations, indicate the need to expand our efforts. Therefore, to include more practicing and prospective teachers in the program, a special project initiative entitled *"Teacher 2000"* was circulated for comments and feedback. This initiative intends to demonstrate a comprehensive program that will be responsive and methodical in significantly improving the representation of African-Americans in the science, mathematics, and technology education teaching work force.

Scholarship and Incentive Awards: *Key to Encouragement and Motivation*

An example of the impact of SEA's scholarship and incentive awards program is reflected in Ms. Ranti Bushura. Back in 1991, Ranti became one of the first students from the Washington, DC area to receive an SEA High School Incentive Award. Ranti is now a sophomore chemistry major at JSU and has a GPA of 4.0. Like many other students today, Ranti says she wants to attend medical school to become an obstetrician or gynecologist. We continue to encourage students like Ranti to gain as much practical experience as possible in the physical science and engineering areas before settling on a career option. During the summer of 1993, Ranti was involved in a key research project at Ithaca College in New York, which she says, "*involved a lot of chemistry that she enjoyed.*" Each year, many of SEA's scholarship and incentive award recipients gain practical experience by participating in a variety of summer research internships.

Ranti and other scholarship and incentive award recipients say that SEA's support has made a difference in their ability to pursue a quality technical education. The goal is to use the incentive awards program to identify young people that have demonstrated a desire and skill level for pursuing science, engineering, and related fields. Thus, we continually work with corporations to place SEA scholars in existing summer internships or create additional summer intern opportunities for these students.

1993 Accomplishments

SEA granted a total of 14 high school incentive awards and 36 undergraduate scholarships. Another key milestone involved steps taken to establish formal linkages between SEA and noted scholarship/fellowship granting organizations.

We established a dialogue with two corporations about summer internships for SEA scholars. The two were CRAY Research and BASF corporation. We will continue these discussions in an effort to create future opportunities for SEA students.

Outreach: *Extending Our Services to Others*

We recognize that other traditionally under-represented groups can benefit from SEA's activities. Therefore, we strive to make the results of the SEA program available to these groups through our strong and focused outreach activities.

1993 Accomplishments

SEA hosted its first special *Continuing to Graduate School Workshop* for students planning to attend graduate school. The hands-on workshop involved some 65 SEA students and students from other HBCUs. The purpose of the workshop was to provide the students with a better understanding of the process involved in securing financial support for graduate school. A secondary purpose was to link the students directly to the sources that are responsible for providing such financial services.

The special workshop served as the catalyst for bringing together, for the first time, the following minority-centered groups:

- *Nan Snow, executive director, National Physical Science Consortium (NPSC);*
- *Le Roy Ervin, executive director, National Consortium for Educational Access (NCEA); and*
- *Vroman Wright, eastern regional manager, Graduate Degrees for Minorities in Science and Engineering (GEM).*

Draft cooperative agreements were established with these groups. The agreements allow for SEA students that are continuing on to graduate school to have an early opportunity at available fellowships and other financial opportunities. SEA also initiated formal discussions with the organizers of the *Partnership for Environmental Technology Education (PETE) 2+2+2 Initiative,* to determine if a linkage would be beneficial and cost effective in supporting national goals.

As part of the strategy to disseminate its results to a wider audience, and to provide assistance to smaller, less endowed HBCUs, the SEA program was linked to the government's *Federal Information Exchange/Minority On-Line Information System (FEDIX/MOLIS).* Aided by FEDIX/MOLIS, SEA conducted a needs assessment session with individual faculty members, administrators, and students for a small private HBCU in North Carolina. SEA identified areas where assistance could be provided, such as, linking the institution to available resources at national laboratories, identifying equipment loan programs and various enrichment opportunities for faculty and students, and suggesting speakers that are willing to provide pro bono technical services to the institution.

Lawrence Livermore National Laboratory (LLNL) has more than 64 education programs in its arsenal of available resource of material. Steps were taken to add the LLNL programs to FEDIX/MOLIS so that greater use of these valuable programs can be made by academic and non-academic institutions.

SEA's outreach efforts were not confined to our domestic borders. Working with Kraft General Foods, SEA was instrumental in getting Kraft to donate about 50 copies of the Journal of Food Science to the University of Technology in Ogbomoso, Nigeria. As a result of this effort, the faculty and staff in the Department of Food Science and Engineering at the University are making progress in their work on developing new food crops and increase utilization of lesser-known plant foods.

Balance Sheet
As of September 30, 1993

(SEA, Inc. not-for-profit corporation)

ASSETS

CURRENT ASSETS	
Cash	$ 64,677
Receivables	35,945
	100,622
FIXED ASSETS	
Furniture, fixtures & equipment	17,370
Less: accumulated depreciation	5,975
	11,395
OTHER ASSETS	
Deposits	1,650
TOTAL ASSETS	**$113,667**

LIABILITIES AND FUND BALANCE

CURRENT LIABILITIES	
Accounts payable	$ 13,343
Accrued leave	4,040
Deferred revenue	2,400
	19,783
FUND BALANCE	93,884
TOTAL LIABILITIES AND FUND BALANCE	$113,667

The financial statements presented are only a portion of a comprehensive audited report of the Science and Engineering Alliance, Inc. for the year ending September 30, 1993. SEA will be pleased to provide, upon request, copies of the complete financial statements from which these financial statements were taken, together with all footnotes and the detailed report of our independent auditors.

Statement of Revenue, Expenses and Changes in Fund Balance
For the Year Ended September 30, 1993

(SEA, Inc. not-for-profit corporation)

SUPPORT	
DOE Grant	$154,661
Other Grant & Contributions	34,490
Donor Support	10,050
Nominal Dues	15,000
Reimbursements	3,078
Interest Income	1,040
Total Support	**218,319**
EXPENSES	
Program Services	
DOE Grant	141,181
Scholarship Fund	16,625
Total Program Services	**157,806**
Supporting Services	
Management & General	23,028
Total Supporting Services	**23,028**
Total Expenses	**180,834**
Net Revenue over Expenditures	**37,485**
Fund Balance, October 1, 1992	**56,399**
Fund Balance, September 30, 1993	**$ 93,884**

SEA Scholarship and Incentive Awards Program (SIAP) 1991-93

Scholarships

	No. of Awards	Amount
1991	5	$ 10,000
1992	12	18,000
1993	36	51,000
Sub-total	**53**	**$ 79,000**

Incentive Awards

	No. of Awards	Amount
1991	5	$ 2,000
1992	8	3,200
1993	14	6,786
Sub-total	**27**	**$ 11,986**
Total Support for SIAP	**80**	**$ 90,986**

Note: SEA scholarship and incentive awards are administered in the calendar year as shown; however, all funds are used during the academic year that coincides with SEA's fiscal year.

SEA Science and Engineering Graduation Data[1]

	1991	1992	1993	Increase Over 1992	Increase Over 1991
Science	248	327	332	+ 5	+ 84
Engineering[2]	245	250	313[3]	+ 63	+ 68
Mathematics	42	55	60	+ 5	+ 18
Males	309	331	366	+ 35	+ 57
Females	226	301	339	+ 38	+ 113
Totals	535	632	705	+ 73	+ 170

[1] SOURCE: Compiled from data supplied by SEA Campus Coordinators.

[2] Includes Engineering Technology (ET). ET graduates continue to increase...86 in 1991, 95 in 1992, and 126 in 1993.

[3] Data from the National Action Council for Minorities in Engineering, Inc. (NACME) indicates that in 1993, 2,637 African-Americans graduated with a Bachelor's degree in one of the engineering disciplines. Therefore, SEA accounted for ~12% of the African-American engineering graduates. Excluding ET graduates, the number drops to ~7%.

SEA Science and Engineering Degrees Awarded in 1993 By Major and By Institution[1]

	AAMU	JSU	PVAMU	SUBR	TOTALS
Chemistry	3	10	5	15	33
Biology	14	61	43	16	134
Physics	2	0	2	5	9
Physics/Meteorology	0	6	0	0	6
Computer Science	31	44	15	60	150
Mathematics	7	18	18	17	60
Sub-Total	57	139	83	113	392
Males	17	55	36	40	148
Females	40	84	47	73	244
Chemical Engineering	0	0	16	0	16
Mechanical Engineering	0	0	24	18	42
Electrical Engineering	0	0	62	39	101
Civil Engineering	6	0	10	12	28
Engineering Technology	28	43	30	25	126
Sub-Total	34	43	142	94	313
Males	30	34	93	61	218
Females	4	9	49	33	95
Totals	91	182	225	207	705

[1] SOURCE: Data supplied by SEA Campus Coordinators.

Officer, Staff, Steering Committee, and Board of Directors

Officer

Robert L. Shepard
Executive Director

Staff

Halima Adasi
Washington Coordinator

Steering Committee

Chairman
Willie F. Trotty
Dean, Graduate School and Director, Research & Sponsored Projects
Prairie View A&M University

John Williams
Professor and Head of Chemistry Department
Prairie View A&M University

Jeanette Jones
Vice President for Research & Development
Alabama A&M University

Calvin Lowe
Chairperson, Physics Department
Alabama A&M University

Arthur Bond
Dean, School of Engineering & Technology
Alabama A&M University

Bettye W. Fletcher
V.P. for Research & Development and Graduate Dean
Jackson State University

Abdul Mohamed
Dean, School of Science & Technology
Jackson State University

William E. Moore
Vice Chancellor for Academic Affairs
Southern University and A&M College

Robert L. Ford
Director, Center for Energy and Environ. Studies
Southern University and A&M College

Tommy L. Smith
Manager, Affirmative Action & Diversity Program
Lawrence Livermore National Laboratory

Board of Directors

Chairman
Julius W. Becton, Jr.,
President, Prairie View A&M University

Chairman-elect
Marvin L. Yates
Chancellor, Southern University and A&M College

David B. Henson
President, Alabama A&M University

James E. Lyons, Sr.
President, Jackson State University

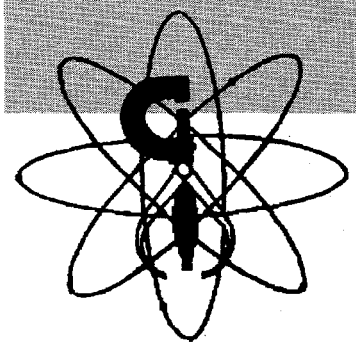
Ron Cochran
Laboratory Executive Officer
Lawrence Livermore National Laboratory

Robert L. Shepard
Executive Director, SEA, Inc.

Past SEA Chairmen

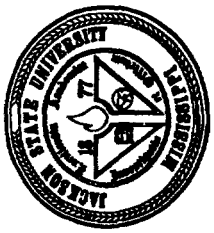
1990-1991
James A. Hefner
President, Tennessee State University

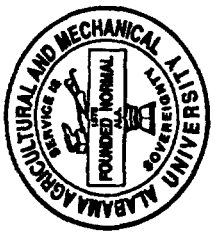
1991-1992
Herman B. Smith
Retired Educator



Science and Engineering Alliance, Inc.

A Model For Advancement Of The U.S. Science & Technology Work Force





Four major Historically Black Colleges and Universities with strong research and development capabilities in science, engineering and computer technology, and Lawrence Livermore National Laboratory have formed the Science and Engineering Alliance. Located in Alabama, Mississippi, Louisiana, Texas and California, each brings to the Alliance a tradition of research and development and educational excellence. This unique consortium is now available to perform research, development and training to meet the needs of the public and private sectors.

This Annual Report was produced by the SEA, as a guide to the activities in fiscal year 1993. The report also serves as an account of work sponsored by the U.S. Department of Energy (DOE) under Subcontract No. L3000025. For more information, call (202) 842-0388 or write to the executive director, Science and Engineering Alliance, 1522 K Street, N.W., Suite 210, Washington, D.C. 20005.

Legend:

Science and Engineering Alliance	➪ SEA
Alabama A&M University	➪ AAMU
Jackson State University	➪ JSU
Prairie View A&M University	➪ PVAMU
Southern University and A&M College	➪ SUBR
Lawrence Livermore National Laboratory	➪ LLNL
Historically Black Colleges and Universities	➪ HBCUs
U.S. Department of Energy	➪ DOE

SCIENCE AND ENGINEERING ALLIANCE, INC.
1522 K Street, N.W., Suite 210
Washington, D.C. 20005
(202) 842-0388
FAX (202) 842-0403

Graphics & Designs by SEA, Inc.
Printed by Panic Press, Inc.