Center for Applied Neuroscience
CAN

Fofi Constantinidou, Ph.D., CCC-S
Professor & Chair
Department of Psychology
Director, Center for Applied Neuroscience

COST MC Meeting
Brussels, October 18, 2011
CAN Vision

- **CAN** will develop into the premier center for the study of applied neuroscience and human behavior in Cyprus and through its activities and collaborations will become the catalyst for further research development in the brain sciences on the island and the region.
Purpose of CAN

- The Center for Applied Neuroscience investigates normal and abnormal behavior and mental processes with procedures, methods and theoretical approaches that are informed by contemporary neuroscience and biological perspectives of human behavior.
- The Center brings together the research interests of members of a core research team with diverse backgrounds whose research will function under the common umbrella of a neuroscience approach and neurobehavioral research methodologies.
- By bringing together this expertise, the Center will be able to produce knowledge in disorders across the lifespan that represent a wide spectrum of neurobehavioral problems.
The Innovation of CAN

- CAN is unique for the local context
- The Center aims to study the prevalence, etiology, assessment and treatment of common neurocognitive-neurobehavioral disorders affecting large numbers of individuals and families in Cyprus.
- CAN deploys contemporary techniques and develops new methodologies that integrate traditional behavioral, neurophysiologic, and neuropsychological measures in order to understand the targeted clinical populations and link brain function with behavior.
Contribution to the local society

- Providing a better understanding and description of highly prevalent psychological and neurocognitive disorders/conditions
- Improving the assessment process and
- Maximizing the effectiveness of treatment options for these disorders
Neurobehavioral Disorders Resulting from the following diagnoses

- Acquired Neurological Disorders
  - Brain Injury
  - Alzheimer’s Disease
  - Epilepsy
- Neurodevelopmental Disorders
  - Attention Deficit Disorder
  - Reading Disabilities
- Psychological Disorders
  - Conduct Disorders/disinhibition
  - Affective and Anxiety Disorders
The Impact of the Disorders

- High Incidence internationally
- Result in significant socioeconomic challenges because of their chronic and long term effects
- Government data confirm the impact and burden of neuropsychiatric disorders in Cyprus; thus the study of these disorders is of local significance and priority.

**CAN** investigates effective diagnostic and treatment methodologies for the neurobehavioral deficits associated with these disorders in order to contribute to the reduction of the socioeconomic burden.
Research Methodologies-Bridging Theory with Practice

**DESCRIPTION**
- Epidemiology
- Genetic/health Markers
- Behavioral Risk/Protective Factors

**DIAGNOSIS**
- Psychometric Instrument Development
- Neuroimaging
- Electrophysiology
- Psychophysiology

**TREATMENT**
- Tx Development/Adaptation
- Clinical Trials

**BASIC RESEARCH**
- Etiological Correlates
  - Cognition
  - Emotion
  - Inhibition
- Biological Markers
  - MRI
  - Physiology
  - Genetics
- Computational/Predictor Models
Specific Research Methodologies

- Neurobehavioral
- Neuroscience
- Computational methods
Integrative Neuroscience Approach

- Traditional psychometric & neuropsychological testing
- Electrophysiologic techniques
- Experimental Psychology paradigms
- Neuroimaging methodology
- Neuropsychological approach to cognitive rehabilitation
Neurobehavioral Measurements

- Neuropsychological-cognitive tests of
  - Attention
  - Decision making
  - Memory
  - Speed of Processing
  - Language (oral and written)
  - Executive Functioning

- Reading
  - Fluency and Speed

- Psychological
  - Intelligence, Ability, Achievement
  - Mood ratings
  - Behavior rating scales
Applied Neuroscience Methodologies

- Brain Electrophysiology
  - ERP
  - EEG

- Psychophysiology
  - HR, GSR, EMG
  - Startle Reflex
  - Eye Tracking

- Neuroimaging
  - Volumetric, Structural, and Functional/dynamic measurements
    - MRI
    - DTI
    - MRI
    - MR spectroscopy
    - fMRI
Scientific & Technological Objectives

1. Conduct epidemiological studies on high incidence disorders/conditions of the nervous system.
   - Adult Populations, normal and pathological aging (i.e. MCI, Alzheimer’s Disease), Traumatic Brain Injury
   - Pediatric Populations with developmental disabilities
   - Epidemiology of affective and anxiety disorders

2. Develop theoretical computational models of behavior integrating assessment and treatment outcome data.
   - Predictors and correlates of inhibitive behaviors
   - Predictors and correlates of cognitive functioning
3. Develop and evaluate the psychometric properties of *culturally-valid and sensitive assessment tools*. 
4. Implement *clinical trials* to assess the effectiveness of innovative and/or appropriately adapted treatment methodologies for Cypriot patients with neurological, behavioral and psychological disorders.

- Adults with acquired neurobehavioral disorders
- Developmental disorders and reading deficits
- Children with neurobehavioral and psychosocial disorders
Funding by the Cyprus Research Promotion Foundation’s Large Strategic Infrastructure competitive funding program

- Two-phase proposal cycle (2.5 years)
- Initial funding for the project: “Applied Neuroscience and Neurobehavioral Research Center”
  - 1,200,000 euros for 4 years (Nov 2010-2014)
  - reduced to 800,000 due to cuts

- The only funded program with a focus on human behavior and applied neuroscience
Additional Funding

- UCY-
  - Building facilities
  - Establishment of the CAN as a UCY research Center with annual support
Future Funding Activities

- Exploring FP7 funding mechanisms
  - ICT
  - LLP
  - Health
- Federal Funding through the Cyprus Research Promotion funding
- Links with the community
  - Research
  - Services
Host Organization Interdisciplinary Core Team

**Psychology:**
- Fofi Constantinidou, Ph.D.
  neurological disorders, cognition and language
- Georgia Panagiotou, Ph.D.
  affective disorders and psychophysiology
- Timotheos Papadopoulos, Ph.D.
  Dyslexia, developmental disabilities
- Anthi Loutsiou Ladd, Psy.D.
  Behavioral-conduct disorders and clinical training

**Mathematics**
- Konstantinos Fokianos, Ph.D.
  statistical modeling and time series analyses

**Electrical Engineering**
- Marios Polycarpou, Ph.D.
  intelligent systems
- Director, KOIOS Center for Intelligent Systems
CAN New Researchers

- Post Doctoral Researchers/Scientists
  - Dr. Christophoros Christophorou-BCI
  - Dr. Nicos Constantinou-Neuroscience (Nilli Lavie’s student, presentation at BM605 conference in Cyprus)

- Research Scientist
  - Mrs. Despoina Themistocleous- Applied Psychology

- Ph.D. and MA graduate students
The **CAN** Consortium

**Host Organization:** The University of Cyprus, Nicosia, Cyprus

**Core Research Team and Researchers**

**Partner 1:** Medical Diagnostic Center, Ayios Therissos, Nicosia, Cyprus

*Dr. Ioannis Seimenis, medical physics, neuroimaging protocols*

*Dr. Eleni Eracleous, radiology, neuroimaging*

**Partner 2:** Department of Psychology, University of Crete, Greece

*Prof. Panayiotis Simos, neuropsychology, electrophysiology, psychometrics*

**Partner 3:** The Center for Clinical Neuroscience, University of Texas Health Sciences Center, USA

*Prof. Andrew Papanicolaou, functional neuroimaging, MEG*

*BM605 Conference Participation in Cyprus, Dec. 2009.*

**Partner 4:** The Cyprus Institute of Neurology and Genetics, Nicosia, Cyprus

*Dr. Savvas Papacostas, behavioral neurology*
The Consortium

UCY
Core Research Team
CAN Researchers

Oliver Zangwill
Andrew Bateman

U of Crete
Panayiotis Simos

MD Anderson
Jason Robinson

Ayios Therissos
Yiannis Seimenis
Eleni Eracleous

U of Texas
Andrew Papanicolaou

CING
Savvas Papacostas

KOIOS CENTER
FOR INTELLIGENT SYSTEMS
COST ACTION-INTELLICIS
Research Activities relating to COST Interests (Computational Neuroscience)

- Investigate the neurophysiologic correlates of cognitive processes normal and clinical populations
  - EEG /ERP studies on the neurophysiology of stimulus presentation in verbal memory
    - Visual inattention and memory load in aging
    - Verbal memory in right and left TLE
  - Social cognition in PD and Psychosis
Integrate data from critical injury or disease variables, psychometric performance, biological markers, neurophysiological measurements, neuroimaging results (volumetric and tractography) demographic variables, and treatment outcomes to develop treatment theoretical predictor models, and disease recovery/progression models (TBI and Aging)

- NEUROAGE (n = 430)-Neurocognitive Study for the Aging
- Develop advanced computational methods to identify subgroups of the population and describe the groups that will benefit the most from specific interventions.
Potential Collaborations with BM 0605-Consiousness

- **Cyclotron Research Centre of the University of Liège**
  - Steven Laureys

- **Hammel Neurorehabilitation and Research Unit (HNRU)**,
  - Morten Overgaard

- **Université Libre de Bruxelles (ULB)**
  - Axel Cleeremans

- **University Medical Center Hamburg-Eppendorf**
  - Andreas Engel

- **Institute of Cognitive Neuroscience, University College London**
  - Nilli Lavie
Collaborations (continued)

- The New School of Psychology, Israel
  - Daniel Levy
- Brain and Trauma Foundation, Chur, Switzerland
  - Andreas Müller
- Human Neuropsychology Laboratory, University of Seville
  - José León-Carrión
Sustainability: Cutting Edge Research

- International partners
- Development of Research networks
- Investment in creating new researchers
  - Post-Doctoral researcher positions
  - Senior Researcher positions
- Advisory Board
- Creating links with the industry
  - Research
  - Assessment Tools
  - Treatment Methodologies
Conclusions

- This center is the first center of its kind in Cyprus
- The development of the CAN is innovative, both in terms of its contribution to the local community and also by producing new knowledge that will advance the brain sciences internationally.
- CAN will engage in integrative activities incorporating cutting edge methodology to build brain and behavior connections through the study of high incidence conditions.
- Given the small size of Cyprus, the Center investigates social and genetic factors that contribute to the conditions/disorders. This uniqueness contributes to the broader scientific literature and we hope that it will be attractive to future funding agencies.
CAN Vision

- **CAN** will develop into the premier center for the study of applied neuroscience and human behavior in Cyprus and through its activities and collaborations will become the catalyst for further research development in the brain sciences on the island and the region.