

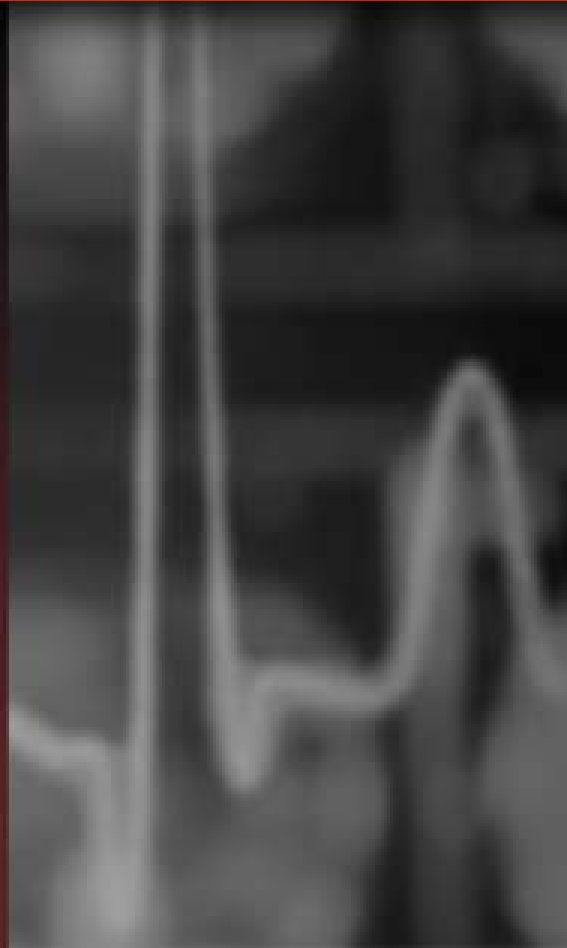
NATAL
Abril, 2011

A CIENCIA COMO AGENTE DE TRANSFORMACAO SOCIAL

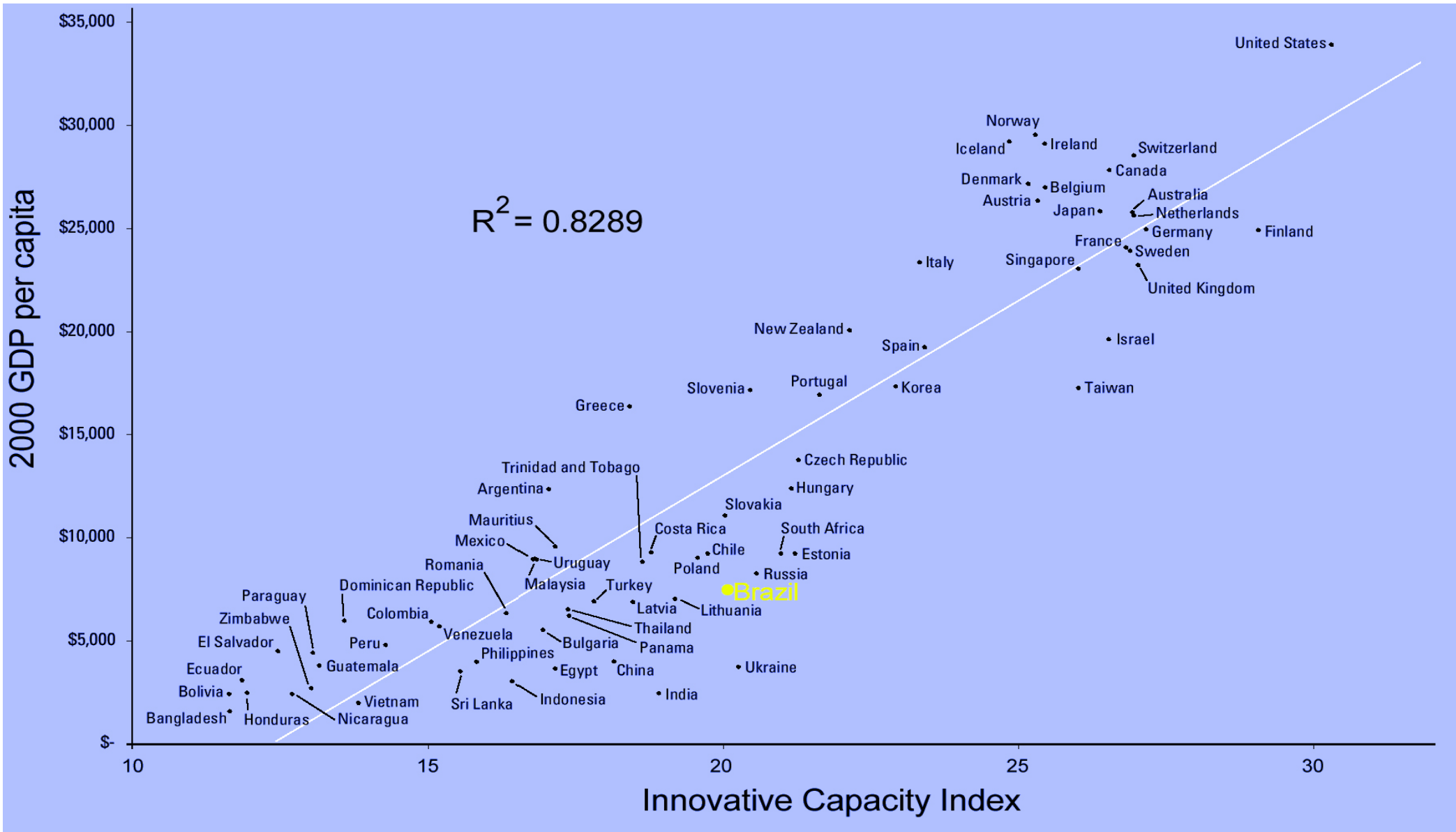
Miguel Nicolelis
Duke University

**Instituto Internacional de Neurociencias
de Natal Edmond e Lily Safra**

SCIENCE AS AN AGENT OF SOCIAL TRANSFORMATION



WHY SHOULD A COUNTRY INVEST IN SCIENCE?



OUR INSPIRATION

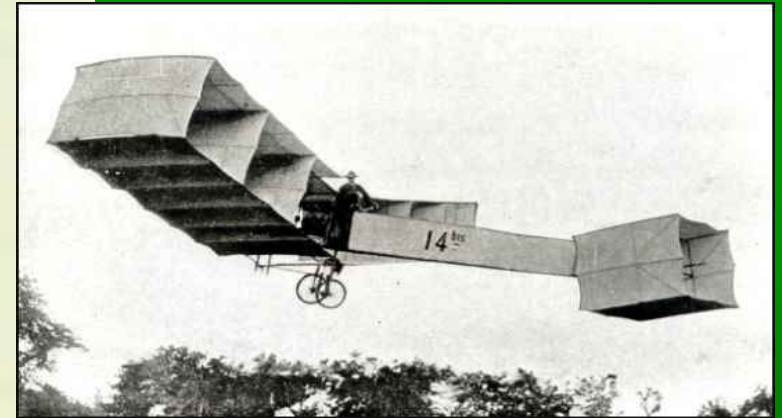
ALBERTO SANTOS DUMONT



Alberto Santos Dumont



1901



1906

EMBRAER

SANTOS DUMONT'S DREAM LED TO THE CREATION OF ONE OF THE LARGEST AVIATION COMPANIES IN THE WORLD

Copyright © 2001 - B. MAREMBERT
<http://aircraftstories.free.fr>



CAATINGA AREA (yellow) : 71 milhões de ha

TOTAL AREA OF BRASIL: 850 milhões de ha



THE HOME OF A NEW TROPICAL SCIENCE: THE BRAZILIAN NORTHEAST

53.5 million people

Twice the area of California





AASDAP
ASSOCIAÇÃO ALBERTO SANTOS
DUMONT DE APOIO À PESQUISA

***SCIENCE AS AN AGENT OF SOCIAL
TRANSFORMATION IN BRAZIL***



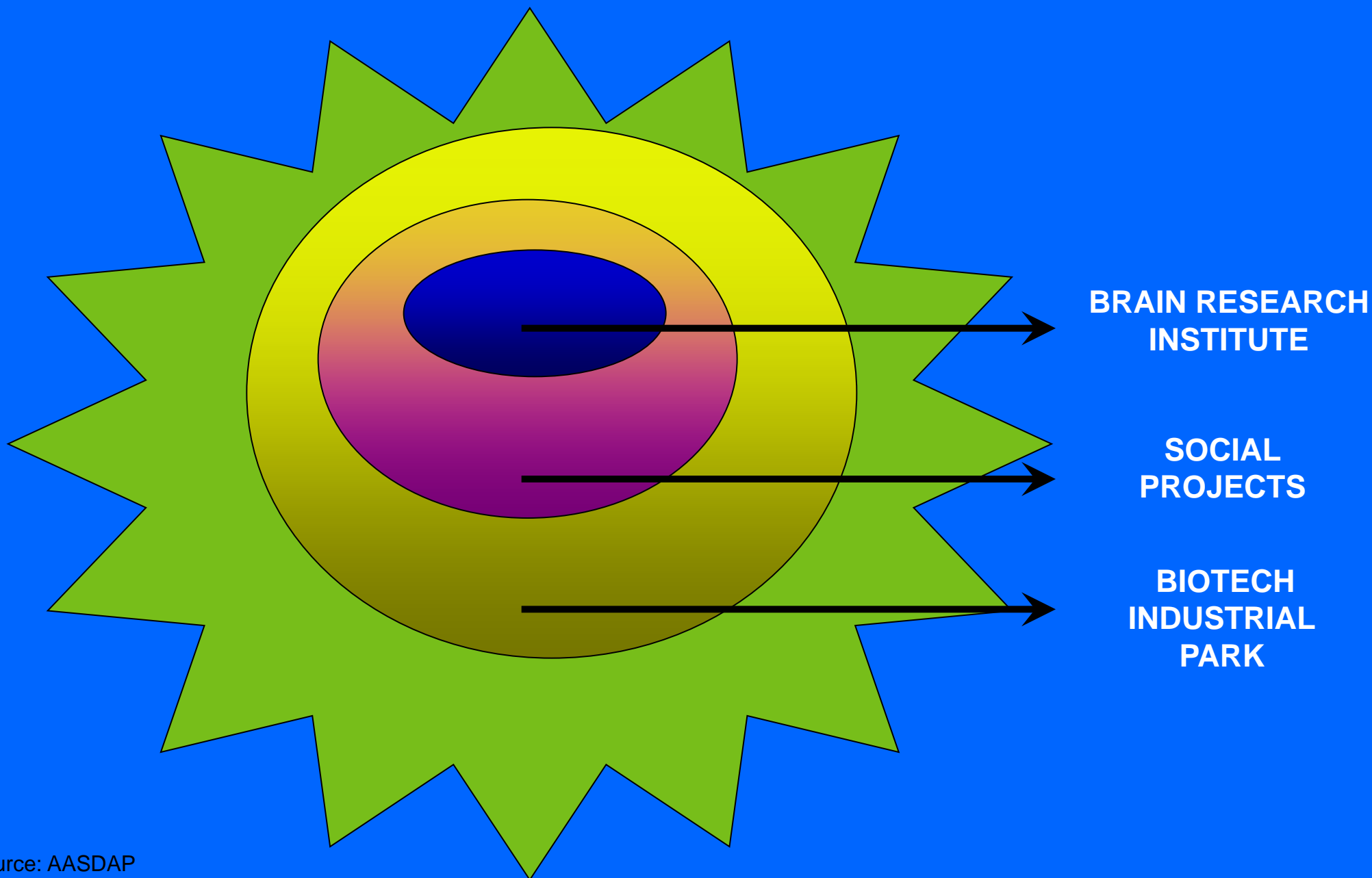
IINN-ELS

INSTITUTO INTERNACIONAL
DE NEUROCIÊNCIAS DE NATAL
EDMOND E LILY SAFRA



Instituto Internacional de Neurociencia de Natal
Campus do Cerebro - Macaíba, Marco de 2004

ORGANIZATION OF THE CAMPUS OF THE BRAIN





IINN-ELS

INSTITUTO INTERNACIONAL
DE NEUROCIÊNCIAS DE NATAL
EDMOND E LILY SAFRA



AASDAP
ASSOCIAÇÃO AMERICANA DE
ESTUDOS PARA A SAÚDE E PESQUISA

**CENTRO DE ESTUDO E PESQUISA
PROF. CÉSAR TIMO-IARIA**



IINN
INSTITUTO INTERNACIONAL
DE NEUROCIÊNCIAS DE NATAL

ENTRADA

Lab. de Neurobiologia Molecular [1]



Lab. de Neurobiologia Molecular [2]



Laboratório de Neuroengenharia



Lab. de Neurobiología Celular





INN-ELS INSTITUTO INTERNACIONAL DE NEUROCIÊNCIAS DE NATAL - EDMOND E LILY SAFRA

AASDAP
ASSOCIAÇÃO ACADÊMICA DE SAÚDE,
DESENVOLVIMENTO E PESQUISA

I ESCOLA DE ALTOS ESTUDOS DA CAPES – IINN-ELS MACAIBA, RN, BRASIL



MACAIBA ADVANCED STUDIES INSTITUTE Supercomputer Blue Gene

- ❖ >8000 microprocessors divided in 4 racks
- ❖ 26 Teraflops peak performance



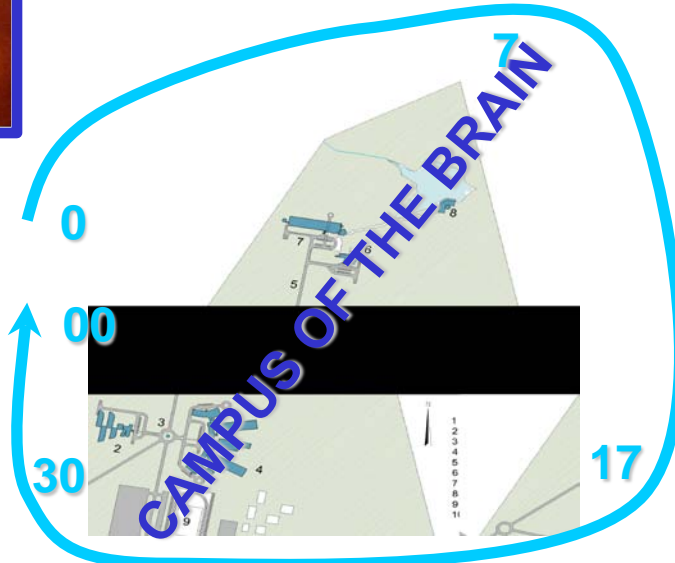
EDUCACIONAL PROGRAM CAMPUS OF THE BRAIN



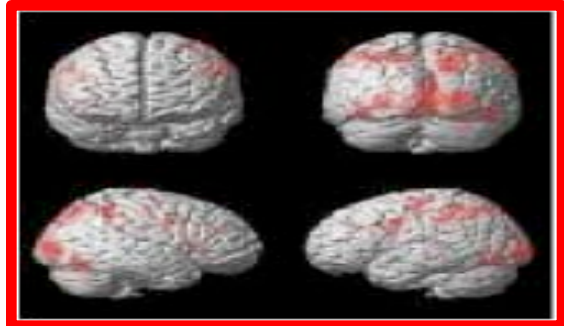
REGULAR EDUCATION
FULL TIME (4-17 years)



PRENATAL CARE



SCIENCE EDUCATION



GRADUATE
EDUCATION



AGROTECNIC EDUCATION



SPORT EDUCATION

CAMPUS

DO

CEREBRO



INICIATIVAS SOCIAIS



**ANITA
GARIBALDI
WOMEN'S
CLINIC**

(MACAIBA)

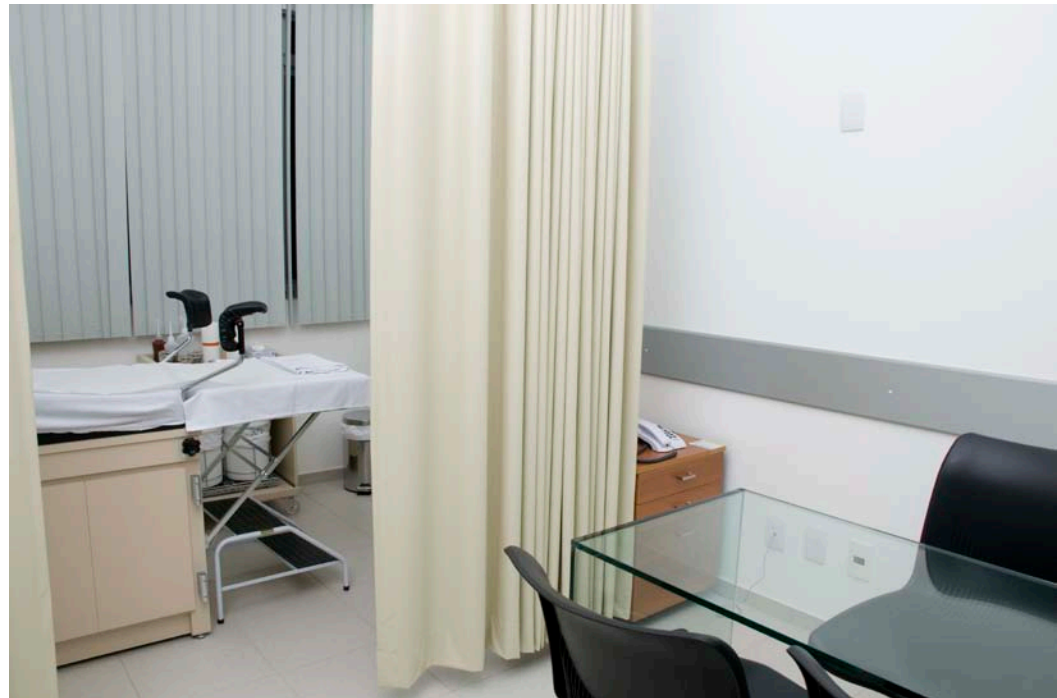
**ALFREDO J.
MONTEVERDE
SCHOOL
(NATAL)**

(600 students)

**ALFREDO J.
MONTEVERDE
SCHOOL
(MACAIBA)**

(400 students)









ESCOLA
ALFREDO J. MONTEVERDE



IINN-ELS

INSTITUTO INTERNACIONAL
DE CIENCIAS DE NATAL
EDMOND E. LILY SAFRA





Centro de Educação Científica: AASDAP

Natal e Macaíba



FOCO CENTRAL DO PROJETO



O Projeto de Educação Científica Infanto-Juvenil da AASDAP visa promover a inclusão social de alunos do ensino básico da rede pública por meio do ensino de conceitos e práticas básicas da ciência moderna.

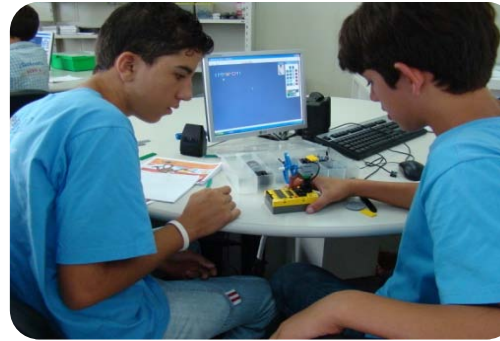
Oficina de Ciência e Tecnologia

A oficina de Ciência e Tecnologia trabalha com conteúdos da Física, da Mecânica, da Matemática, da Geometria, entre outros. Todos os conteúdos trabalhados resultam em “engenhocas” produzidas pelos alunos.



Oficina de Robótica

A Oficina de Robótica trabalha em especial com conteúdos da Mecânica e da Eletrônica, com materiais de sucata e kits de montagem de motores e sensores controláveis por computador, desenvolvendo como produtos de trabalho “engenhocas robóticas”.



Laboratório de Química

O Laboratório de Química é um espaço de experiências e de produção do conhecimento da Química, da prática da pesquisa experimental e da relevância desse instrumental de investigação na produção de bens e serviços ao ser humano.



Laboratório de Biologia

No laboratório de Biologia os alunos investigam eventos do cotidiano desenvolvendo aprendizagem da natureza viva que os envolve.



Laboratório de Física

O laboratório de Física desenvolve experiências e produção do conhecimento nos diferentes conteúdos da Física.



Oficina de História

A oficina de História trabalha o significado das histórias de vida, valorizando a identidade cultural dos alunos e resgatando a auto-estima de cada um.



Oficina de Ciência e Arte

Na oficina de Ciência e Arte os alunos criam e desenvolvem projetos tecnológicos e artísticos vinculados à cultura local.



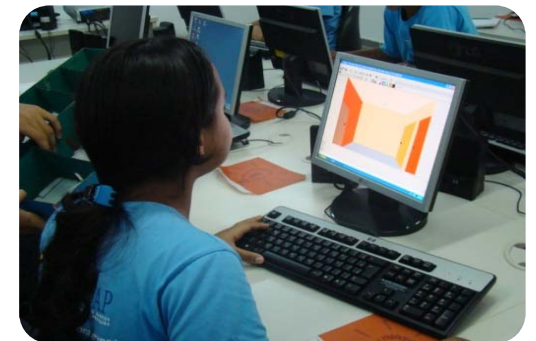
Biblioteca Multimídia

A biblioteca é um espaço de aprendizagem que estimula o gosto pela leitura, estudo, pesquisa e lazer.



Laboratório de Informática

O laboratório de informática é o ambiente onde o computador é utilizado como recurso de ensino e aprendizagem da pesquisa, da tecnologia da informação e seus aplicativos.



Espaço de Convivência

O lugar de encontros entre os alunos para conversar, cantar, jogar, assistir documentários e se alimentar.



ALFREDO J. MONTEVERDE SCHOOL MACAIBA



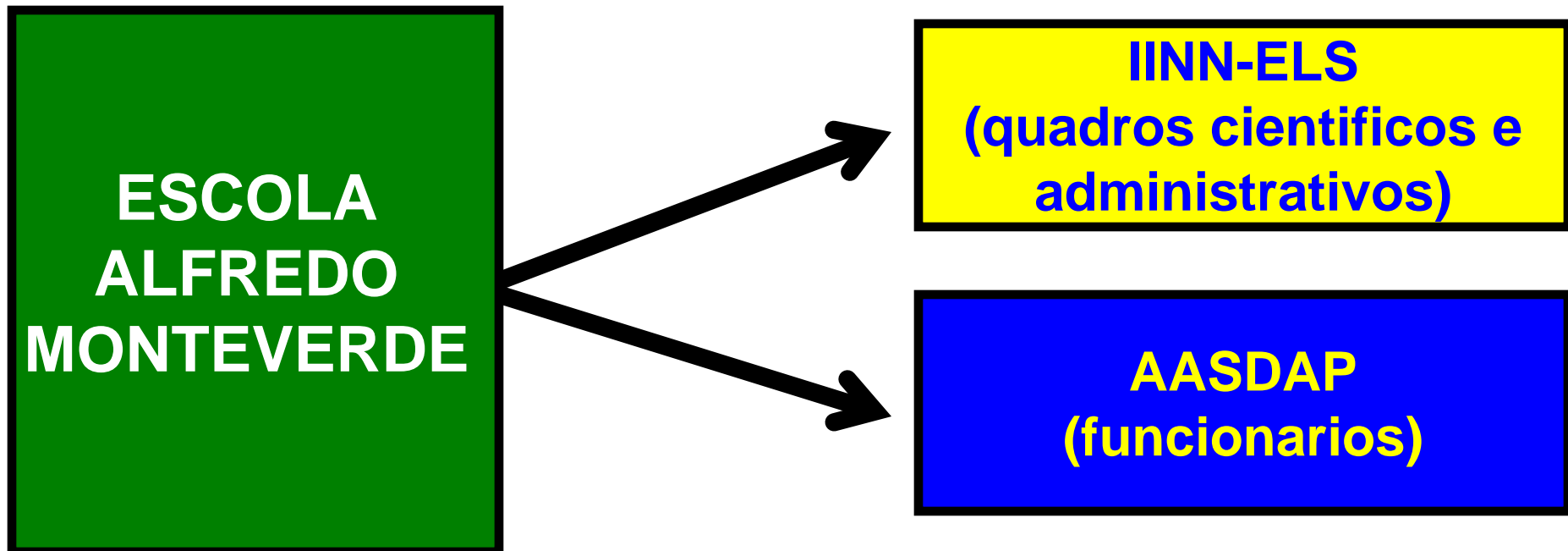
Centro de Formação Continuada

Projeto de educação continuada que reúne professores da equipe profissional de **NATAL E MACAÍBA** para a socialização, reflexão e registro da prática pedagógica fundamentada teoricamente.



PROGRAMA JOVEM CIENTISTA

- **OBJETIVO:** Introduzir jovens do ensino medio a pratica da ciencia moderna, atraves de um sistema de instrucao dirigida, focado na solucao de problemas cientificos aplicados.
- **Metodo pedagogico baseado na relacao TUTOR → APRENDIZ**

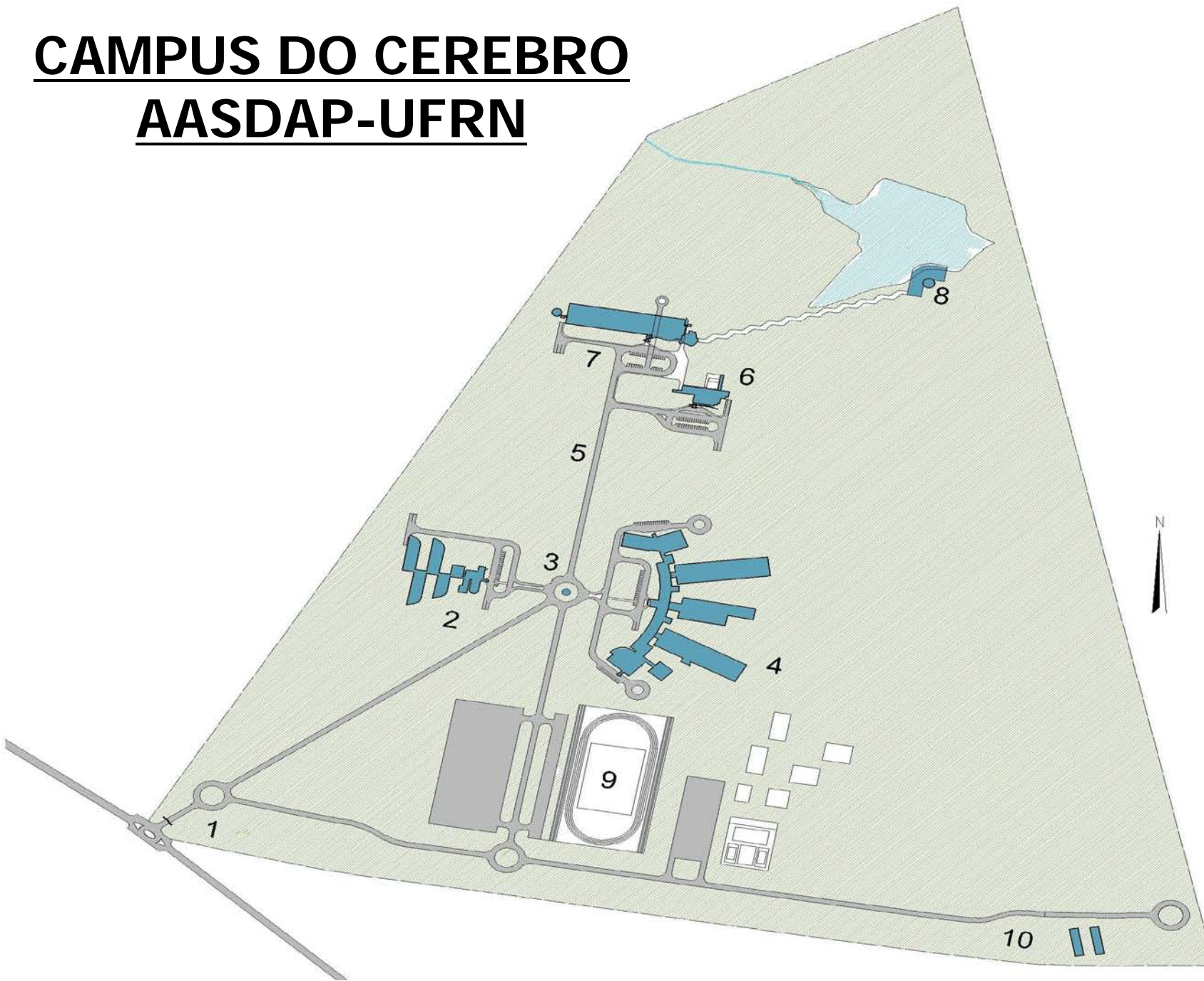


PROGRAMA JOVEM CIENTISTA

TODOS FINANCIADOS PELO BOLSA CIENCIA: R\$ 520 mes



CAMPUS DO CEREBRO AASDAP-UFRN



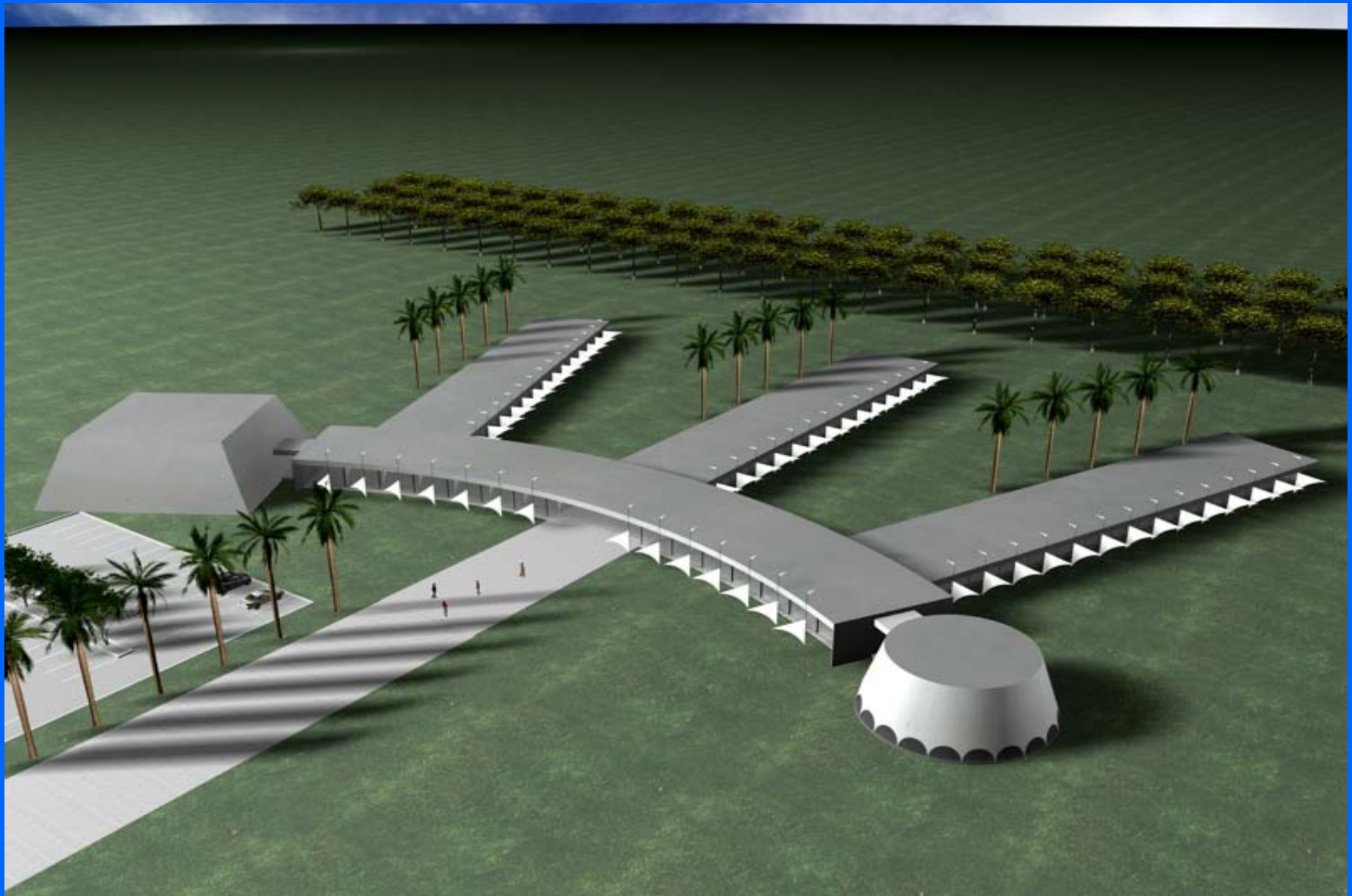
- 1 - Pórtico
- 2 - Centro de saúde
- 3 - Memorial
- 4 - Centro Comunitário
- 5 - Avenida Central
- 6 - Hotel
- 7 - Centro de Pesquisa
- 8 - Quiosque / Deck
- 9 - Centro Esportivo
- 10 - Serviços gerais

INSTITUTO DE NEUROCIENCIAS



Project: Jose Galbinski

ESCOLA LYGIA MARIA



Project: Jose Galbinski



A ILHA DO CONHECIMENTO DE MACAIBA, RN

**CAMPUS
do
CEREBRO**

geracao
de
conhecimento
de
ponta

IINN-ELS

NIT

IEA-ASD

ESCOLA
ALFREDO
MONTEVERDE

EDUCACAO
TODA VIDA

PROGRAMA
SAUDE DA
MULHER

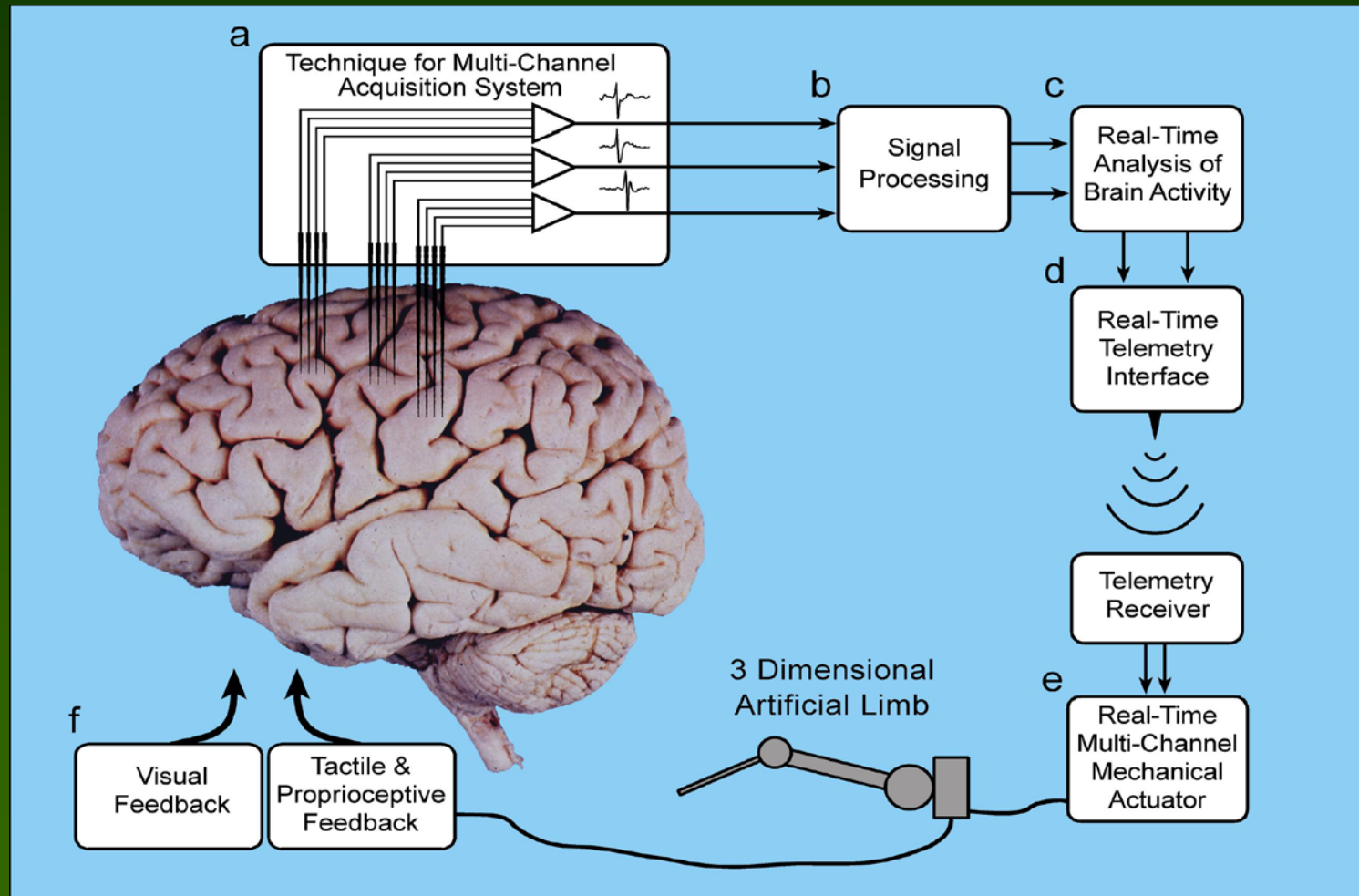
**CIDADE
DO
CEREBRO**

primeiro
parque
neurotech
do
mundo

**AEROHUB
SAO
GONCALO
DO
AMARANTE**

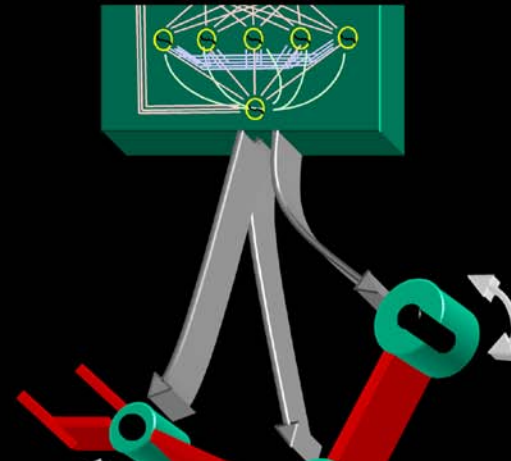
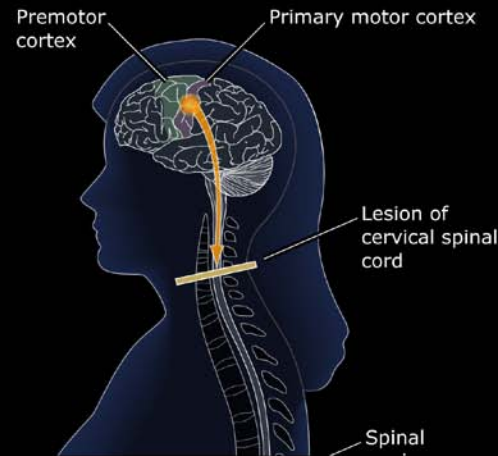
maior
aeroporto
de
exportacao
da
America
Latina

DESIGN OF A BRAIN MACHINE INTERFACE



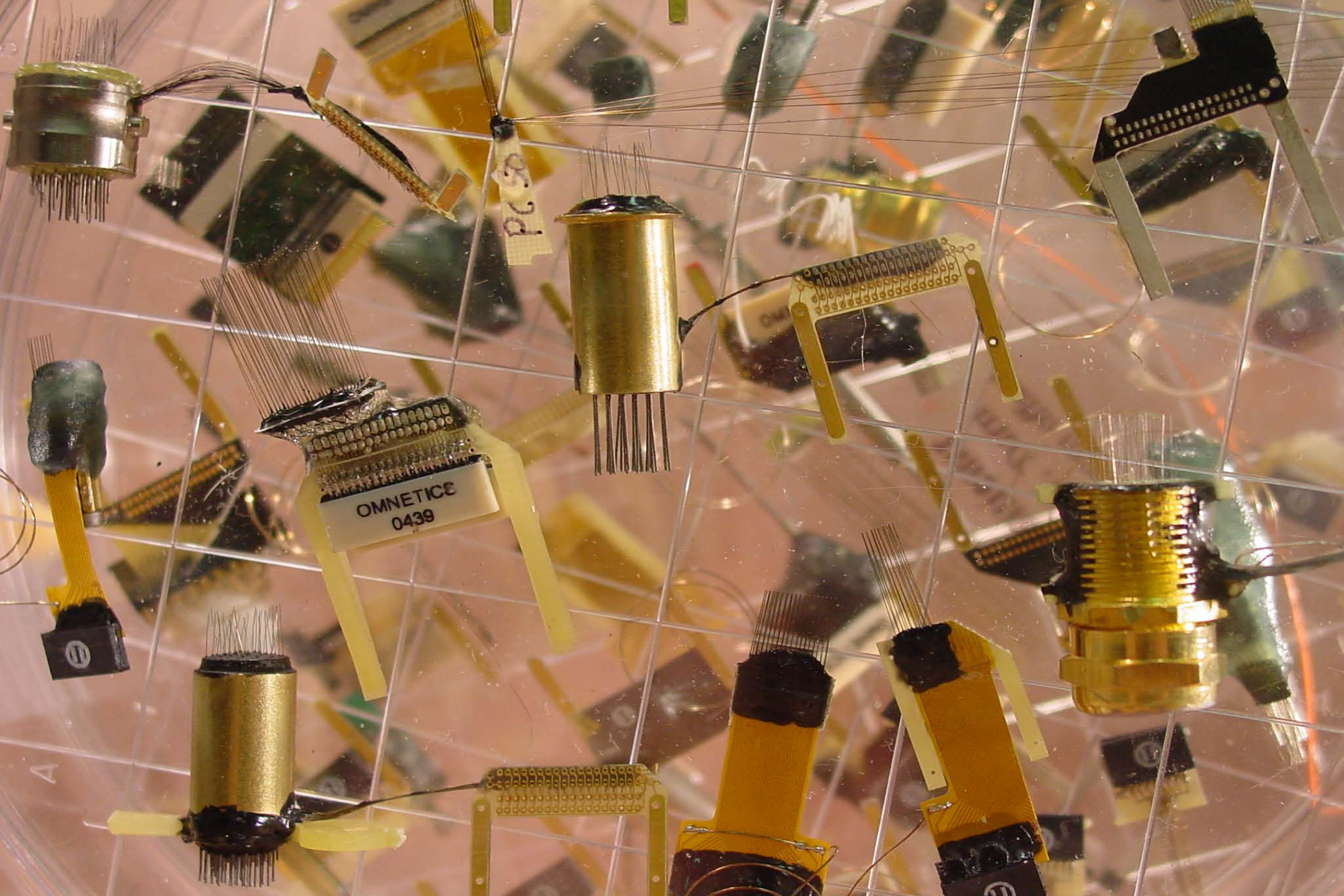
Wessberg et al., Nature 2000; Nicolelis, Nature 2001

Cortical Neuroprosthesis for Restoring Motor Functions



Nicolelis and Chapin. Scientific American 2002.

Nicolelis, MAL. Nat. Rev. Neurosci. 2003; Nicolelis, MAL and Lebedev, M. Nat. Rev. Neurosci. 2009.

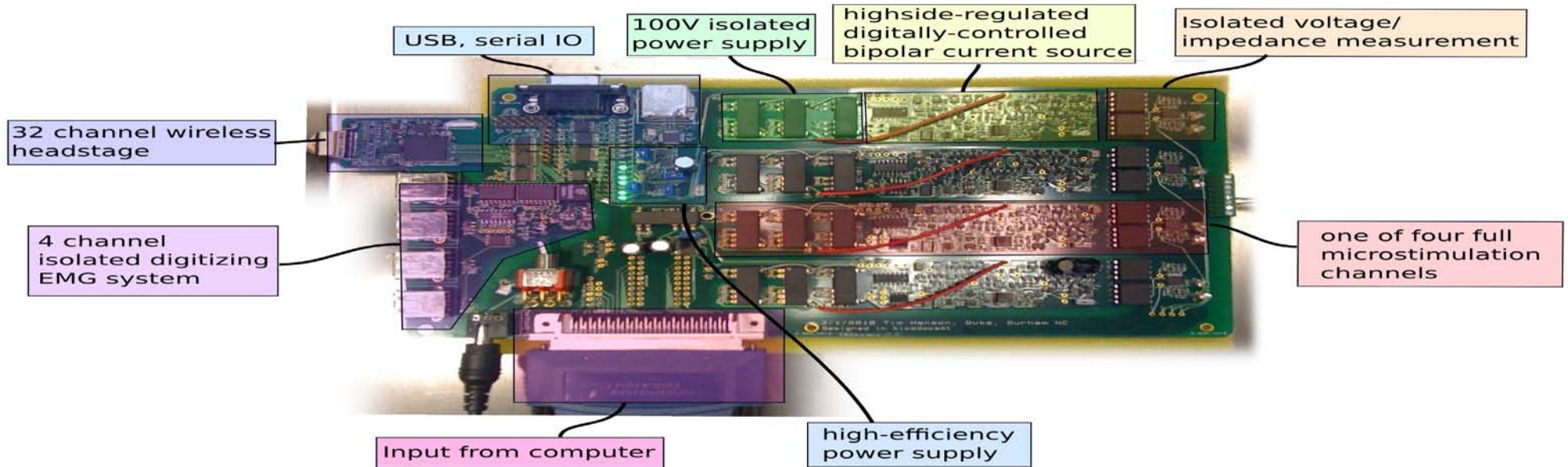
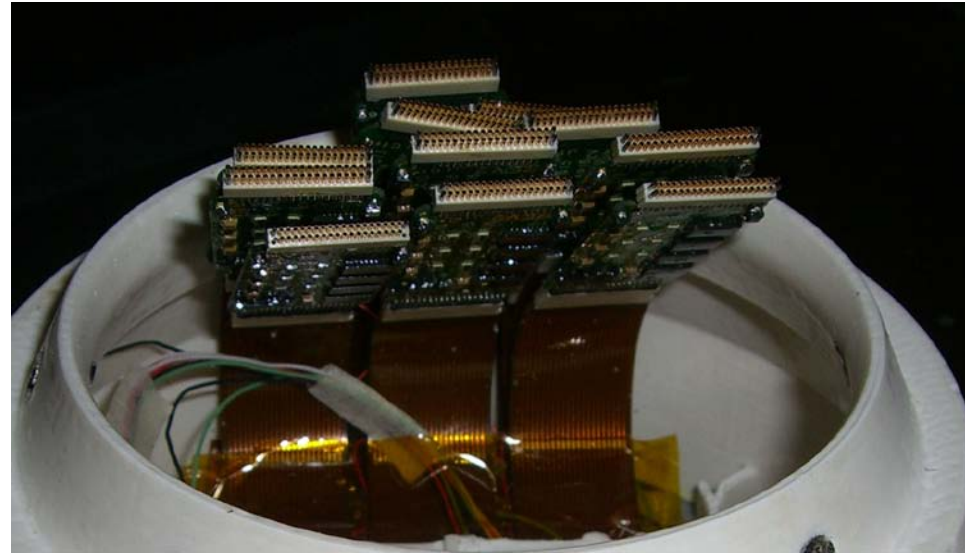
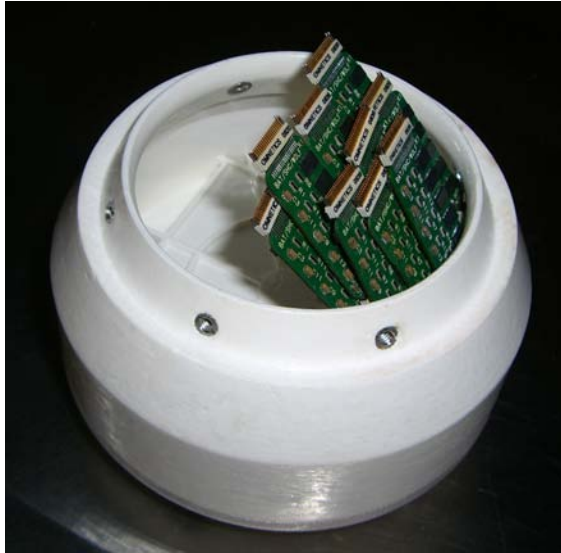


OMNETICE
0439

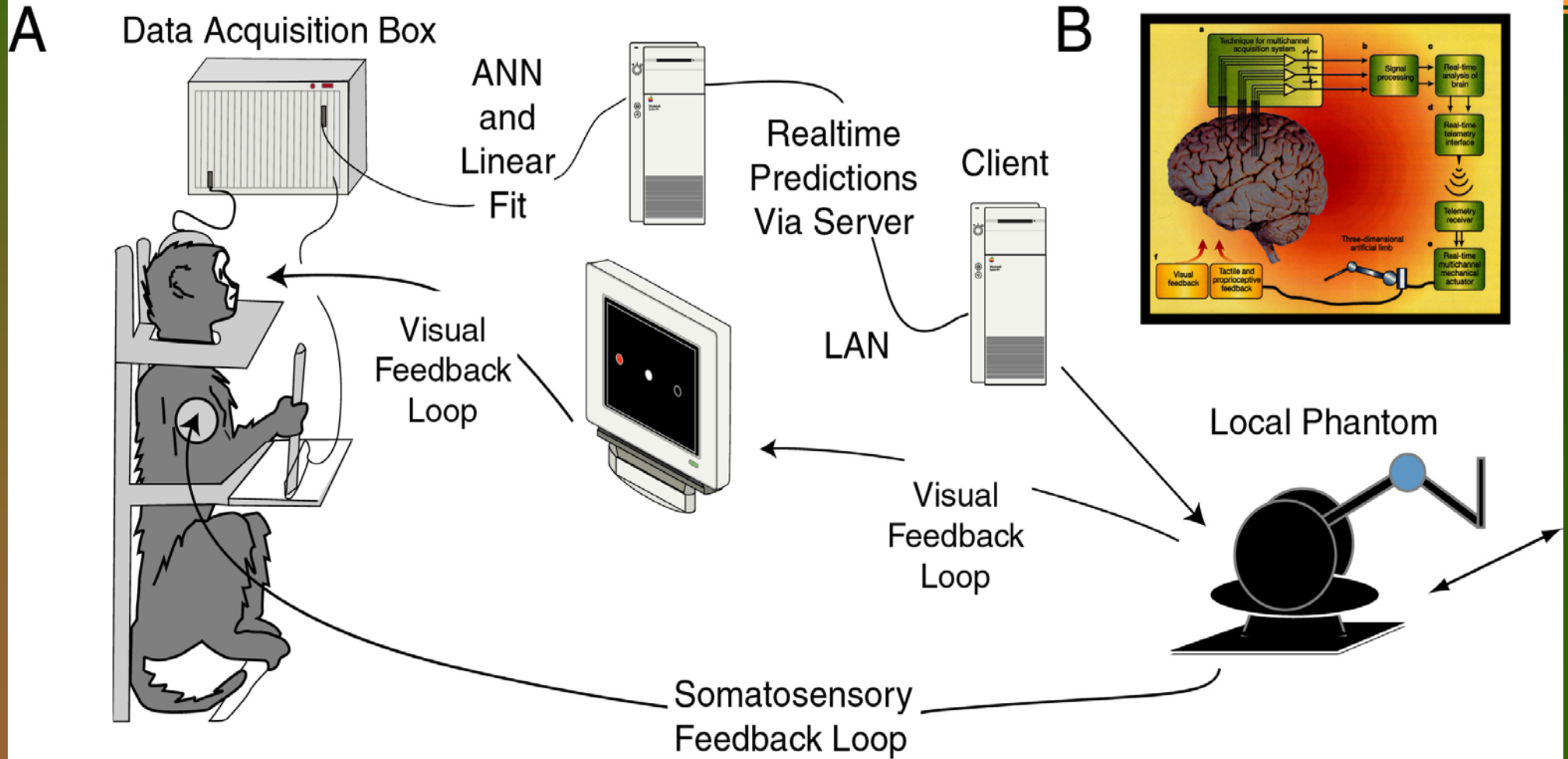
PC.80

A

KILOCHANNEL NEURO-RECORDING SYSTEM



EXPERIMENTAL APPROACH



THE WALK AGAIN PROJECT

STANDARD TIME ZONES OF THE WORLD

**DUKE UNIVERSITY
CTR. NEUROENGINEERING**



Brain Control
March 28, 2003



BERLIN

MUNICH

LAUSANNE

DURHAM

Use the monkey avatar as a feedback for the real monkey



NATAL

SAO PAULO



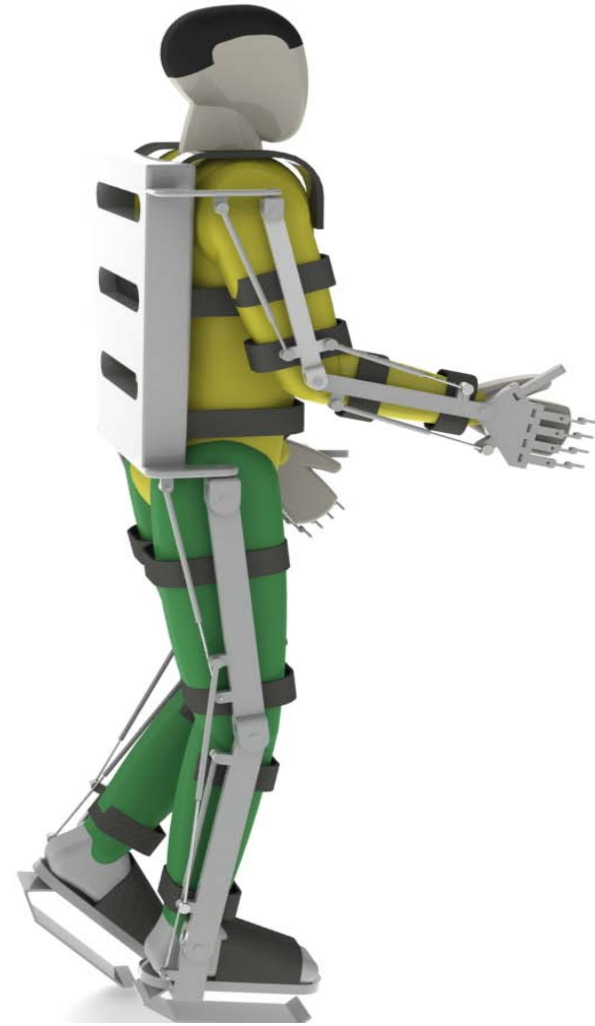
**BRAZILIAN NATIONAL PROGRAM OF
BRAIN-MACHINE INTERFACES
ELS-IINN**

Scale 1:85,000,000
Miller Cylindrical Proj
0 500 1000 Kilometers
0 500 1000 Miles

French Southern and Antarctic Lands
FRANCE
POLICE DEPARTEMENT
SAO PAULO
0 500 1000 Kilometers
0 500 1000 Miles

Subtract time zone number from UTC to obtain local time. Add time zone number to UTC to obtain local time.

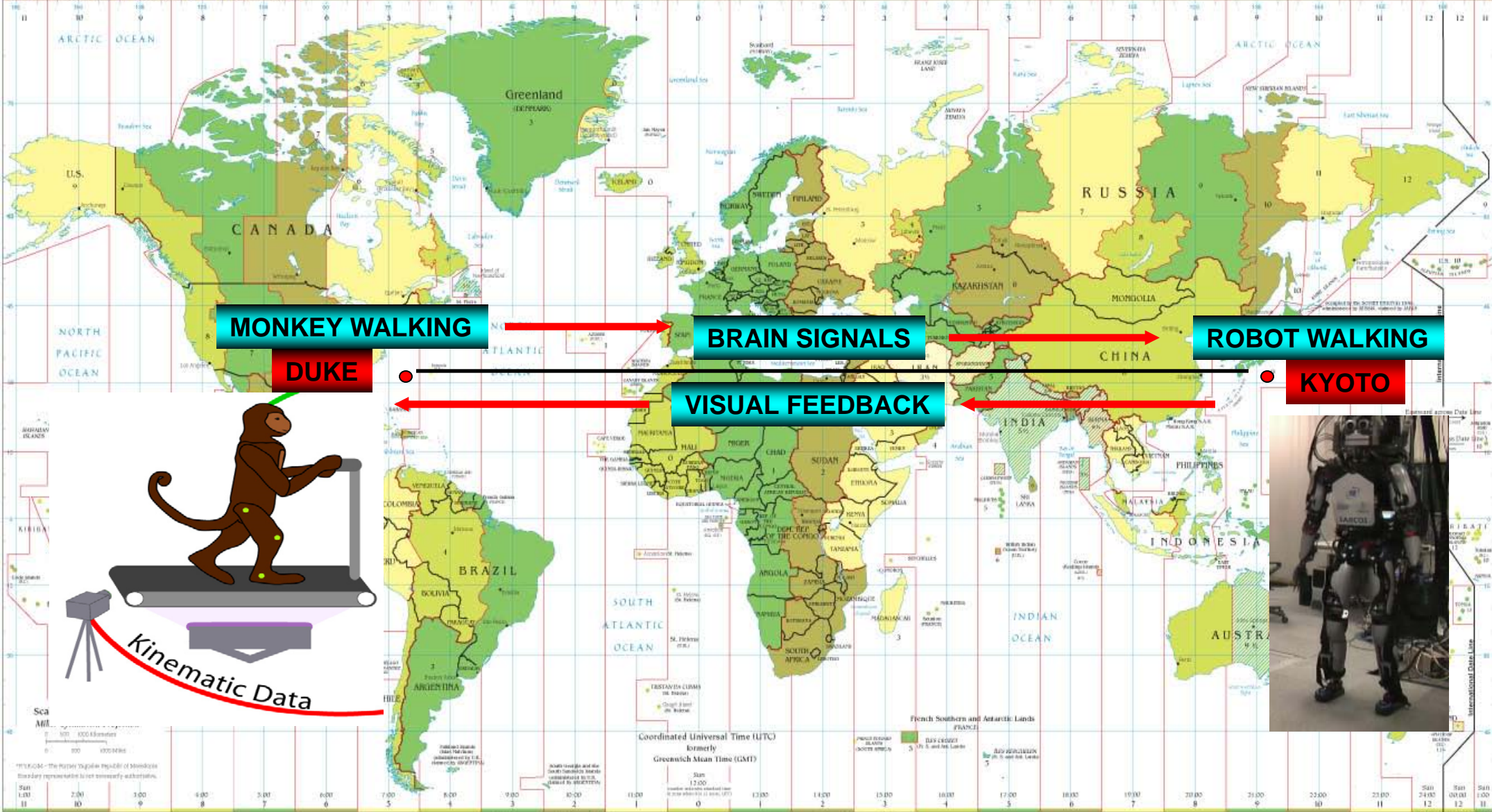
WHOLE-BODY EXOSKELETON



Design: Gordon Cheng (Technical University of Munich)

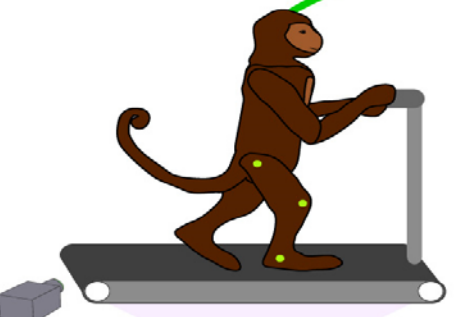
BRAIN-ROBOT INTERFACE ACROSS THE GLOBE

STANDARD TIME ZONES OF THE WORLD



MONKEY WALKING

DUKE



Kinematic Data

BRAIN SIGNALS

ROBOT WALKING

KYOTO



VISUAL FEEDBACK

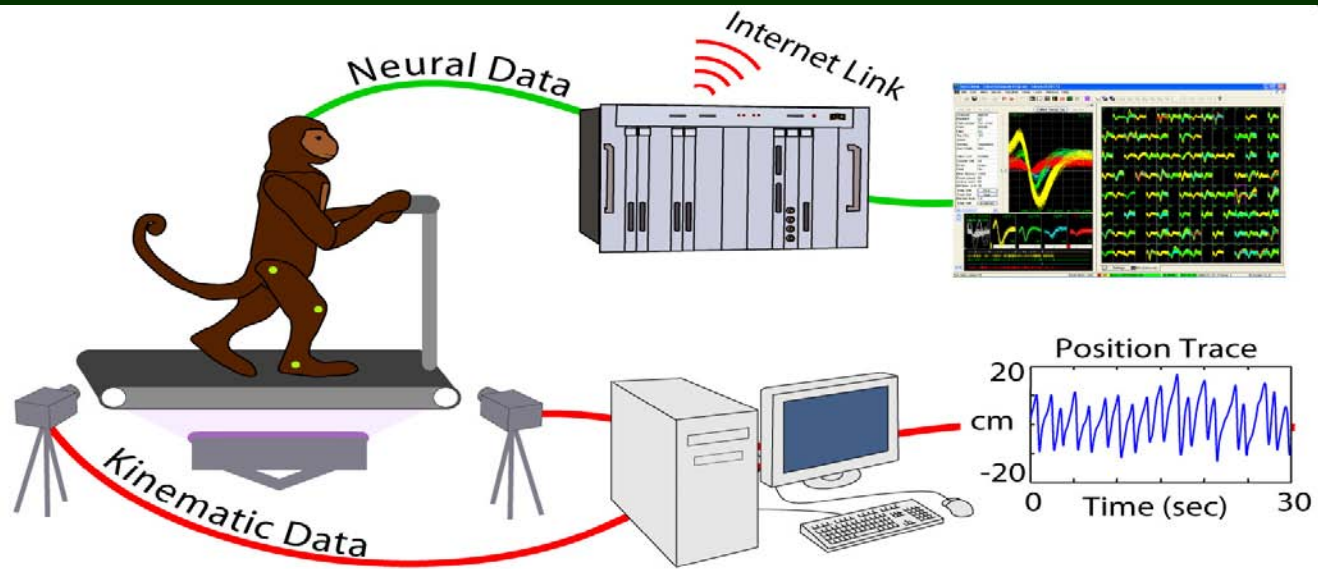
Scale
0 100 500 Kilometers
0 100 500 Miles

Coordinated Universal Time (UTC)
formerly
Greenwich Mean Time (GMT)

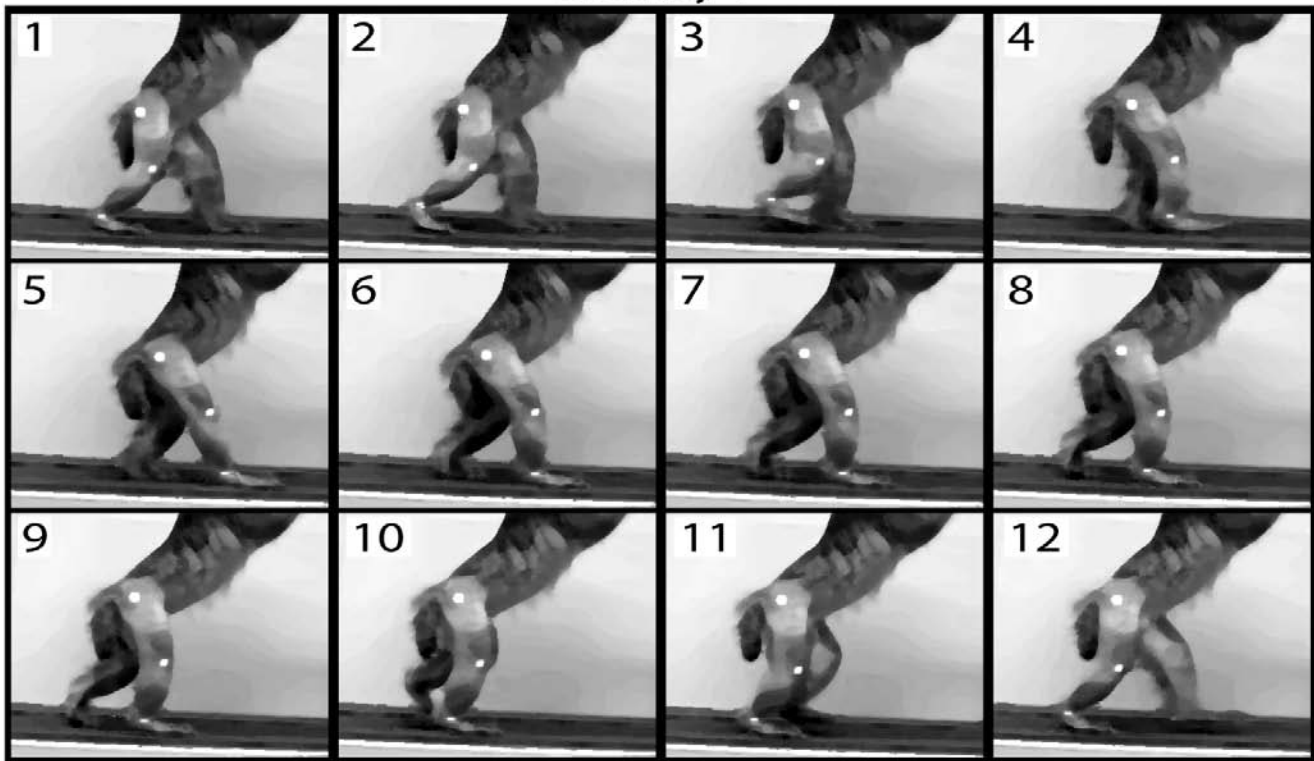
Start
12:00
End
12:00

WEST EAST

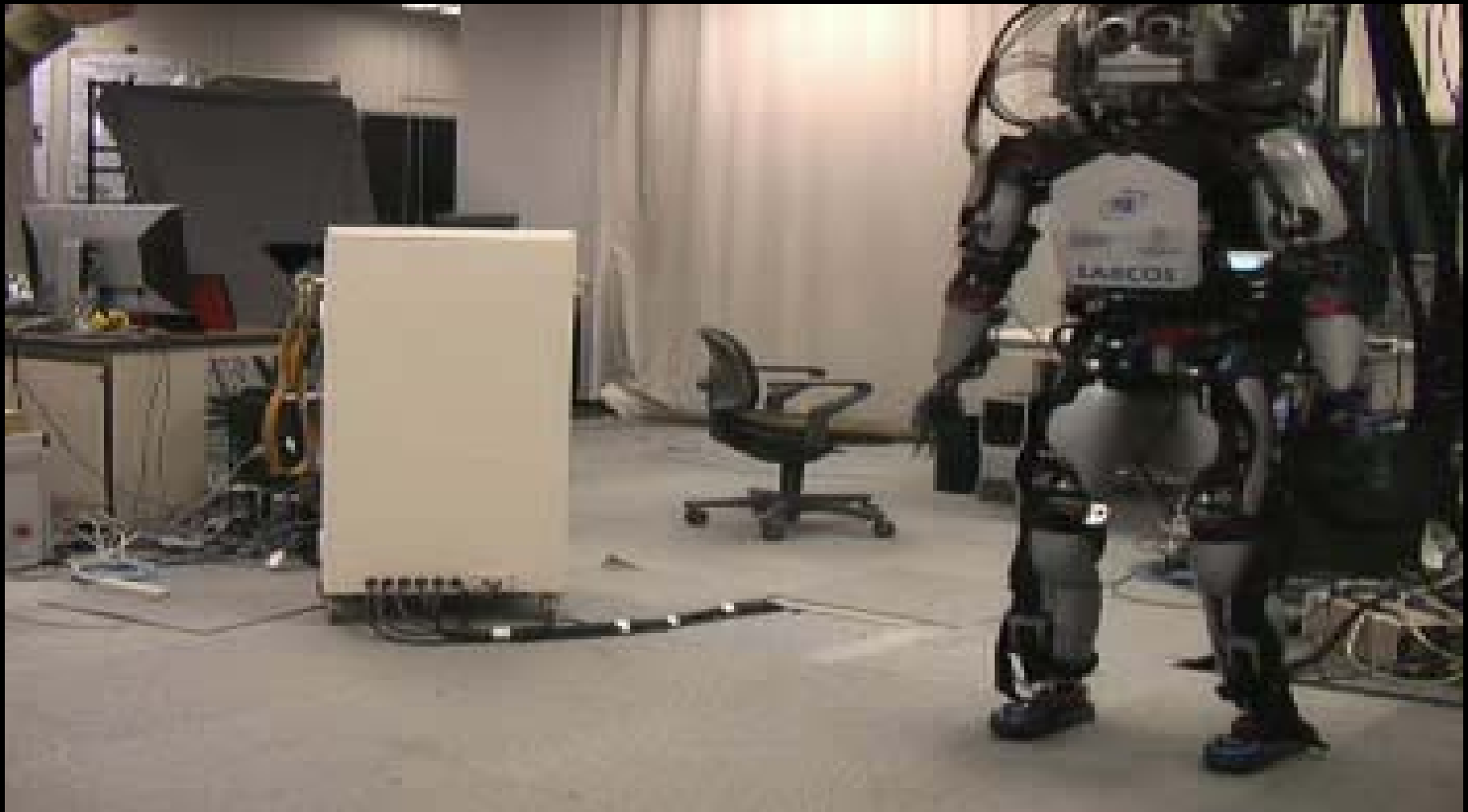
8020564 (R02103) 3-04

A

Monkey 1

B

AUTONOMOUS ROBOT WALKING IN JAPAN PRODUCED BY MONKEY CORTICAL ACTIVITY



THE CITY OF THE BRAIN

Natal, Brazil



- **RESIDENTIAL DISTRICT**
- **SCIENCE AND TECHNOLOGY PARK**
 - Neuroscience Research Institute
 - Biotech Companies and Startups
- **EDUCATIONAL PROJECTS**
- **NEURO HOSPITAL**
- **ECO-CULTURAL RESORT**
- **BRAZILIAN HERITAGE PARK**
 - Art Galleries
 - Interactive Museum
 - Entertainment Complex
 - Sports Complex
- **RENEWABLE ENERGY PLANT**
- **BANK OF THE BRAIN**



RENEWABLE ENERGY PLANT

Wind and Solar Energy Plant

Biofuel Research

Agroenergetic Cluster

Biodiesel Plant



**NEUROSCIENCE CLINICAL RESEARCH ORGANIZATION
CAMPUS FOR ESTABLISHED BIOTECH COMPANIES
AND STARTUP COMPANIES**

NEUROTECHNOLOGY PARK DEDICATED TO THE “INDUSTRY OF THE BRAIN”

MUSEUM OF THE BRAIN

A decorative graphic at the bottom of the slide features a horizontal band with a gradient from orange to grey. The band contains binary code (0s and 1s) in a light orange color. To the right of the band, there are several overlapping circles in shades of orange and grey, creating a stylized, abstract design.



NEUROHospital



Bank of the Brain

**Micro-credit Program
Third Sector Lending
Innovation Fund
Research Translation
Biotech Startups
Biofuel Development**



ECO-CULTURAL RESORT AND BRAZILIAN HERITAGE PARK

hotel

art galleries

interactive museum

restaurants

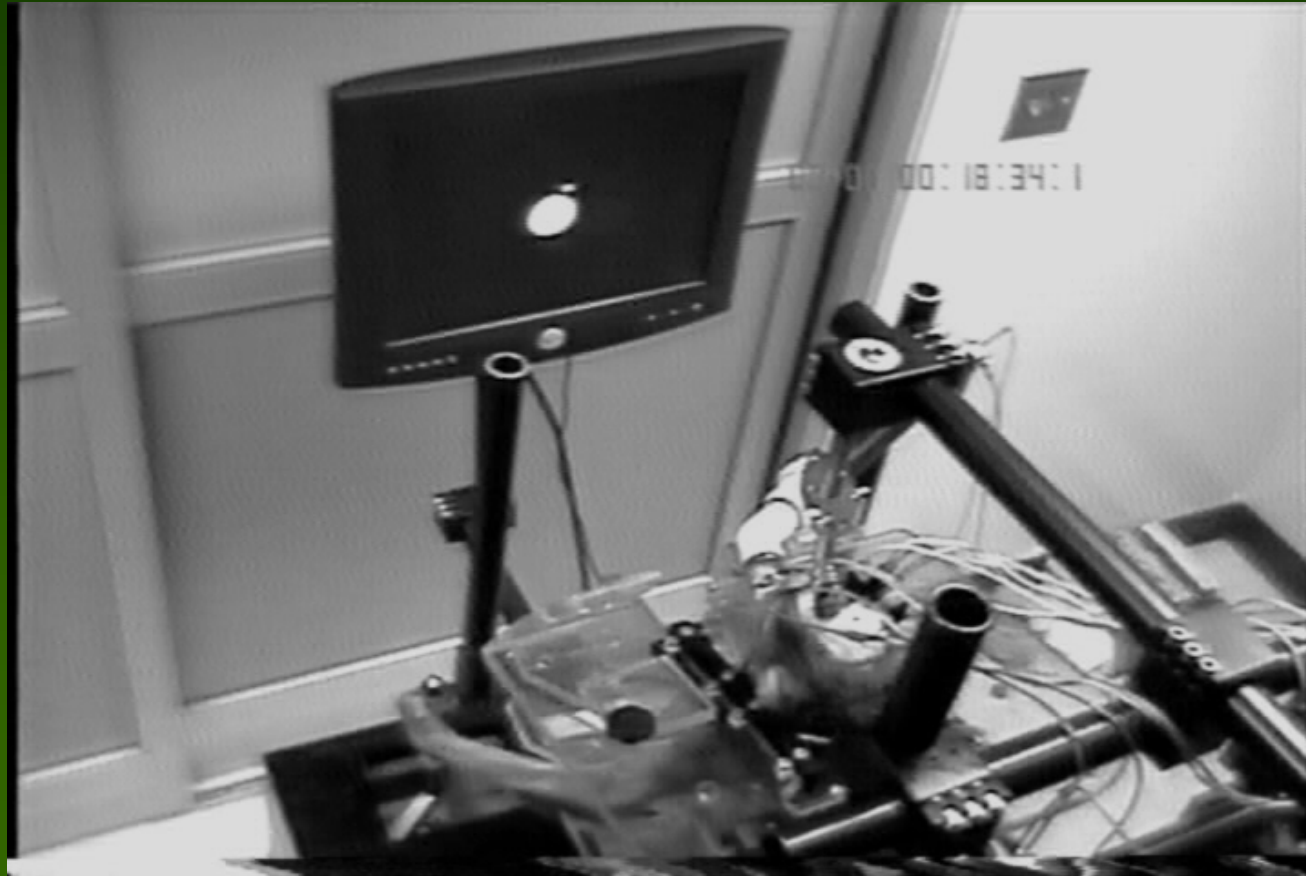
ecological park

exhibition park

music arena

CURSOR MOVEMENTS

100% Pole Control



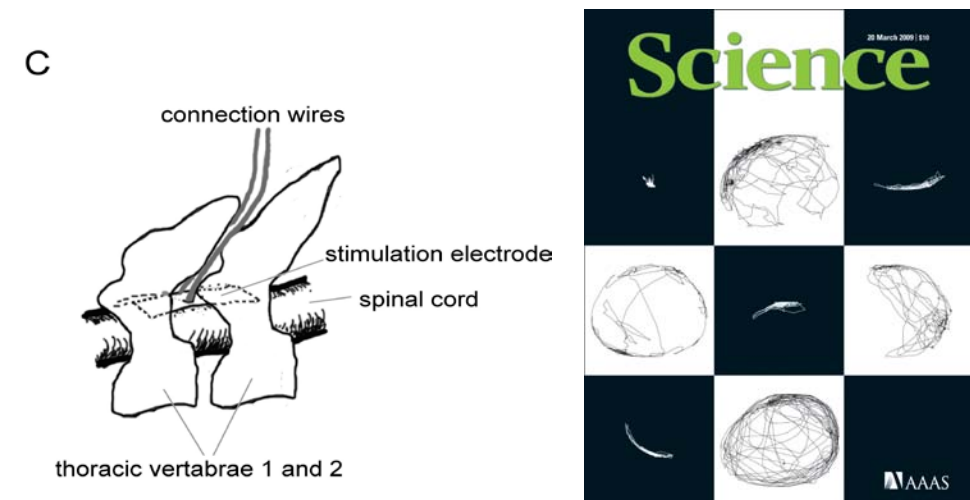
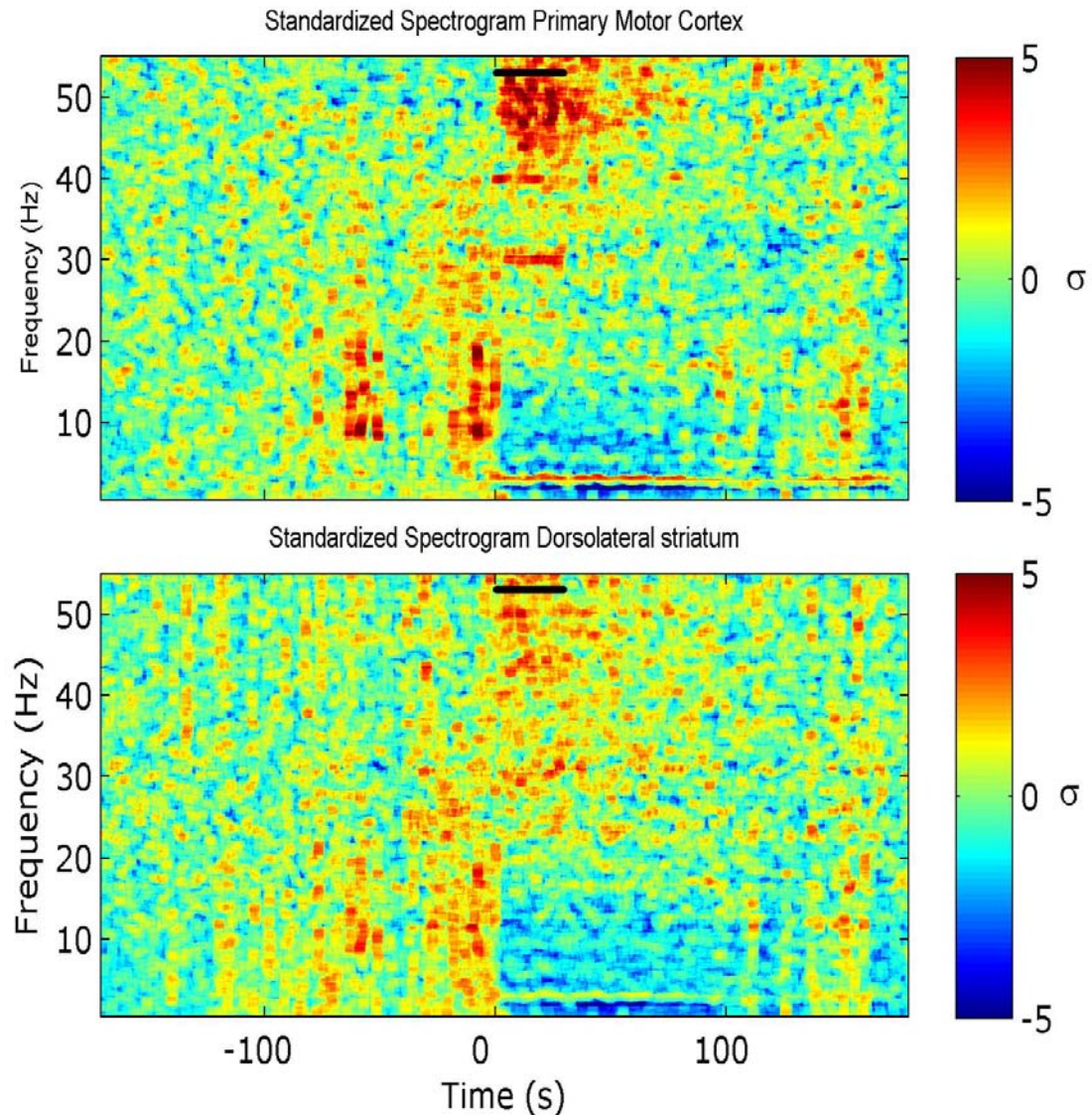
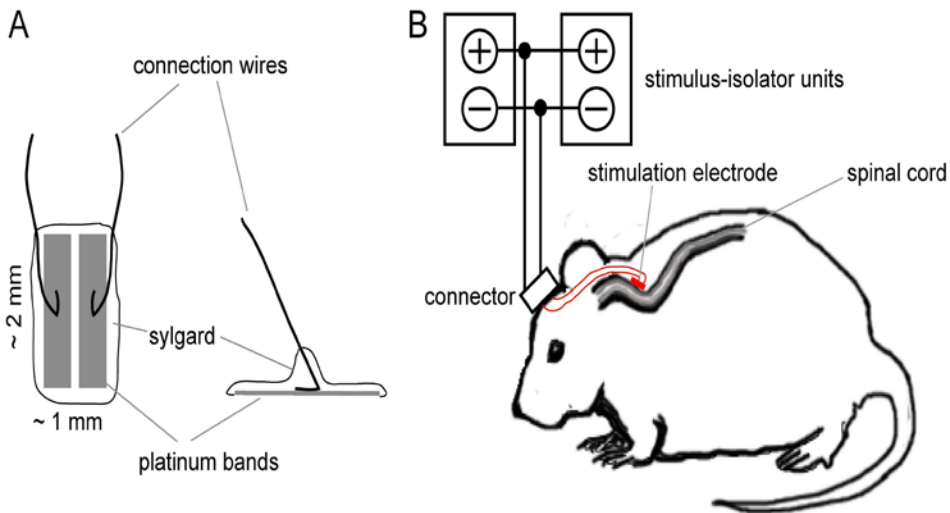
BRAIN CONTROL CAN BE ACHIEVED WITHOUT ARM MOVEMENTS



ROBOT CONTROL AND DISSOCIATION OF ARM MOVEMENTS



Electrical stimulation of the dorsal funiculi with an epidural bipolar electrode



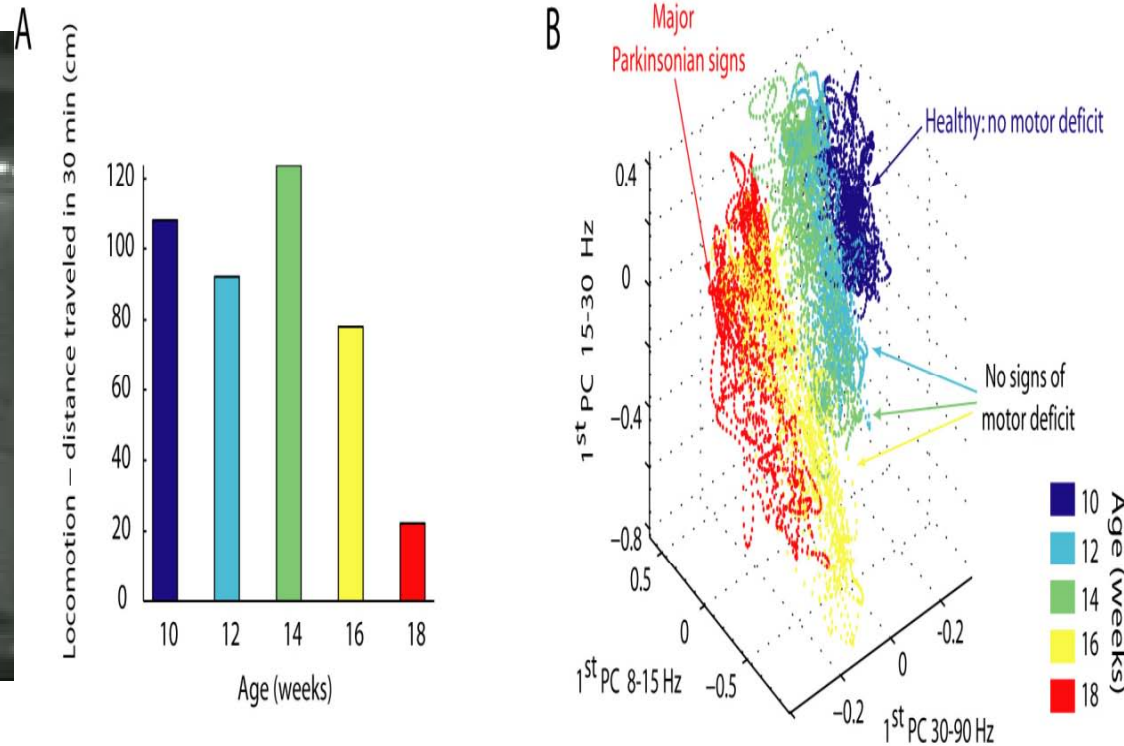
Fuentes et al. *Science*, 2009

SPINAL CORD ELECTRICAL STIMULATION IN AKINETIC MICE RESTORES NORMAL LOCOMOTION



Fuentes et al. Science, 2009

GLOBAL BRAIN DYNAMICS BEGINS TO CHANGE MANY WEEKS BEFORE ANIMALS SHOW MOTOR IMPAIRMENT



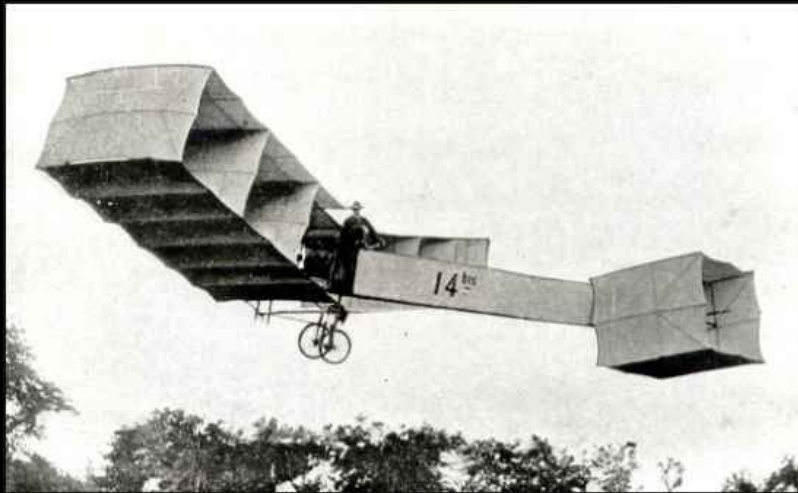
SPINAL CORD STIMULATION IN PRIMATE MODEL OF PARKINSON'S



ENTRADA DO “CAMPUS DO CEREBRO”: o 14 Bis do Século 21



Project: Jose Galbinski



**Esse 14 BIS vai voar
sob
a luz do Cruzeiro do
Sul**

