CENTER FOR BEHAVIORAL NEUROSCIENCE

STRATEGIC PLAN
2/15/00

Executive Summary

The Center for Behavioral Science is a National Science Foundation supported Science and Technology Center involving 8 colleges and universities in Atlanta, Georgia. The Center is dedicated to inter-disciplinary programs integrating three major initiatives: research, education, and knowledge transfer. The research plan includes the development of collaboratories and core programs focused on the neurobiology of social behavior, including studies of affiliation, reproduction, aggression, and fear. The education plan creates inter-institutional undergraduate and graduate behavioral neuroscience programs as well as several initiatives to improve K-12 science education. Knowledge transfer involves not only plans for increasing public awareness of behavioral neuroscience through exhibits and journalism workshops but also the commercialization of Center discoveries. This strategic plan describes specific goals, milestones, and indicators of success for each of these initiatives.

History of the Center

The Center for Behavioral Neuroscience was established in 1998 by a grant from the Robert W. Woodruff Foundation. In November, 1999, the Center became one of the National Science Foundation's Science and Technology Centers. At that time, the Center expanded to include eight institutions in Atlanta, Georgia: Emory University, Georgia State University, Georgia Institute of Technology, and the five schools of the Atlanta University Center (Clark Atlanta University, Morehouse College, Morehouse Medical School, Morris Brown College, and Spelman College). In line with the National Science Foundation's goals, the Center was developed (a) to foster interdisciplinary research, (b) to integrate research and education, and (c) to transfer discoveries and technology from the laboratory to the public. These three goals, briefly referred to as science, education, and knowledge transfer, provide the basis for this strategic plan for the Center for Behavioral Neuroscience. This plan reflects our expectation for the first five years of the Center's activities (ending October, 2004).

Mission Statement

Neuroscience research during this decade has revolutionized our understanding of the brain and how it functions. Powerful new molecular techniques have revealed families of developmental genes that specify regional neurogenesis, while imaging studies have provided new insights into cellular organization at the microscopic level and functional circuits at the macroscopic level. Although these new technologies have increased our understanding of many aspects of brain function, they have not delivered on the brain's greatest mystery: behavior. Especially complex behaviors, such as social behaviors that are essential for species survival, remain largely unexplored by neuroscientists. Not only do we know very little of the neural mechanisms that underlie these behaviors, we know even less about how social experience sculpts the developing brain. **Our mission is to bring together the unique resources from a consortium of Atlanta colleges and universities, backed by considerable state and federal support, to build a nationally recognized program that will (a) define the interaction of brain processes and complex behaviors, (b) create a cadre of interdisciplinary investigators focused on behavioral neuroscience, and (c) transfer relevant discoveries from the laboratory to the public.**

a. Define the interaction of brain processes and complex behaviors (Science Plan)

The proposed research program will focus on the neural basis of social behaviors. We propose collaboratories, comparative research programs that will develop a new, interdisciplinary approach for studying how the brain regulates behavior and how experience modifies the brain. Each collaboratory will include investigators focused on the same questions but using different model systems, from invertebrates to primates. Comparing different species not only offers insights about the conservation of genes and circuits across evolution, it may transform the way we think about how hormones influence behavior, how genes are regulated, or how brain mechanisms have been adapted for different environmental demands. This broad approach cannot be applied by a single laboratory; it requires the integrated effort of many groups investigating the neural basis of homologous behaviors. The collaboratories will be supported by technical development cores to provide expertise at four levels of analysis: molecular, cellular, systems, and organismic. Each of these cores will develop novel technologies for

behavioral neuroscience, ranging from cDNA microarrays to *in vivo* neuroimaging in small animals. The Center will integrate this multi-level approach to technical development with the comparative collaboratories through a series of joint meetings, workshops, and shared facilities.

b. Create a cadre of interdisciplinary investigators. (Education Plan)

The next generation of investigators will need to think across disciplines, incorporate emerging technologies, and, increasingly, work in non-academic settings. To prepare this generation for these challenges, several successful, currently funded educational programs will be expanded to ensure that under-served minorities and women are included and that the best features of the current programs are shared across member institutions. The Center will build inter-institutional undergraduate and graduate degree programs to integrate the diverse perspectives of the participating schools. We will educate graduate students about alternative careers by providing internships not only in laboratories but also in industry, biotech companies, and centers for public information and policy. Finally, we are faced with urgent needs for educational outreach, especially in the sciences. We will work with Atlanta Public Schools to provide professional development opportunities for teachers including research in Center laboratories, workshops in inquiry-based science, and new curricular materials.

c. Integrative and outreach components (Knowledge Transfer Plan)

For both the research and educational programs, we will link the participating units by shared projects, facilities, workshops, and symposia. Although all of the participants are within 30 minutes driving time, we are expanding Web-based technologies to facilitate exchange of information as a model for more distant collaborations. ScienceNET, the central web-based technology for integrating our education programs, and the LearnLink system, an electronic conferencing system designed to facilitate interaction among students and faculty, will serve to integrate both our scientific and educational programs. To reach the general public, the Center has developed links to Zoo Atlanta, CNN, and local print media, with joint educational projects and workshops on behavioral neuroscience. The Center has a unique mechanism for linking discoveries and new technologies to industry via the Biotechnology Development Center (BDC), a new biotechnology incubator. Each of the Center's cores has identified a target technology that will not only alter our approach to behavioral neuroscience but will have broad application for potential technology transfer agreements. The BDC will help to nurture these developments for commercial application and provide venture capital support at the appropriate stage.

Vision: The Center for Behavioral Neuroscience will develop molecular, cellular, systems, and organismic level technologies to change the way we study the brain and behavior. The Center will not only provide a new, comprehensive understanding of how brain mechanisms regulate and are regulated by complex behaviors, it will transmit the excitement of behavioral neuroscience to the next generation of investigators.

Recruitment and Retention (Faculty and Post-docs)

The Center is dedicated to developing a new type of scientist, with interests that cross model systems, skills that span many levels of analysis, and ambition that is not discouraged by the difficult problems in behavioral neuroscience. The Center is also concerned about the low representation of minorities in neuroscience. In the latest demographic study of the Society for Neuroscience, 1% of its membership was African Americans, 4% was Hispanic, and 30% was female. Because of its location in Atlanta and the large minority student population of each of the participating institutions, the Center has a unique opportunity to increase the number of minority neuroscientists during this next decade. The participating institutions plan to recruit at least 15 new faculty for the Center over the next 5 years. In the early years, we will be recruiting for faculty through a national search, recognizing that the pool of minority applicants is limited. Ultimately, we hope to increase this pool through our Education Plan, allowing us to retain some of our local talent for the Center faculty. **The goals of our recruitment and retention efforts are (1) increase and improve the behavioral neuroscience program across the participating institutions through faculty and post-doc recruitment and (2) increase the number of behavioral neuroscience faculty from under-represented minorities and women.**

Milestones

Year 1
- Develop recruitment strategy for postdocs and faculty that will target minorities
- Launch faculty recruitments at Emory, GSU, GaTech, AUC
- Develop post-doc recruitment materials, application materials, and review process
- Recruit first 5 post-docs to bridge Center labs
- Use Internal Advisory Board to enhance faculty recruitment and retention as well as infrastructure needs at each institution

Year 2
- Recruit 5 faculty, 1 at senior level (2 at Emory, 2 at GSU, 1 at AUC)
- Expand the program to include 10 post-docs
- Develop mentoring program for new faculty and post-docs
- Develop first alternate careers program for post-docs
- Internal Advisory Board to address retention issues (family leave, faculty development, cultural differences, etc.)

Year 3
- Recruit 4-5 faculty (3 at Emory, 1 at AUC)
- Continue post-doc recruitment
- Place first cohort of post-docs in tenure track positions or other neuroscience careers
- Evaluate resources for newly recruited faculty (with Internal Advisory Board)

Year 4
- Recruit of 4-5 faculty, 1 at senior level (2 at Emory, 1 at GSU, 1 at AUC)
- Continue post-doc recruitment and development

Year 5

- Continue faculty recruitment
- Assess progress with Internal Advisory Board
- Develop new plans

Indicators

The development of a behavioral neuroscience program across the participating institutions will require a long-term effort of recruitment and retention. Success will depend on increased space and improved infrastructure for research at each institution. The Center will influence the development of space and infrastructure, but these issues are not entirely under our control. That said, we will consider success as:

- Within 5 years, the recruitment of 15 new behavioral neuroscience faculty who participate in the Center and support its mission. These faculty should ultimately be funded through sponsored research support independent of the Center. In the first 5 years, we are aiming for 20% of these new faculty to be minority and 50% to be women.
- The completion of 20 post-doctoral fellowships over the first 5 years leading to academic or alternative careers related to brain and behavior research. In the first 5 years, we are aiming for these post-doctoral fellows to be 25% minority and 50% women.

SCIENTIFIC PLAN

The ultimate scientific goal of the proposed center is to identify the fundamental principles that govern the neurobiological control of social behavior. This will be accomplished by using a multidisciplinary, comparative, and hierarchical approach. Although many of the questions are old, the approach here will create new opportunities for breakthroughs by (a) fostering synergistic interactions with revolutionary technologies from molecules to behavior, (b) integrating the strengths of invertebrate, rodent, and primate studies, and (c) creating a set of think-tanks to generate new theoretical approaches. The Scientific Plan rests on the development of Collaboratories and Cores.

Collaboratories

"Coming together is a beginning, staying together is progress, and working together is success." ~ Henry Ford ~

Investigators will be organized into interactive teams called collaboratories. The word "collaboratory" signifies our intent to alter the single laboratory approach that has dominated scientific research and, we believe, impeded progress. Collaboratories bring investigators using different models, technologies, and approaches together into interactive groups (working "think tanks") focused on common questions. Center funding for collaboratories will <u>not</u> be used to support the already well funded research programs of individual labs, but will permit novel projects that cut across existing approaches or incorporate new techniques. One collaboratory will focus on initial targets of fear and aggression (for example: the amygdala and conditioned defeat; serotonin and aggression in crayfish, mice, and primates). A second collaboratory will focus on affiliation and reproductive behavior (for example: vasopressin and paternal care; genes for reproductive behavior conserved from nematodes to mammals). We have chosen these four interrelated areas of focus because they represent current strengths where we can build bridges immediately between highly productive labs. We expect the focus of these collaboratories to evolve. We are proposing a structure that will ensure that these collaboratories interact to integrate discoveries from their own models into overall hypotheses of the underlying principles governing the neural mediation of affect and behavior. **The goals of the collaboratories are (1) initially to develop inter-disciplinary teams of investigators using diverse model systems and (2) ultimately to contribute important new insights into the neurobiology of social behavior.**

Milestones

Year 1

- Establish 2 collaboratories with clearly identified scientific targets within each thrust (affiliation-reproduction, fear- aggression). Identify leaders and participating faculty. Establish interactive, web-based conferencing to discuss collaboratory issues. Hold regular meetings to update progress and incorporate new ideas.
- Hold scientific retreat to develop bridges between labs

- Establish monthly evening seminar series - alternating between internal and external speakers
- First set of 10 summer undergraduate students in collaboratories

Year 2

- Collaboratories functioning as discovery teams using technologies developed by cores
- Hold scientific retreat to assess initial progress
- Continue monthly seminar series - alternating between internal and external speakers
- National meeting on Neurobiology of Social Behavior
- Increase to 10 summer students and/or teachers working in collaboratories
- First graduate students enter collaboratories

Year 3

- First collaboratory papers published
- Scientific retreat to assess focus, cores, and integration with education
- Increase to 7-8 graduate students in collaboratories
- Publish edited volume on Neurobiology of Social Behavior
- Submit grant proposals to federal and private sources to augment collaboratory research
- Maintain summer student/teacher goals

Year 4

- Scientific retreat to focus on new developments external to Center
- Additional collaboratory papers published
- Obtain additional external funding for collaboratory research
- Maintain post-doc, graduate student, and summer student goals

Year 5

- Major review of scientific programs
- Additional collaboratory papers published
- Obtain additional external funding for collaboratory research
- Maintain post-doc, graduate student, and summer student goals

Indicators

Because the goal is to develop a new interdisciplinary approach, the measures of success include an evaluation of the process as well the content of our collaboratory effort. Specifically, with the assistance of our External Advisory Board, we will assess annually:

- The innovation, inter-disciplinarity, and quality of scientific projects. Is the science providing new insights and opening new fields of study or is it derivative and narrow? Are the projects of the collaboratories demonstrably different from the previous work of individual labs? Are they bridging labs and institutions, including the AUC? Are they focussed on important questions? Are the quality and quantity of the resulting research worth the time and effort required? Quality and quantity are complex variables, but numbers of papers in top-ranked journals, citations from other investigators, and additional grant support can be useful indicators.
- Integration with technical cores. Are the collaboratories using the technologies developed by the cores? Are they guiding the activities of the cores? Are they applying the techniques from other areas of science to the complex questions of behavioral neuroscience?

- Integration with educational mission. Are the collaboratories including undergraduates, graduate students, and post-doctoral fellows from all of the participating institutions? Are students successfully completing their projects? Are post-doctoral fellows finding jobs? What is the attendance at monthly seminars, retreats, meetings?
- Development of the Center. Has the Center recruited new faculty as scheduled? Are retreats and meetings well attended by faculty? Has the Center developed a scientific focus? Has the Center established national recognition?

Cores

"For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled." - Richard Feynman

The collaboratories will be supported by core programs developing and assisting in the application of critical new technologies. Cores will be established in molecular, cellular, systems, and computational neuroscience, as well as in imaging and behavioral technologies. A major strength of the cores is the technical expertise that is available at the participating institutions which ranges from biomedical engineering to behavioral analysis. However, because the technological needs of the projects will undoubtedly change as the research progresses, the types of technologies to be targeted for future development will be determined by the collaboratory scientists, scientists participating in core developments, the external advisory board, and specialists from around the country. The initial cores (and representative technology targets) include Molecular (microarrays for neuroendocrinology), Cellular (viral vectors), Systems (ensemble recording), Imaging (small animal in vivo neuroimaging), Computational (modeling), and Behavioral (novel data capture). We expect that these will evolve based on center needs. **The major goals of the cores are (1) to develop innovative technologies for behavioral neuroscience and (2) to assist in their application both within and outside of the Center.**

Milestones

Year 1

- Set-up labs: Purchase equipment and recruit technician/core managers
- Develop approaches to integrate technology development with collaboratories through periodic joint seminars and meetings
- Technical workshop to refine technology targets
- First set of 5 undergraduate summer students in core labs

Year 2 - 4

- Develop target technologies for use by collaboratories (e.g. arrays, microPET)
- Publish technical developments
- Annual technology workshop
- Annual review of focus by joint meetings with collaboratories
- Involvement of students in technology development and workshops
- Begin technology transfer via the Biotechnology Development Center

Year 5

- Major review of cores

- Commercialization of technologies

Indicators

The success of the cores ultimately depends on their support of collaboratory research. With the assistance of the External Advisory Board, we will annually assess:

- Productivity and availability of each core. Is the core moving the field forward by providing new tools and approaches? Is the work in the core original or is it derivative? Are core resources available to all participants?
- Integration with the collaboratories. How much has the core contributed to the collaboratory effort? Are the technologies moving the science forward? Is the core used by more than a single investigator? Is it providing technology transfer opportunities?
- Integration with educational mission. How many students and post-docs are involved in the cores? Are students from each of the participating universities given access?
- Development of the Center. How many patents or licensing agreements are generated? Have the cores provided new opportunities for funding? Are core resources (e.g. microarrays and antibodies) used outside the Center?

EDUCATION PLAN

"We are not students of some subject matter but students of problems. And problems may cut right across the borders of any subject or discipline." Karl Popper

Our education plan involves graduate, undergraduate, and K-12 initiatives. **The primary goals of the education initiative are to: (1) create pathways to careers in behavior and neuroscience, with a special focus on minorities and women, (2) increase the number of minority students attaining PhD's in behavioral neuroscience, (3) broaden career pathways to include science policy, journalism, biotechnology and pre-college teaching as well as academic and industry positions, (4) improve science education in Atlanta schools.**

K-12 Programs

The Center will work with Atlanta Public Schools, providing professional development opportunities for teachers of kindergarten through twelfth grade. Participants can expect research visits and internships in laboratories, new curricular materials, and workshops in inquiry-based and hypothesis-driven science. Instructional materials will be distributed to local schools by LearnLink, a web-based information system at Emory, and through hands-on experiences on the BioBus, a 30- foot, travelling state-of-the-art laboratory that supplements the regular science curriculum in Georgia elementary schools. These K-12

education initiatives build on strong inter-institutional programs already in place, such as the Elementary Science Education Partners program and Georgia Internship for Teachers.

Goal: Improve science education in public schools and coordinate existing programs

Year 1

- Establish coordinating council for aspects of Georgia Internship for Teachers (GIFT), Elementary Science Education Project (ESEP), Neuroscience Guides (NSG) and other programs related to Center for Behavioral Neuroscience
- Establish CBN Partners; CBN Interns
- Design projects, workshops and curriculum units related to standards, national and state with teacher input through GIFT program
- Involve 6-10 Teacher interns in CBN labs
- Plan and conduct teacher workshop on Problem Based Learning, Technology, BioQUEST and Behavioral Neuroscience
- Develop first BioBus unit
- Provide first Biomolecular Computing Resource at Emory (BIMCORE) workshop for teachers

Year 2

- Begin BioBus visits to schools, organized by GSU Neuroscience educator and students
- Recruit faculty and students to assist in tutorial development
- Continue internships and workshops
- Develop one curriculum unit for elementary, middle and high school in Behavioral Neuroscience
- Coordinate Brain Awareness Week w/ Atlanta Society for Neuroscience
- Develop one curriculum unit for elementary, middle and high school in Behavioral Neuroscience and use in Brain Awareness Week
- Develop opportunities for CBN faculty and students to mentor science fair projects
- Establish on-line curriculum and/or virtual lab; virtual posters for science fair
- Develop potential grants for curriculum development

Year 3

- Continue above teacher internships and workshops
- Develop another curriculum module or interactive lab for each level
- Teacher workshop on new SciTREK exhibit (see Knowledge Transfer)

Year 4-5

- Continue above and evaluate impact on students and teachers
- Coordinate efforts with College and University Education departments when feasible

Indicators

- Coordination improved among CBN partners as measured by joint projects and grants
- Number of teachers participating in GIFT program
- Teacher developed labs and materials (number and use)
- Improved student performance on areas associated with units, assessed by pre-post tests
- Improved student interest in science as indicated by survey, focus groups, involvement in programs
- BioBus visits

Our assessment will address such questions as: Are teachers using materials developed with CBN faculty? Are Teacher Interns connected with CBN mentors after research experience? Do students express more interest in science careers, join more science programs? Are more students from Atlanta area interested in CBN school science majors? Are graduate students, undergraduate students and postdocs from CBN schools participating in outreach? Are CBN faculty participating in outreach?

Undergraduate Initiatives

Although our programs are open to all students, a particular focus is on the preparation and recruitment of underrepresented students. All participating schools have a high percentage of minority students interested in science. By equipping new lab courses at each of the AUC schools, providing new summer programs (such as a summer short course in Behavior and Neuroscience to attract first and second year students), developing more research opportunities, and creating internships in science journalism and biotechnology, we hope to prepare more minority students for doctoral study. The Center will also create a new BS/MS program for students who are either not yet committed or yet prepared for a graduate doctoral program. New faculty start-up funds and Teacher-Researcher postdocs will help build behavioral neuroscience programs at the AUC. **Our goal is to attract students to careers in behavioral neuroscience and to other fields in which understanding of behavioral neuroscience would enrich science literacy for the public, such as science journalism, K-12 teaching and public policy.**

A. Center Undergraduate Fellow /Minor in Behavioral Neuroscience

Year 1

- Establish requirements for Center for Behavioral Neuroscience Undergraduate Fellow
  - 4 courses, seminar and research or internship experience
- Develop list of approved internships and lab experiences for website
- Recruit first cohort of Fellows with Summer Undergraduate Research Experience and internships (10-20)
- Submit as minor to all curriculum committees
- Biomolecular Computing Resource at Emory (BIMCORE) workshop for students in molecular modeling

Year 2

- Center will award certificates and develop interinstitutional ceremony, plus award at school graduations
- First certificates awarded
- Evaluate success of minor/undergraduate fellows program using post-baccalaureate goals and admissions to graduate schools or BS/MS program
- Expand based on evaluation

Year 3-5

- Continue expansion in conjunction with interinstitutional major and BS/MS

Indicators

- Increase in students graduating with minor or entering major
- Broadened career interests (not only medical school)

B. Curriculum Development: Major and BS/MS
Goals: To develop courses to support interinstitutional undergraduate major and BS/MS and to attract minorities and women to careers in behavioral neuroscience

Milestones
Year 1
- Design lab courses and order equipment at Atlanta University Center Schools
- Develop outlines for major and submit to curriculum committees at participating schools
- Develop outline for BS/MS in conjunction with the CBN's Graduate Initiatives Committee
- Survey Biology, Psychology and other students re interest in major and BS/MS
- Develop introductory course for Atlanta University Center schools
- Develop Brain and Behavior course at Morris Brown and establish approval for social science elective
- Develop draft of BS/MS proposal for federal funding
- Involve 15 students in summer research in collaboratory and core labs
- Write grant to provide neuroimaging research opportunities for undergraduates

Year 2
- Develop Careers in Science seminar and webcast featuring women and minority scientists
- Develop list of approved internships to be offered Year 2
  Research, Journalism, Policy, Education and related areas
- Summer Research
  Rotations for first years and sophomores with two week introduction to techniques, followed by rotation in center labs where advanced students can help mentor. Research summaries and posters will be posted on website.
- Offer new lab courses at Atlanta University Center schools.
- LearnLink for Atlanta University Center schools and GSU to support courses in biology, and psychology
- BS/MS program
  Submit proposal to all curriculum committees
  Secure tuition remission if not covered by grant funds
  First cohort recruited as juniors
  Senior year includes courses in methods and Frontiers of Behavioral Neuroscience plus lab rotations in Center for Behavioral Neuroscience labs and thesis prospectus
  5th year to include research, thesis and additional coursework
- Interinstitutional major to all curriculum committees
- First web courses and on-line tutorials
  Experimental techniques and participation in Frontiers in Behavioral Neuroscience course as Graduate/senior undergraduate class
  Behavioral Neuroscience 401, Senior Seminar in Neuroscience and Behavioral Biology and Experimental Design and Statistics available to all Center schools via teleconference or World Wide Web casting

Year 3
- First BS/MS students 6-10

- First majors in Behavioral Neuroscience at Atlanta University Center, GT and GSU with a target number 20-40

Year 4-5

- Evaluation of all programs
- Recruit additional majors (40-60) and BS/MS (10-20)

Indicators

- Minimum 30% minorities 50% women in undergraduate major, BS/MS and as Undergraduate Fellows
- Increase % of undergraduates applying to graduate programs in neuroscience
- Increase student interest in careers in behavioral neuroscience as measured by course enrollments and demographics

Graduate

We will be building a graduate program where students will be supported for 3-5 years from Center funds. Students admitted to the participating graduate schools, who are interested in the work of the collaboratories and cores will be eligible for these funds and for career development workshops and internships in biotechnology, science policy and science journalism. By exposing students to the methodologies and approaches of different disciplines, we hope to generate flexible, collaborative scientists who can work at the boundaries of disciplines, the emerging frontiers.

Goal: To develop a cadre of behavioral neuroscientists who are educated to collaborate; to broaden career pathways; and to recruit women and minorities to behavioral neuroscience.

Milestones

Year 1

- Consult with experts on recruitment and retention of women and minorities to identify issues; develop plans to attract minorities and women
- Develop recruitment materials for graduate students
- Develop requirements for students supported by the Center as addenda to existing graduate handbooks
- Develop Frontiers of Behavioral Neuroscience course for first year graduate and senior undergraduate (w/ collaboratory faculty) ; choose initial course director(s)
- Develop Methods and Techniques in Behavioral Neuroscience course (using core faculty); choose initial course director(s)
- Work with Undergraduate committee on BS/MS

Year 2

- Recruit first cohort of graduate students (6)
- Establish articulation agreement for center students in major and BS/MS
- Introduce new courses
- Develop internships to broaden career path for graduate students; these include science journalism, undergraduate or K-12 teaching, policy, biotechnology, among others
- Expand Values in Science course for all graduate students and postdocs
- Career preparation seminars developed and presented

Year 3

- Begin long range planning for interinstitutional graduate program if feasible
- Present first telecourses
- Recruit second cohort of graduate students (6)
- Write training grant for graduate students and potentially Graduate-K-12 training initiative

Year 4-5

- Increase enrollment in graduate program if training grant successful
- Evaluate program

Indicators

- At least 30% minority; 50% women for graduate students
- Focus recruitment on Center undergraduate programs, using Summer Research and BS/MS
- First group of graduate students near completion

Knowledge Transfer

"The only way to discover the limits of the possible is to go beyond them into the impossible."
Arthur C. Clarke, Technology and the Future

The Center will develop a series of links both internally to the participating institutions and externally to the public via ZOO Atlanta, SciTREK, CNN, and the Carter Center. Links with other national centers will be developed through technology and collaborative grants. The Center also has a unique mechanism for linking discoveries and new technologies to industry via the Biotechnology Development Center (BDC), a new biotechnology incubator. The BDC will provide the infrastructure necessary for managing the early to middle phases of the commercial development process in order to simultaneously increase the yield of successful ventures and capture a greater share of the potential compensation. The BDC will be developed through a unique collaboration among Emory University, GaTech, the Georgia Research Alliance, local foundations and commercial sector representatives. This comprehensive initiative will provide a novel and cost-effective mechanism for nurturing the development of early stage technology. It will also develop and coordinate all of the components required to translate university-based discoveries into innovative products and services that will boost our local and state economies and provide a revenue stream for Center scientists. **The overall goals of our Knowledge Transfer plan are (1) to develop links that will enhance the integration of research and education as well as increase public exposure to behavioral neuroscience and (2) to facilitate technology transfer of Center discoveries.**

Technology for Integrating Research and Education

The number of sites and diversity of projects within the Center require new communication technology for integrating the research and education missions. Our plan is to use Learnlink for internal communications and conferencing and to develop a Website for external access. **Our goal is to ensure that (a) all faculty are using the information technology (including Internet2) that will link our research and education missions and (b) relevant Center activites are accessible via a sophisticated website.**

Milestones

Year 1

- Establish Learnlink for all Center Faculty and for courses and students at Atlanta University Center and other schools
- Set up web site for Center with capacity for videoconferencing between schools, including a Virtual Collaboratory and Core Tour
- Provide recruitment and application materials on-line
- Set up ability to videoconference with NSF and other STC's
- Identify infrastructure needs to be able to conduct telecourses
- Identify infrastructure to permit cross registration on line
- Develop report infrastructure for NSF data collection
- Web applications for SURE

Year 2

- Establish web database of center activities and accomplishments
- Deploy real video and real audio server/www casting of center activities
- Connect collaboratories and cores to collaborative computing frameworks (or equivalent) for shared research; high speed network infrastructure planning
- Introduce on-line courses for undergraduate
- Introduce on-line curriculum for K-12 (virtual labs)
- WWW casting of seminar series for collaboratories and cores
- Continue Center web and ScienceNet development
- Apply for funding for infrastructure development for integrating research and education

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Year 3

- Develop internet 2 projects for vBNS
- Provide all major and BS/MS course materials on website
- Introduce first graduate course materials on-line
- Continue development of K-12, undergraduate, graduate curriculum modules and hypertextbooks

Year 4-5

- Evaluate using indicators
- Continue development and maintenance of websites
- Continue development of infrastructure for integrating research and education

Indicators

- Growth in users, log-ins on website and ScienceNet
- Use of teleconferencing and telecourses by all Center schools
- Number of on-line courses or units
- Growth of quantity and quality of web resources for research and education

Increasing Public Exposure to Behavioral Neuroscience

The Science and Technology Centers are expected to enhance public understanding of science. Many of the scientific efforts of the CBN are relevant to important social issues (e.g. aggression, reproduction, social dominance). The Center intends to increase public

awareness of behavioral neuroscience through linking with the local zoo (ZooAtlanta) and science museum (SciTrek) and working with journalists. **Our goal is to increase public exposure and public appreciation of behavioral neuroscience.**

Milestones

Year 1-2

- Develop video/radio spots on Center scientists and collaboratories and cores (webcast)
- Work with Atlanta Neuroscience Society on Brain Awareness Week
- Develop Public Science Day in conjunction with Georgia Tech
- Science journalism interns (g and undergraduate) publish a web newsletter
- Begin annual workshop for journalists, including partnership with CNN.
- With ZooAtlanta develop an exhibit on the Neuroscience of Social Behavior; other potential venues include Fernbank Museum, SciTrek

Year 3-5

- Seek funding to support public exhibits
- Continue public outreach programs

Indicators

Success in this program will be measured by:

- Attendance and response to workshops for journalists (evaluations from participants)
- Impact of public exhibits (number of visits, response)
- Coordination of teacher workshops and student internships with public science exhibit development
- Involvement of Center faculty and students in public science initiatives

Facilitate Technology Transfer of Center Discoveries

The participating institutions have varying experience with technology transfer issues. The Center has the opportunity to develop the technology transfer infrastructure at each of these institutions. At the same time, the Center can ensure that its faculty, particularly faculty working in the Cores, are fully informed of the opportunities and problems that arise with technology development. The Center expects that technology transfer will ultimately serve as a revenue stream, gradually replacing NSF support in the final years of funding. **Our initial goal is to enhance technology transfer throughout the Center.**

Milestones

Year 1

- Negotiate a technology transfer agreement that is acceptable to all participating institutions, insuring revenue stream for the Center.
- Create a web form for invention disclosures that will be simultaneously distributed to the relevant university offices that manage technology transfer, as well as to the Center's Executive Committee. The Center's co-director for technology transfer will take the lead in coordinating the management of the Center's technology portfolio with the partnering universities.

Year 2-4

- Sponsor a seminar program that focuses on technology transfer issues. Since most of these issues are, in general, not discipline-specific, the program can be done collaboratively with other interested groups from academia, industry and government.
- Create a Technology Transfer Committee, made up of Center faculty and representatives from the technology transfer offices of the participating universities. Members of this committee will meet with core and collaboratory faculty regularly. The Center's co-director for technology transfer will provide the Center's Executive Committee with semiannual updates.
- Organize an annual workshop that enable Center faculty to present potential commercial ideas to groups interested in technology development (e.g., EMTECH, the Georgia Research Alliance, venture capitalists, etc.).
- Develop a non-profit start-up to facilitate knowledge transfer (i.e., the creation and dissemination of educational materials).
- Create an Industrial Affiliates Program whose goal is to facilitate collaboration and information flow between the commercial sector and the Center.

Year 5

- Full review of activities
- Scan for new partnerships

Indicators

The goals of technology transfer will be long-term, but we expect to develop the basic infrastructure (e.g. workshops, EMTECH, intellectual property agreements) within the first two years. Success in this program will be measured by:

- Presence of technology transfer agreement at each of the center schools
- Number of patents, licensing agreements, start-ups