Welcome

MIM 2020: Procesamiento de Imágenes y Bioseñales I & II

Procesamiento de Imágenes y Bioseñales I

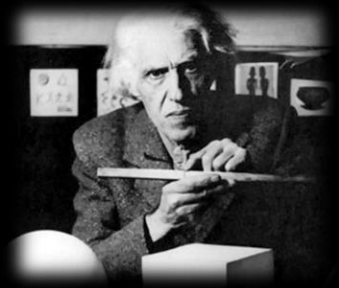
Prof. Dr. Steffen Härtel: www.scian.cl / www.cimt.cl / www.cens.cl

Laboratory for Scientific Image Analysis (SCIAN-Lab)
Centro de Informática Médica y Telemedicina (CIMT)
Centro Nacional en Sistemas de Información en Salud (CENS)
Biomedical Neuroscience Institute (BNI)
Institute of Biomedical Sciences (ICBM)
Anatomy and Developmental Biology Program
Escuela de Postgrado
Facultad de Medicina, Universidad de Chile

Laboratory for SCIAN Scientific Image Analysis

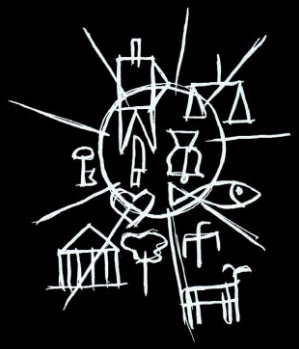
Welcome

BIOMEDICAL NEUROSCIENCE INSTITUTE

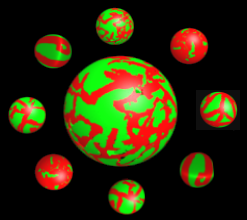


Joaquín Torres García 1874-1949

Richard Feynman (1918-1988)

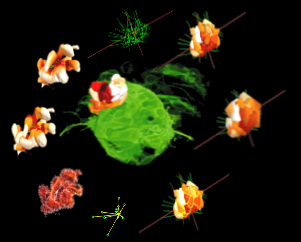


Mats Gustafson 2006 - 2011

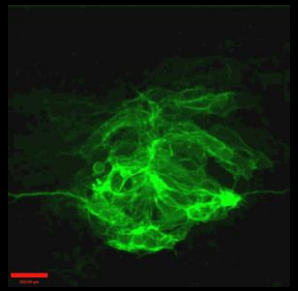


René Descartes (1596-1650)

Maria Goeppert-Mayer 1906-1972



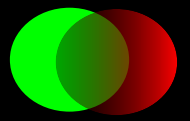
Ernst Abbe 1840- 2005



E Betzig

S Hell

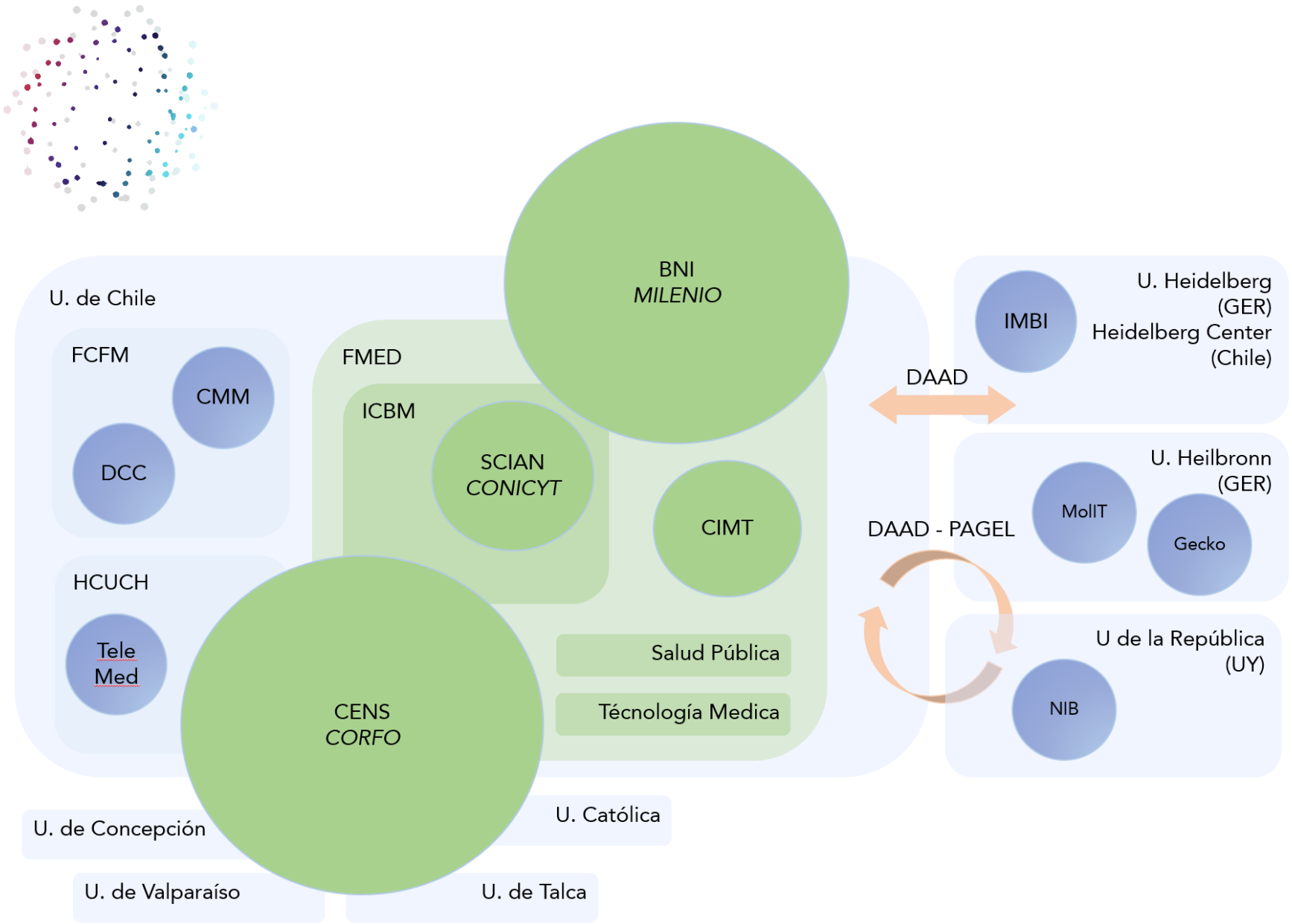
W Moerner



Basic Science	Scientific Platforms	Human Capital Formation & Research in Medical Informatics	Institutes
FONDECYT ANID	FONDEF ANID	DAAD / DFG / STIC-AMSUD / NIH / BID	ICM / ICBM

SCIAN-Lab Members

PIs	●●	Biophysics / Computer Science
PostDocs / Young Academics	●●●●●	Biology / Computer Sc / Electric Engineer / Mathematics
PhD - students	●●●●	Computer Sc / Electric Engineer / Biochemistry
Master - students	●●●●●…	Medical Technology / Electric Engineer / Medical Informatics
Undergraduate	●●●●	Computer Science/Biology
Research – Assistants	●●●●●	Medicine / Computer Sc / Electrical Engineer / Biology
Technicians	●●●	Biotechnology / Labtechnician / Administration


U. de Chile
FCFM
CMM
DCC
FMED
ICBM
SCIAN
CONICYT
BNI
MILENIO
CIMT
HCUCH
Tele
Med
CENS
CORFO
Salud Pública
Técnología Medica
U. de Concepción
U. Católica
U. de Valparaíso
U. de Talca
DAAD
IMBI
U. Heidelberg
(GER)
Heidelberg Center
(Chile)
U. Heilbronn
(GER)
DAAD - PAGEL
MolIT
Gecko
U de la República
(UY)
NIB

U. de Chile

FCFM

CMM

DCC

FMED

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MILENIO

CIMT

HCUCH

Tele
Med

CENS
CORFO

Salud Pública

Técnología Medica

U. de Concepción

U. Católica

U. de Valparaíso

U. de Talca

IMBI

U. Heidelberg
(GER)
Heidelberg Center
(Chile)

U. Heilbronn
(GER)

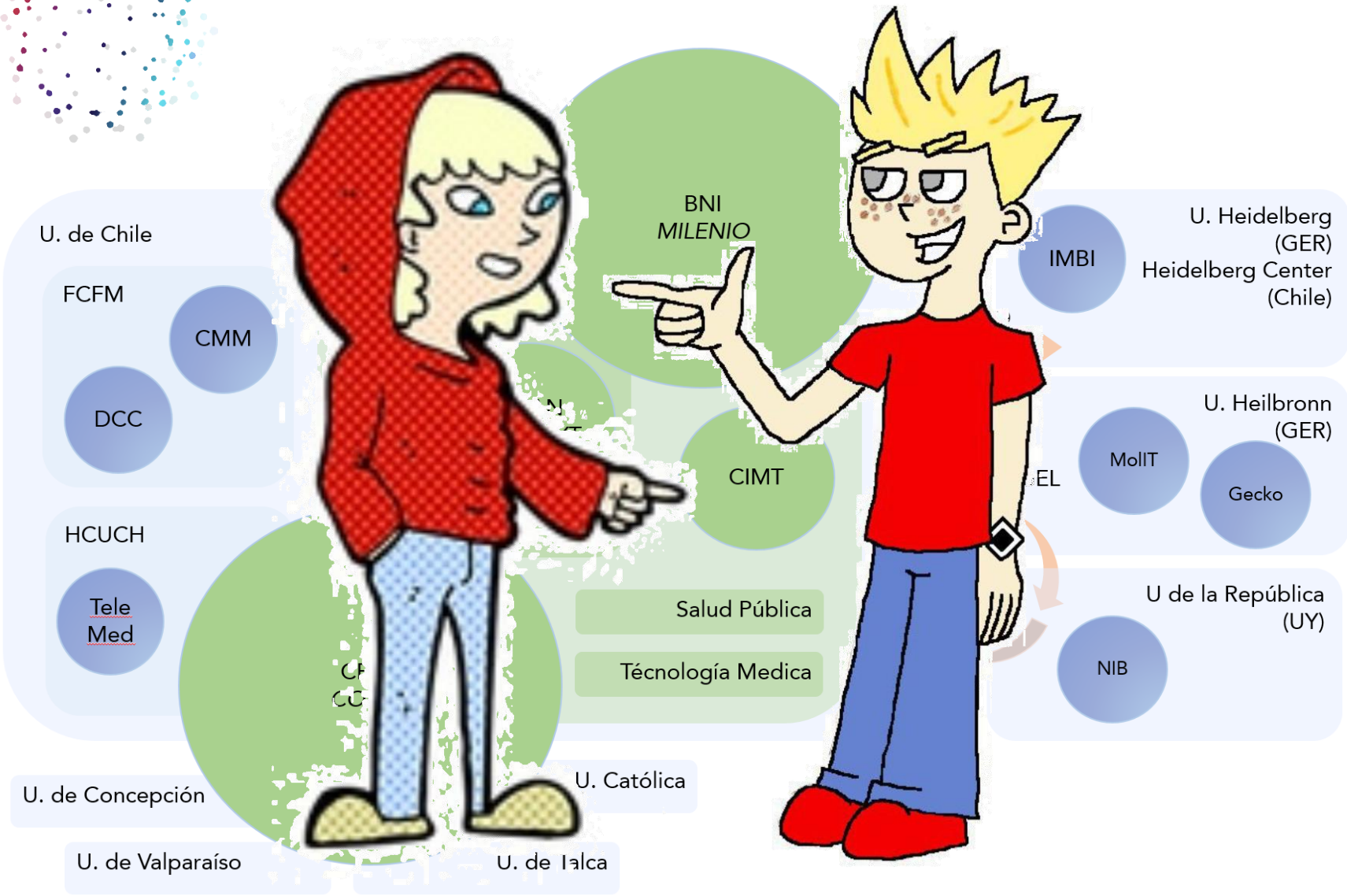
MolIT

Gecko

EL

U de la República
(UY)

NIB


U. de Chile
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Técnología Medica
U. de Concepción
U. de Valparaíso
U. Católica
U. de Talca
IMBI
U. Heidelberg (GER)
Heidelberg Center (Chile)
U. Heilbronn (GER)
MollT
Gecko
U de la República (UY)
NIB

We are a scientific institution seeking to establish the knowledge production as a fundamental engine for the social, cultural and economic development of the country.

Biomedical Neuroscience Institute
Chile

Sub-cellular functional dynamics | Cellular function & morphology | Supra-cellular development & networks | Plasticity & behaviour | Systems neuroscience | Clinical studies

Biomathematics

Neuropathology

Image and signal processing

Biomedical informatics & telemedicine

Neurodegenerative disease (ALS, Parkinson, Alzheimer)

Psychiatric diseases (Schizophrenia)

Applied Neuromedicine & Technology

Students - Postdocs - Young investigators - Clinicians - Entrepreneurs

Advanced instrumentation - Animal facilities - Communications & events - Scientific & innovation

285 Publications 2011-2017

ISI 5.51 2017

Becas Puente (42/30) y Proyectos Semilla (18)

17 groups
45 magíster
52 PhD
28 postdocs

- Prof Dr Steffen Härtel, Biofísico, Dr. rer. nat. Director SCIAN-Lab

- Prof Dr Mauricio Cerda, Ing. Civil en Computación PI SCIAN-Lab

- Prof Dr Victor Castañeda, Ing. Civil Eléctrico, PI SCIAN-Lab / DTM

- Dr Jorge Jara, Ing. Civil en Informática, PostDoc SCIAN-Lab

- MSc Constanza Vásquez, Ing. Biomédica, Computación

- MSc Roberto Rojas, Ing. Civil Eléctrico, Ingeniería Eléctrica

- Malcolm Moreno, Administrador REDECA-BNI-SCIAN-Lab

- Dra Karina Palma, PostDoc SCIAN/LEO-Lab

- Dra Carmen Lemus, Bióloga, PostDoc SCIAN/LEO

- MSc(c) Nicole Canales, T. Médico, SCIAN, Microbiología

- Dante Castagnini, SCIAN-Lab, Bioquímico

- Martín Cádiz, Ing. Civil SCIAN-Lab, Eléctrico

- Dr Camilo Sotomayor, Medico, SCIAN/HCUCH-Lab

SCIAN

Plataforma BioMat-BNI

Biomedical Neuroscience Institute
CHILE

LEO

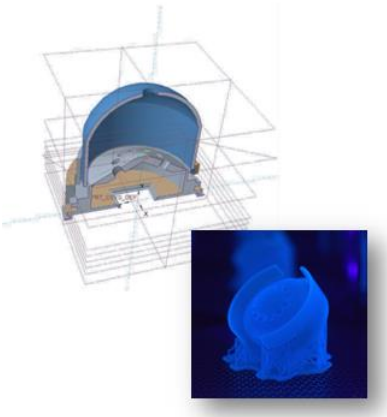
Este equipo humano avanzado conforma actualmente BioMat-LEO/SCIAN/BNI.

Busca apoyar a científicos y colaboradores para desarrollar, aplicar, capacitar, y entregar acceso a servicios de metodologías cuantitativas con microscopía de avanzada, procesamiento de imágenes, diseño 3D, y manejo de datos masivos.

Universidad de Chile

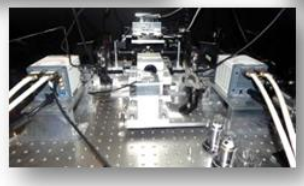
INSTITUTO DE CIENCIAS BIOMÉDICAS

DISEÑO OPTOMECÁNICO



Diseño e impresión 3D,
Diseño opto-mecánico,
Sistemas ópticos.

MICROSCOPÍA AVANZADA

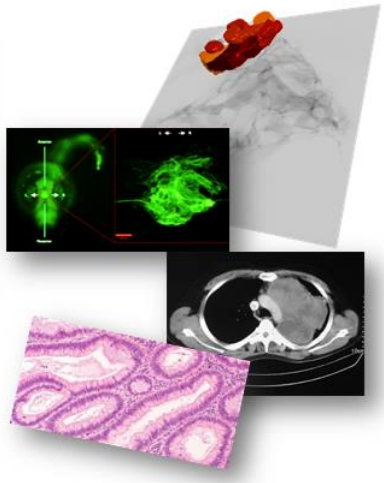


Microscopía de Fluorescencia Confocal convencional, *Spinning disk,4-Lens Light sheet,* Súper-resolución, Ablación láser, *Tissue scanner*, Microscopía de expansión, Control electrónico/óptico de hardware.

ALMACENAMIENTO MASIVO DE DATOS EN NUBE & HPC

OwnCloud @
respaldo y almacenamiento de datos con acceso de alta velocidad (red U. de Chile/REUNA) y acceso a HPC. Red con ancho de banda dedicado 10Gbps.

PROCESAMIENTO DE IMÁGENES Y BIOSEÑALES

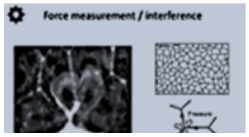


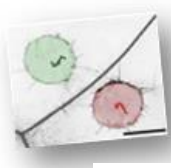
Segmentación de estructuras 2D/3D multicanal + tiempo, *Tracking*, Deconvolución, Cuantificación de morfología, topología & dinámica, Colocalización, Clasificación.

Universidad de Chile

ICBM INSTITUTO DE CIENCIAS BIOMÉDICAS

CIENCIA BÁSICA





Colaboraciones, Proyectos asociativos a nivel local y regional (cs. básicas y aplicadas), Escuelas de verano, Cursos de postgrado, Cursos y Encuentros nacionales e internacionales, Capacitaciones (*), Modalidad de servicios (*)

Bio. del desarrollo, neurociencia, biofísica, microbiología

INNOVACIÓN CON PROCESAMIENTO DE IMÁGENES MÉDICAS

CED·AI SpA
Centro de Espermiogramas Digitales Asistidos por Internet

DeepPathology
Plataforma de telepatología distribuida

IA-TRAD CHILE
Inteligencia artificial para apoyo diagnóstico y tele-radiología clínica

CPDAI
CENTRO DE PATOLOGIA DIGITAL ASISTIDO POR INTERNET

Spin-offs

Fertilidad,
IA & Patología Digital,
IA & Radiología

PROGRAMAS DE FORMACIÓN Y CENTROS

MIM MAGISTER EN INFORMATICA MEDICA

Programa de Magíster U. Ch./U. Heidelberg, Escuelas de verano/invierno, Diplomados, Centros (CIMT, CENS), Cursos y Encuentros internacionales

Inf. Médica, Telemedicina, Sistemas de Información en Salud

INICIATIVAS REGIONALES Y NACIONALES

MAKE HEALTH COLOMBIA
Charlas y Talleres de Alto Impacto

CENS - MIT Critical Data
MAKE HEALTH CHILE
HEALTH DATA SCIENCE: CONFERENCE AND WORKSHOPS

CENS TechChallenge

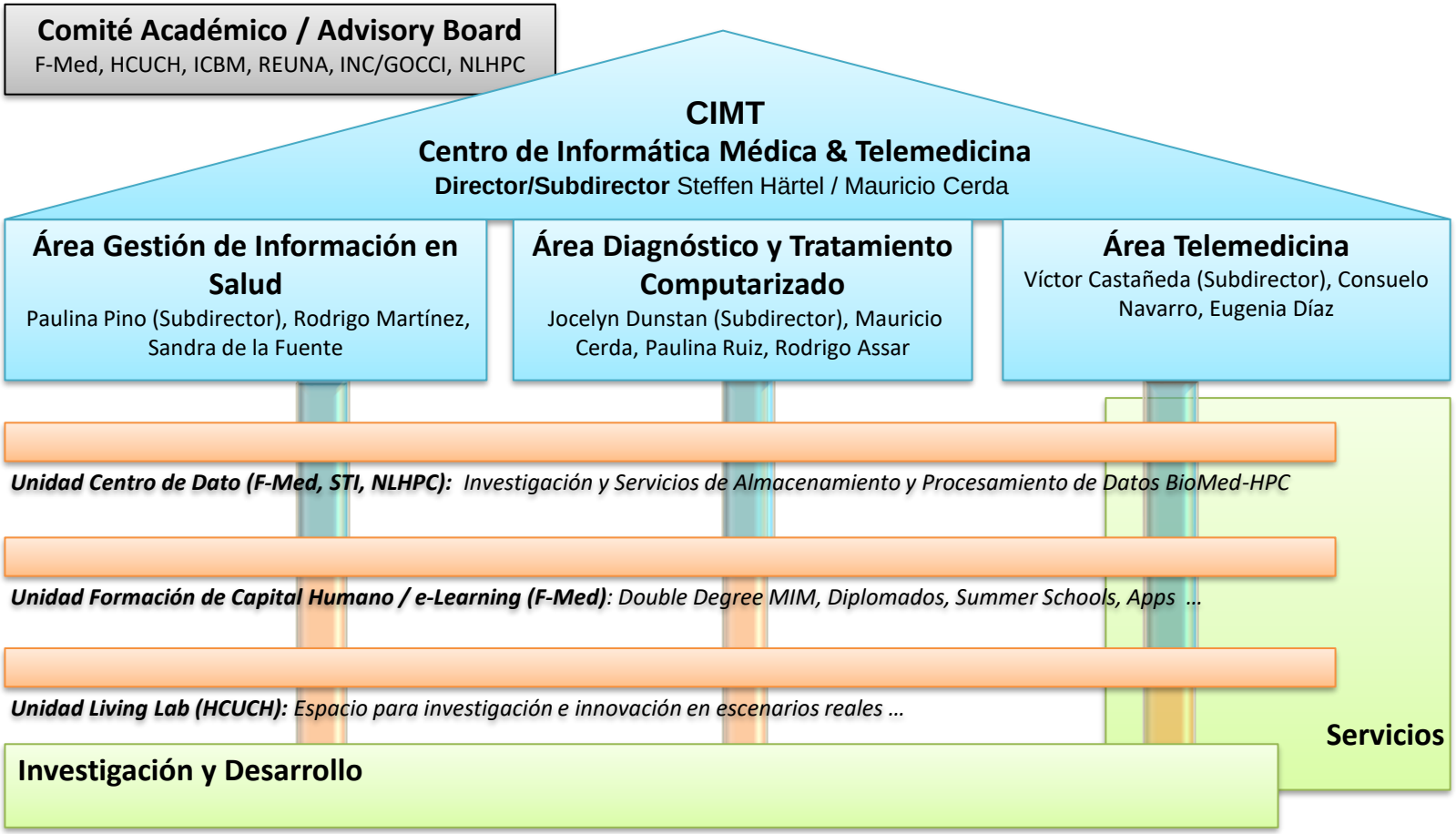
FORTALECIMIENTO UNIVERSIDADES ESTATALES CHILE

RACSEL
RED AMERICANA DE COOPERACIÓN SOBRE SALUD ELECTRÓNICA

Mesas de trabajo y proyectos asociativos en Adquisición, Almacenamiento, Procesamiento y Acceso a datos biomédicos

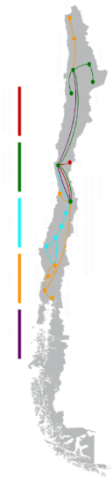
Microscopía, Inf. Médica, Telemedicina, *Big Data*

El Centro…


Comité Académico / Advisory Board
F-Med, HCUCH, ICBM, REUNA, INC/GOCCI, NLHPC
CIMT
Centro de Informática Médica & Telemedicina
Director/Subdirector Steffen Härtel / Mauricio Cerda
Área Gestión de Información en Salud
Paulina Pino (Subdirector), Rodrigo Martínez, Sandra de la Fuente
Área Diagnóstico y Tratamiento Computarizado
Jocelyn Dunstan (Subdirector), Mauricio Cerda, Paulina Ruiz, Rodrigo Assar
Área Telemedicina
Víctor Castañeda (Subdirector), Consuelo Navarro, Eugenia Díaz
Unidad Centro de Dato (F-Med, STI, NLHPC): Investigación y Servicios de Almacenamiento y Procesamiento de Datos BioMed-HPC
Unidad Formación de Capital Humano / e-Learning (F-Med): Double Degree MIM, Diplomados, Summer Schools, Apps …
Unidad Living Lab (HCUCH): Espacio para investigación e innovación en escenarios reales …
Servicios
Investigación y Desarrollo

CENS: National Center for Health Information Systems

Centro Nacional en Sistemas de Información en Salud



Salud + Desarrollo

Universidad de Chile

Pontificia Universidad Católica de Chile

Universidad de Concepción

Talca Universidad Chile

Universidad de Valparaíso Chile

CORFO

CHILE HAS

CENS

Centro Nacional en Sistemas de Información en Salud

... to close the sectoral gaps, generating links between public and private health providers, and the Health IT.


Sandra Gutiérrez

CAPITAL HUMANO

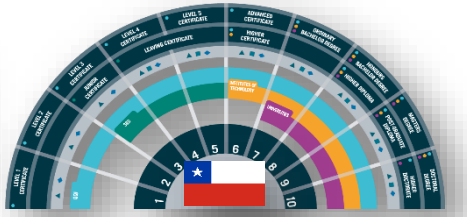
Bienes Públicos

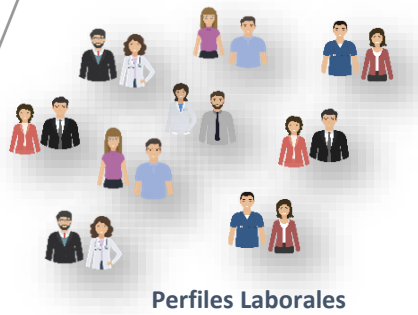
Modelo de Competencias Salud Digital

Asesorías

Capacitaciones

Marco Calificaciones Pais





Perfiles Laborales

Certificaciones


Sonia Espinoza

INTEROPERABILIDAD

Bienes Públicos

HL7 International

HL7 CHILE

Consolidación de HL7 Chile

Asesorías

Capacitaciones

Huemul

Plataforma Aprendizaje HL7 FHIR

CENS Pharma

Servidor Terminológico

Servicio de Terminología Farmacéutica y Diagnóstica

Soluciones

HL7 FHIR

Eric Rojas

CALIDAD

Bienes Públicos & Sellos

Tech Connects

B-PRACSIS: Madurez y Buenas Prácticas en Sistemas de Información en Salud

Capacitaciones

Servicios Sellos de Calidad en Registro Clínico Electrónico y Telemedicina

Sistemas

COMISIONES ASESORAS DE DATOS DE INTERÉS PÚBLICOS MINCIENCIA & MINSAL


Alejandra García

INNOVACIÓN & EMPRENDIMIENTO

Bienes Públicos

Formación del Ecosistema en Salud Digital con European Connected Health Alliance (Echalliance).

Unidades de Pilotajes

Colaboración público – privada – academia – sociedad

Talleres de desafíos de innovación abierta

Apoyo a Emprendedores & Empresas

ProChile
CENS

Diagnóstico de Innovación ProChile - CENS

"La Ruta: Internacionalización de Soluciones Healthtech Chile"

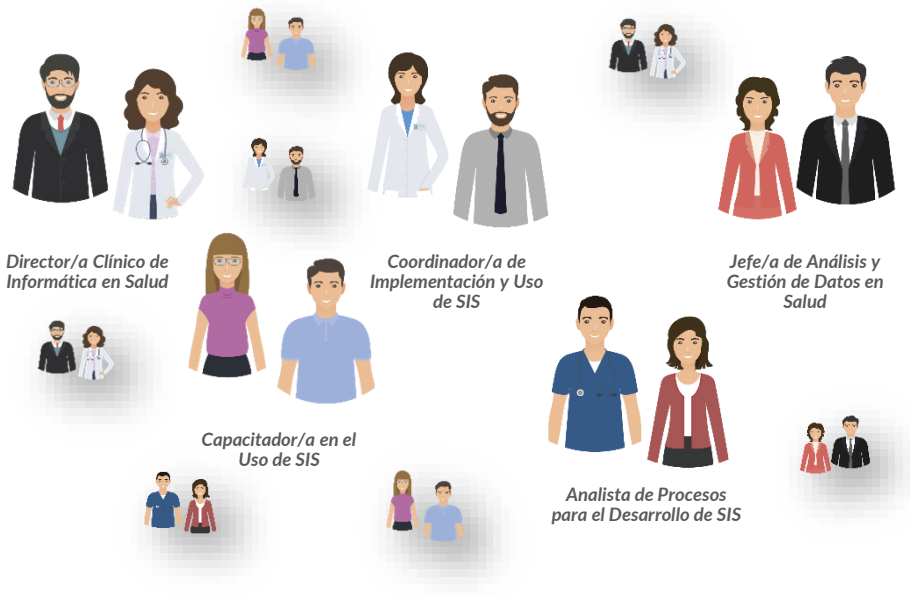
El diagnóstico pretende identificar en cuál de las siguientes etapas se encuentra tu producto o solución:

CAPITAL HUMANO CENS

Modelo de Competencias Referenciales en SIS

2 Áreas, 8 Dominios, 32 Competencias y 136 Subcompetencias.

Perfiles Laborales Impulsando la Salud Digital en Chile

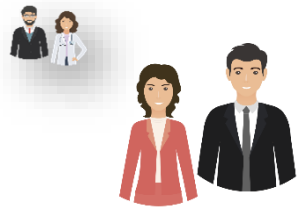


CAPITAL HUMANO CENS

Modelo de Com… R…

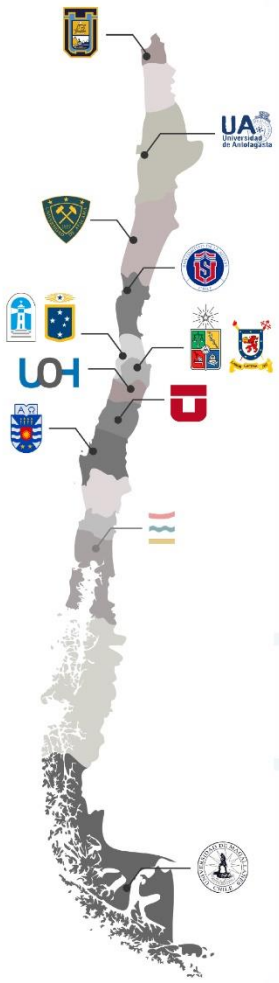
2 Áreas, 8 Dom…

…aborales …d Digital en Chile



Jefe/a de Análisis y Gestión de Datos en Salud

Analista de Procesos para el Desarrollo de SIS



Red de Salud Digital de las Universidades del Estado (RSDUE)

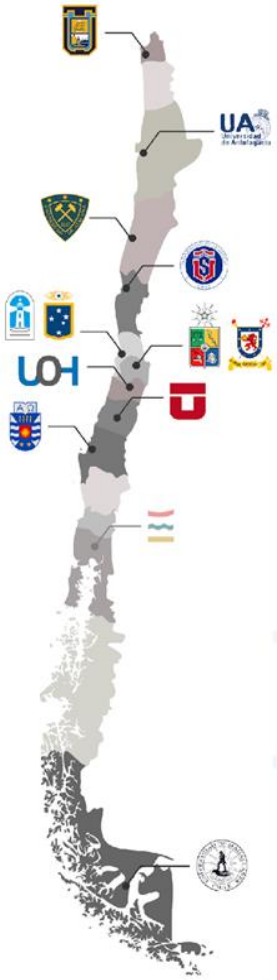
Digital Health Network of State Universities

12/13 Universidades

4 Asociados

3 Años

FORTALECIMIENTO UNIVERSIDADES ESTATALES CHILE



Red de Salud Digital de las Universidades del Estado (RSDUE)

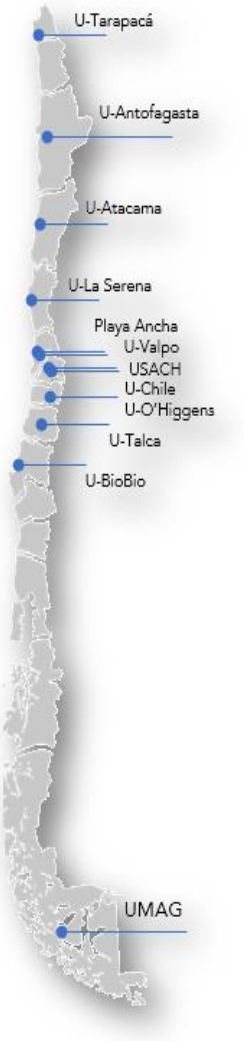
Digital Health Network of State Universities

Objetivo General

Desarrollar la **RSDUE** con una gobernanza orientada a fortalecer e instalar competencias, capacidades y acciones para casos de uso en el abordaje de los desafíos en salud digital, vinculándose con instituciones públicas y privadas.





Red de Salud Digital de las Universidades del Estado (RSDUE)

Digital Health Network of State Universities (RSDUE)

FORTALECIMIENTO UNIVERSIDADES ESTATALES CHILE

4 Objectivos

Establecer una gobernanza con una estructura colaborativa, que contribuya a responder con un **enfoque multidisciplinar** a los desafíos que enfrentan las universidades en la digitalización de la formación y atención en salud.

Fortalecer e instalar capacidades en RSDUE para el **desarrollo e implementación de competencias en tecnologías en información en salud** en investigación e innovación y en el proceso formativo mediante programas de simulación y virtualización.

Diseñar, desarrollar e implementar **prototipos de sistemas de información y plataformas para usuarias y usuarios** de los prestadores de salud (centros de atención u hospitales vinculados a las universidades de la red) para atención, formación e investigación.

Promover la salud mental de los y las estudiantes de la RSDUE con un abordaje psicoeducativo, preventivo y escalonado a través del desarrollo de una plataforma digital colaborativa.

HL7 International HL7 CHILE itms atrys division REUNA Ciencia y Educación en Red I-DAIR

Diseño de un modelo de **PRESTADORES DE SALUD** en Chile.
InnovaChile/CORFO Bien Público Estratégico de Alto Impacto.

TERMINOLOGÍA FARMACÉUTICA CHILENA.
InnovaChile/CORFO Bienes Públicos Estratégicos.

EXZELLENZZENTRUM SANTIAGO DE CHILE-HEIDELBERG I - III:
Center of Excellence for Innovative Research and Education
Medical Informatics, DAAD 2009/2014, 2014/2019, 2021/2024

CHIP / PAGEL: CHILEAN HEALTH INFO AND PROCESS CHALLENGE
Partnerships for the Health Sector in Developing Countries. DAAD: 2016 – 2019

2017 Healthier World Challenge Grant, Johns Hopkins University

Deep-Pathology: Plataforma de TelePatología Distribuida Basada en Blockchain y Diagnóstico Colaborativo Apoyado por Deep Learning, FONDEF IDeA I+D ID 19I10334 (2019-2021)

IA·TRAD CHILE: Inteligencia Artificial para apoyo diagnóstico y procesos de atención en radiología y tele-radiología clínica, ANID COVID0733: Härtel S, Cabrera G, Castañeda V, Pereira G, CIMT, HCUCH, UdeC (2020-2021)

-> 3 FONDECYTs como PIs / 3 FONDECYTs como CO-Is, Anillos, …
-> Telemedicina HCUCH/CIMT.
-> CENS: Centro Nacional en Sistemas de Información en Salud.

-> 2 Cursos Anuales Pregrado Medicina en Informática Medica y Telemedicina.
-> Cursos e-learning, histopatología virtual U-Chile-UMAG.
-> Escuelas de Verano y Diplomas en Informática Medica.

- Image Processing & Microscopy

2D/3D · Morpho-topology, Motion estimation, Tracking

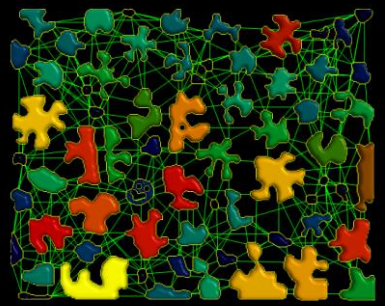
2022 Traffic
2021 Cell Calcium
2021 Methods in Molecular Biology
2021 Frontiers in cellular and infection microbiology
2018 Immunobiology
2017 Brain
2017 Nature Communications
2017 Developmental Dynamics
2016 Journal of Physics: Conference Series
2016 Cell Reports
2016 Pathogens and Disease
2015 Acta Tropica
2015 J of Clinical and Experimental Pathology
2015 The American Journal of Tropical Medicine
2014 Current Molecular Medicine
2014 Medical Image Analysis
2013 Development

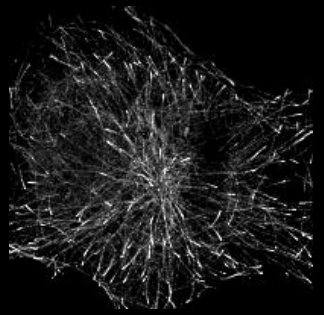
Colocalization

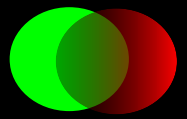
2021 Frontiers in Immunology
2021 PNAS
2017 Frontiers Molecular Neuroscience
2015 Gene
2014 Chromatine Research
2014 Frontiers Molecular Neuroscience
2012 PLosOne …

- (Bio)Medical Informatics & Health - Data

2021 Nat Methods
2021 Research and Care. Diagnostics
2020 JMIR mHealth and uHealth
2018 PLOS Medicine
2018 Computer Physics Communications
2017 Computers in Biology and Medicine I y II
2016 Computers in Biology and Medicine I
2015 Science Translational Medicine
2015 IPOL
2013 IEEE Transactions on Pattern Analysis …







IPOL

Image Processing On Line

ImageJ
Image Processing and Analysis in Java

- Image Processing & Microscopy

2D/3D · Morpho-topology, Motion estimation, Tracking

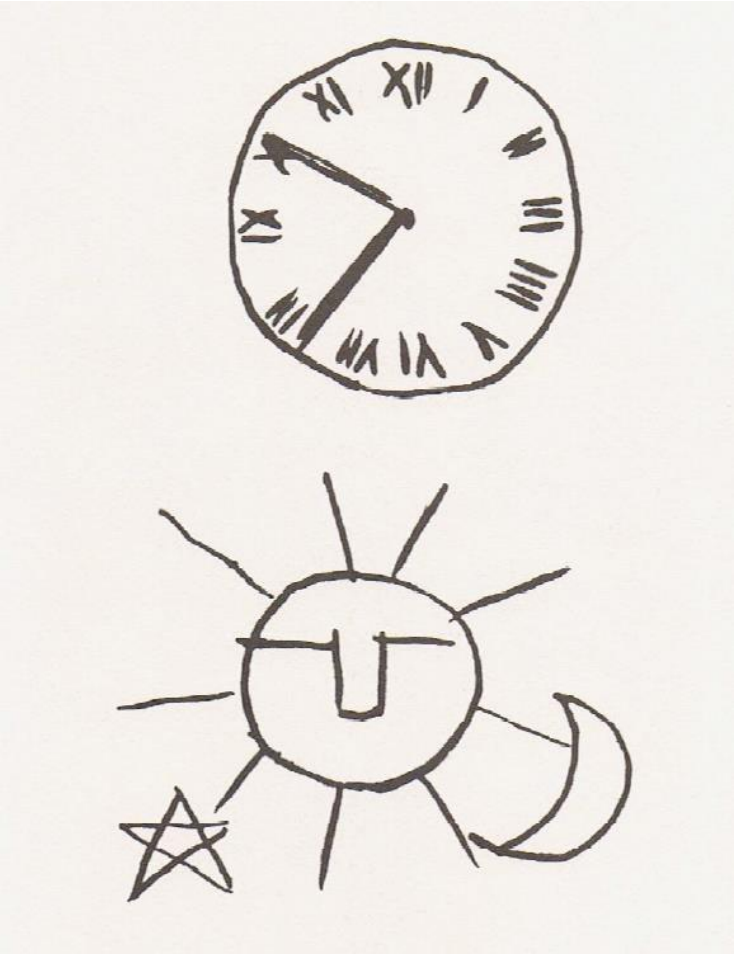
2022 Traffic
2021 Cell Calcium
2021 Methods in Molecular Biology
2021 Frontiers in cellular and infection microbiology
2018 Immunobiology
2017 Brain
2017 Nature Communications
2017 Developmental Dynamics
2016 Journal of Physics: Conference Series
2016 Cell Reports
2016 Pathogens and Disease
2015 Acta Tropica
2015 J of Clinical and Experimental Pathology
2015 The American Journal of Tropical Medicine
2014 Current Molecular Medicine
2014 Medical Image Analysis
2013 Development

Colocalization

2021 Frontiers in Immunology
2021 PNAS
2017 Frontiers Molecular Neuroscience
2015 Gene
2014 Chromatine Research
2014 Frontiers Molecular Neuroscience
2012 PLosOne

- (Bio)Medical Informatics

2021 Nat Methods
2021 Research and Care. Diagnostics
2018 PLOS Medicine
2018 Computer Physics Communications
2017 Computers in Biology and Medicine I y II
2016 Computers in Biology and Medicine I
2015 Science Translational Medicine
2015 IPOL
2013 IEEE Transactions on Pattern Analysis …
2013 Biological Cybernetics



Joaquín Torres García

Uruguayo, pintor y pensador,

Montevideo, Barcelona, París, NY …

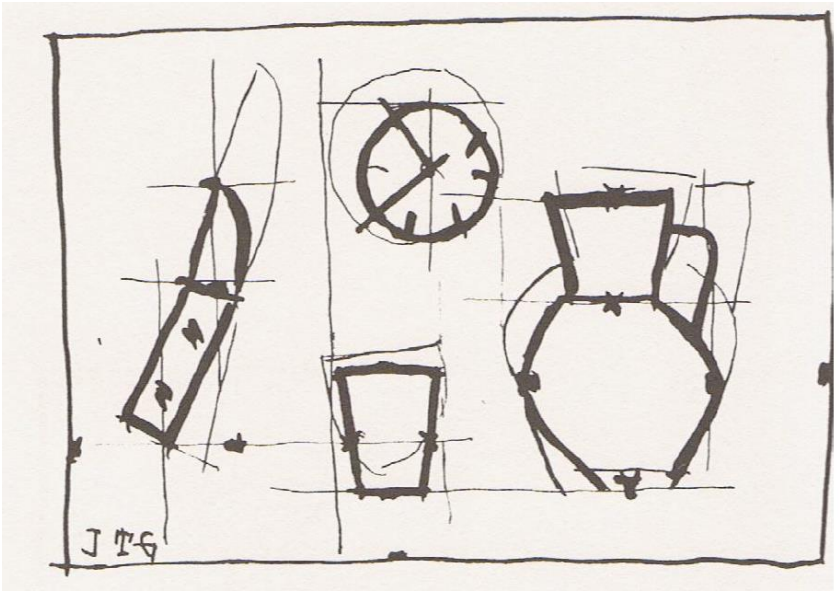
PENSAR ES GEOMETRIZAR

La geometría es como un teclado de lenguajes …

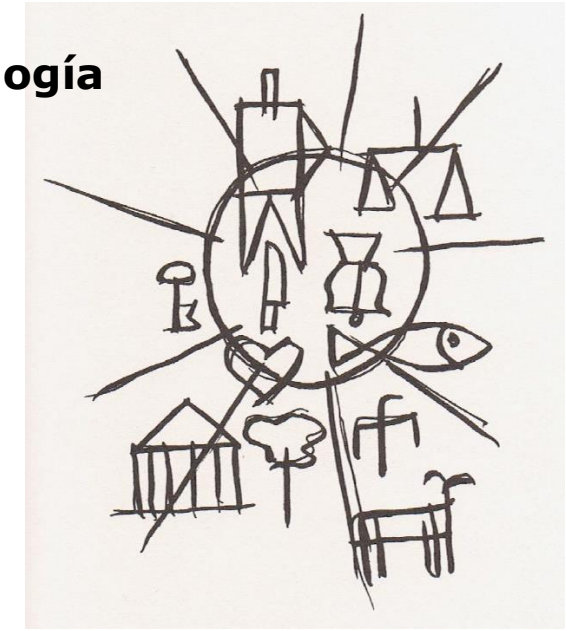
… curvas, regulares o no, rectas, ángulos, circunferencias, arcos …

… son los pocos elementos universales con que se puede expresar todo !!!!

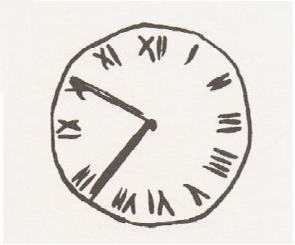
morfología

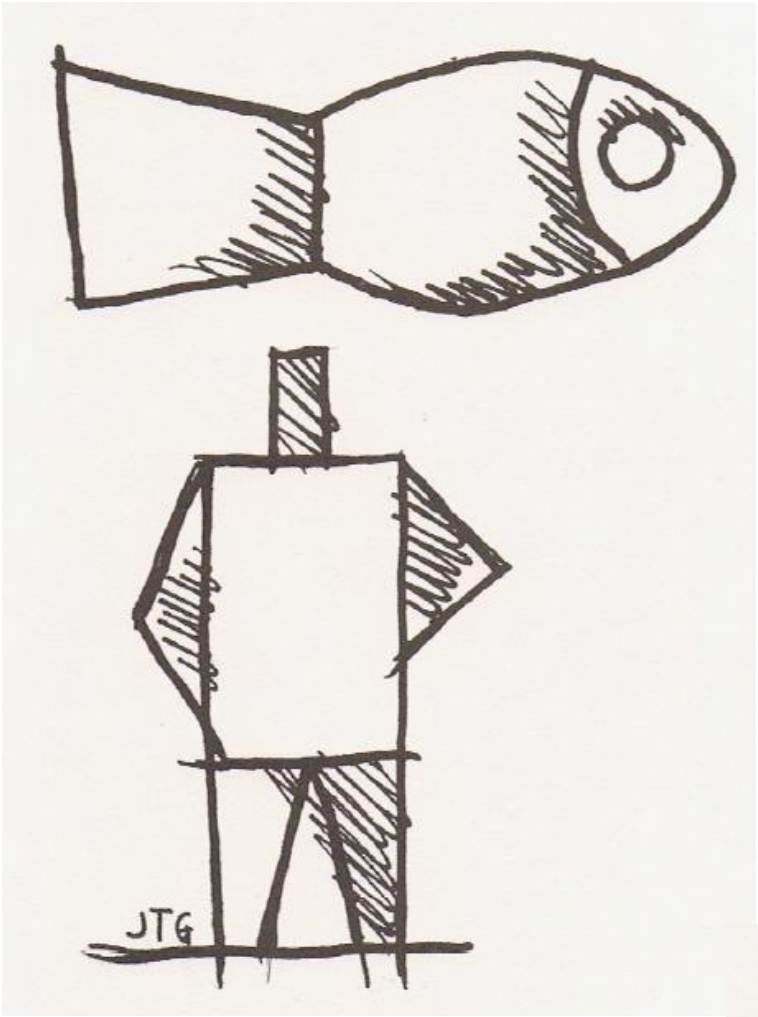


topología

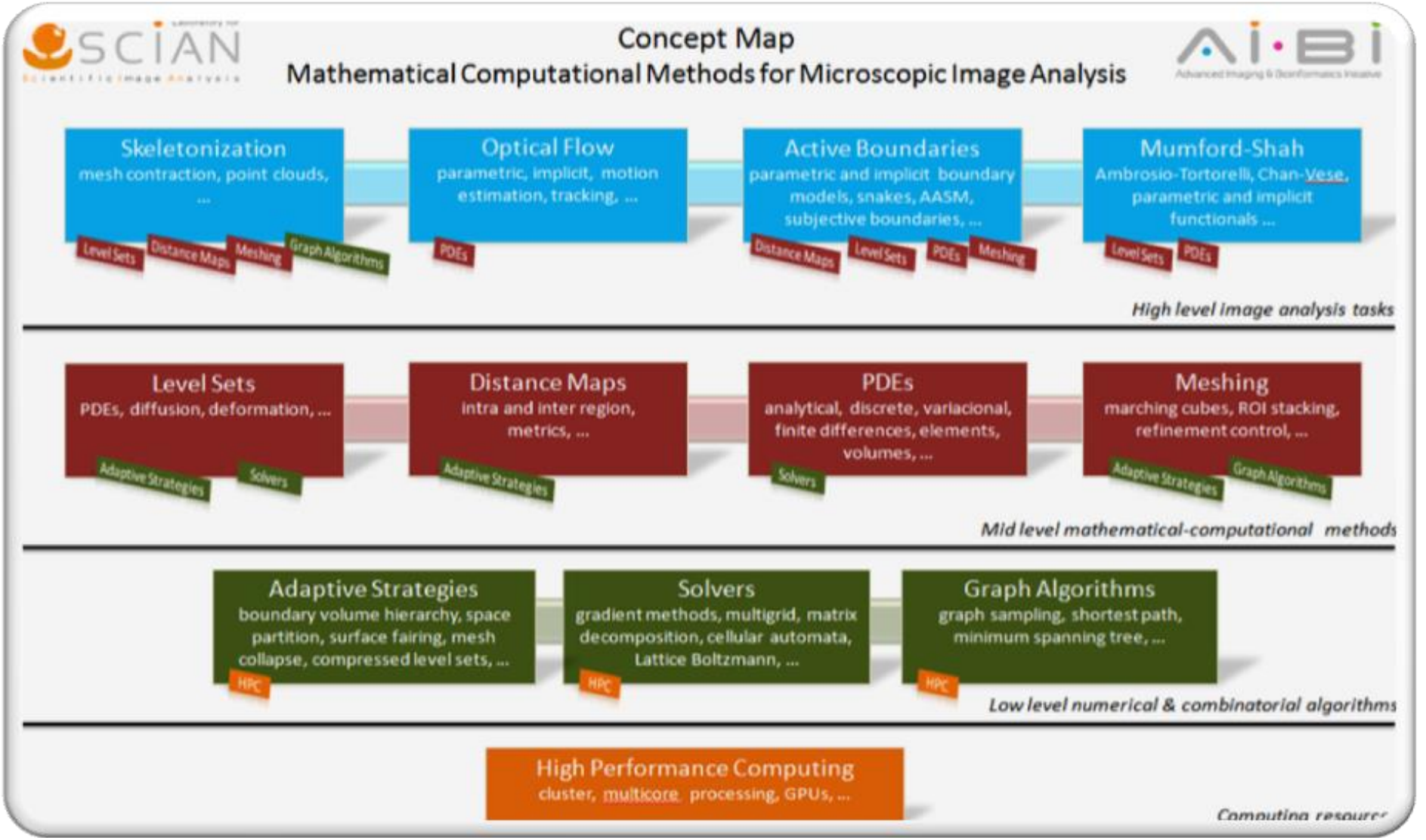


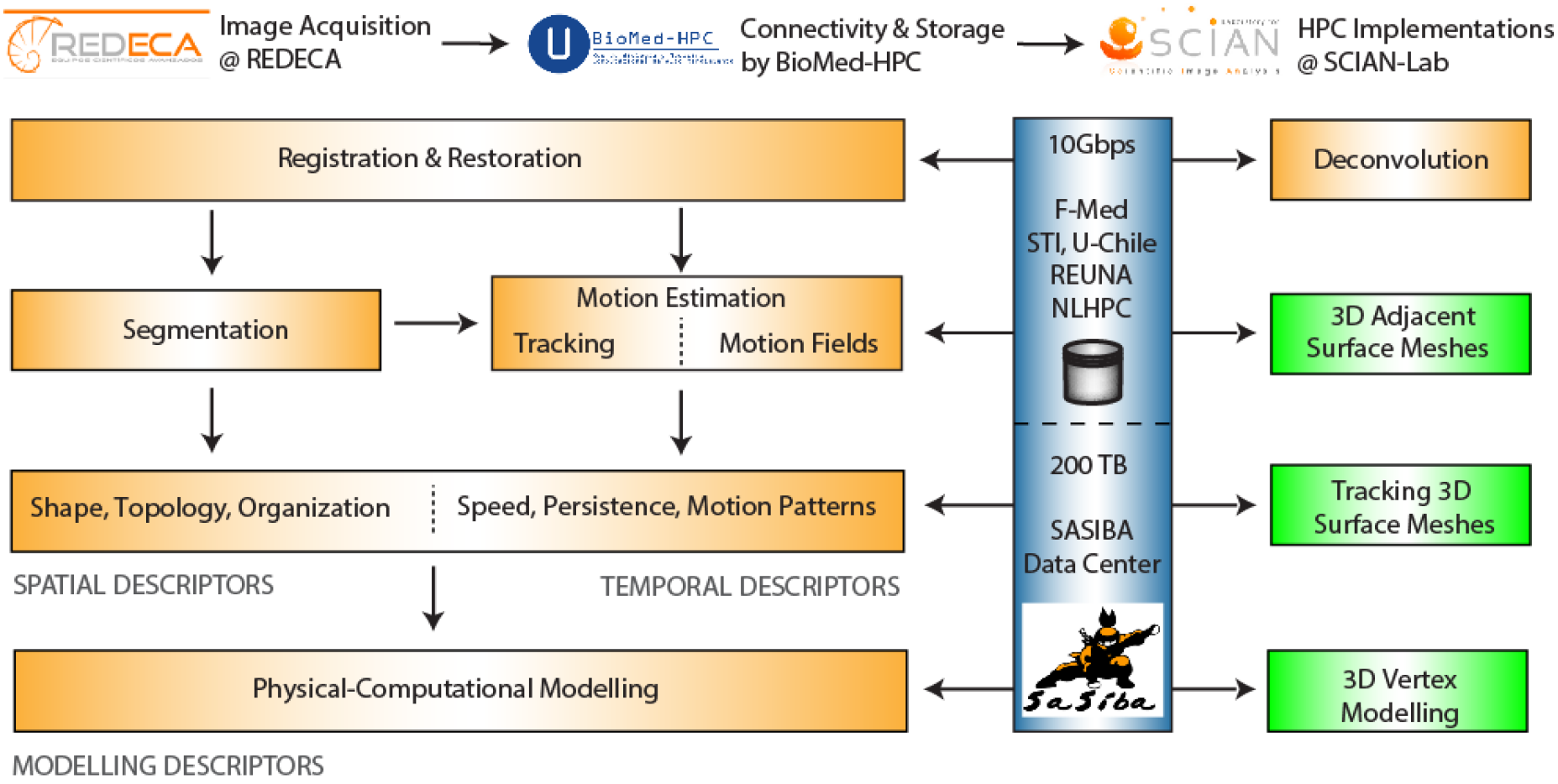
tiempo





UNIVERSALISMO CONSTRUCTIVO


SCIAN
Concept Map
Mathematical Computational Methods for Microscopic Image Analysis
AiBi
Skeletonization
mesh contraction, point clouds, ...
Level Sets
Distance Maps
Meshing
Graph Algorithms
Optical Flow
parametric, implicit, motion estimation, tracking, ...
PDEs
Active Boundaries
parametric and implicit boundary models, snakes, AASM, subjective boundaries, ...
Distance Maps
Level Sets
PDEs
Meshing
Mumford-Shah
Ambrosio-Tortorelli, Chan-Vese, parametric and implicit functionals ...
Level Sets
PDEs
High level image analysis tasks
Level Sets
PDEs, diffusion, deformation, ...
Adaptive Strategies
Solvers
Distance Maps
intra and inter region, metrics, ...
Adaptive Strategies
PDEs
analytical, discrete, variacional, finite differences, elements, volumes, ...
Solvers
Meshing
marching cubes, ROI stacking, refinement control, ...
Adaptive Strategies
Graph Algorithms
Mid level mathematical-computational methods
Adaptive Strategies
boundary volume hierarchy, space partition, surface fairing, mesh collapse, compressed level sets, ...
HPC
Solvers
gradient methods, multigrid, matrix decomposition, cellular automata, Lattice Boltzmann, ...
HPC
Graph Algorithms
graph sampling, shortest path, minimum spanning tree, ...
HPC
Low level numerical & combinatorial algorithms
High Performance Computing
cluster, multicore processing, GPUs, ...
Computing resources


REDECA
Image Acquisition
@ REDECA
BioMed-HPC
Connectivity & Storage
by BioMed-HPC
SCIAN
HPC Implementations
@ SCIAN-Lab
Registration & Restoration
Segmentation
Motion Estimation
Tracking
Motion Fields
Shape, Topology, Organization
Speed, Persistence, Motion Patterns
SPATIAL DESCRIPTORS
TEMPORAL DESCRIPTORS
Physical-Computational Modelling
MODELLING DESCRIPTORS
10Gbps
F-Med
STI, U-Chile
REUNA
NLHPC
200 TB
SASIBA
Data Center
Deconvolution
3D Adjacent
Surface Meshes
Tracking 3D
Surface Meshes
3D Vertex
Modelling

Data Niña: Sistema de Almacenamiento y Servicios Informáticos Biomédicos Avanzados (SASIBA)
https://redeca.med.uchile.cl/sasiba

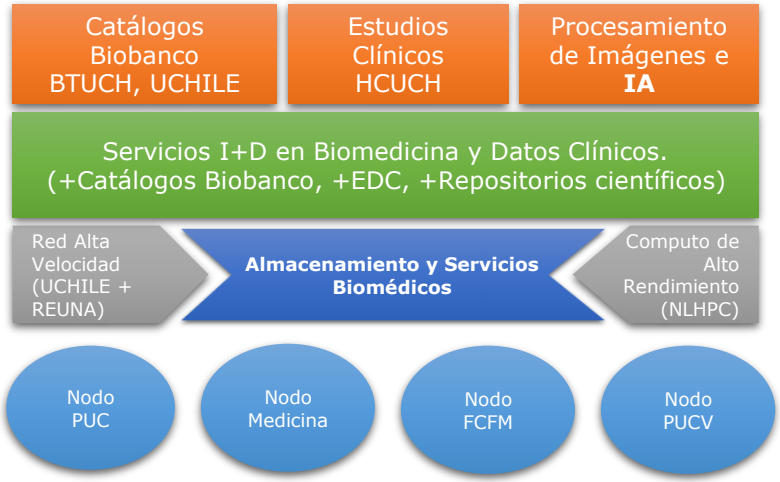

M Cerda

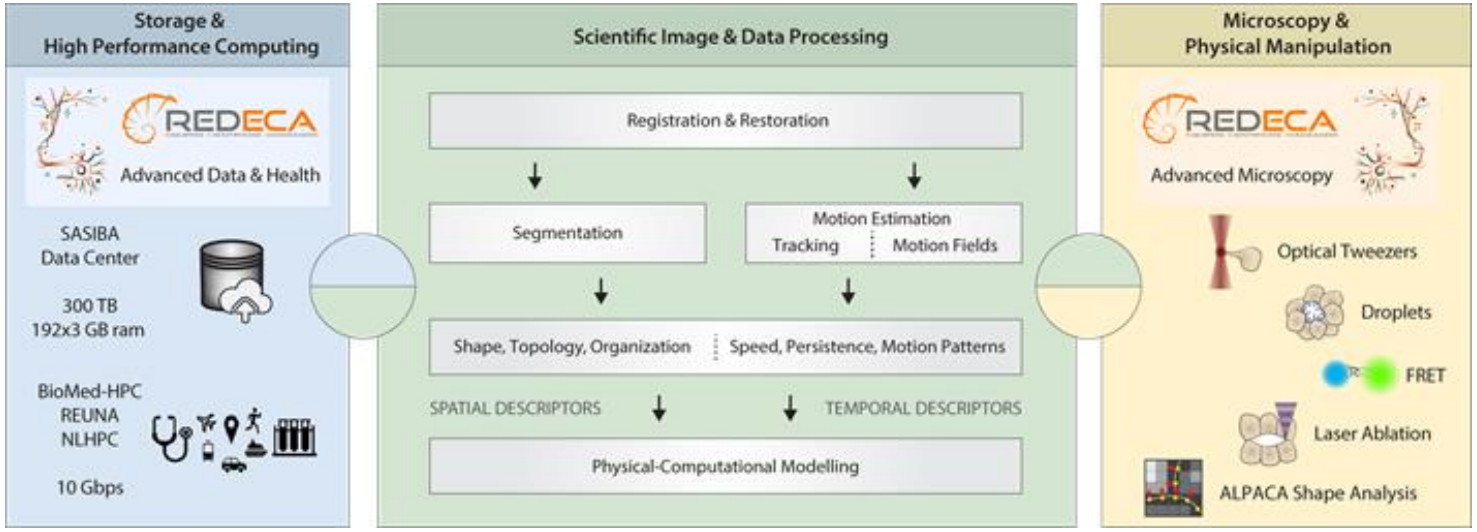
2014-21 FONDEQUIP 200 MM

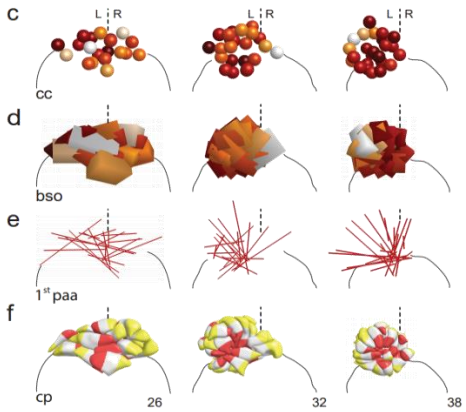
- **250 TB**, 3 servidores de uso general
- **> 26 proyectos** lo usan/usaron
- **> 300 usuarios** en nube
- **> 95% de uso** en capacidad
- **99.996% *uptime***

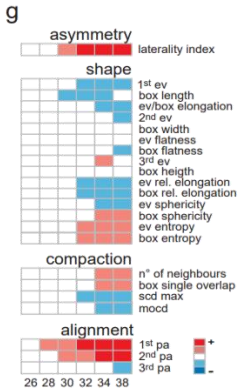
2021-28 FONDEQUIP 400 MM

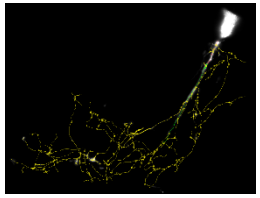
- **600 TB rápidos**, 3 servidores de uso general
- **3 GPU medias para IA**
- **software de gestión múltiples nodos**
- **software biobanco**
- **software repositorios científicos**

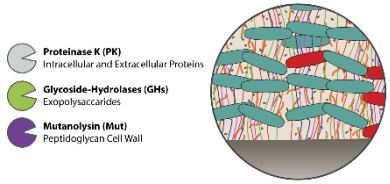


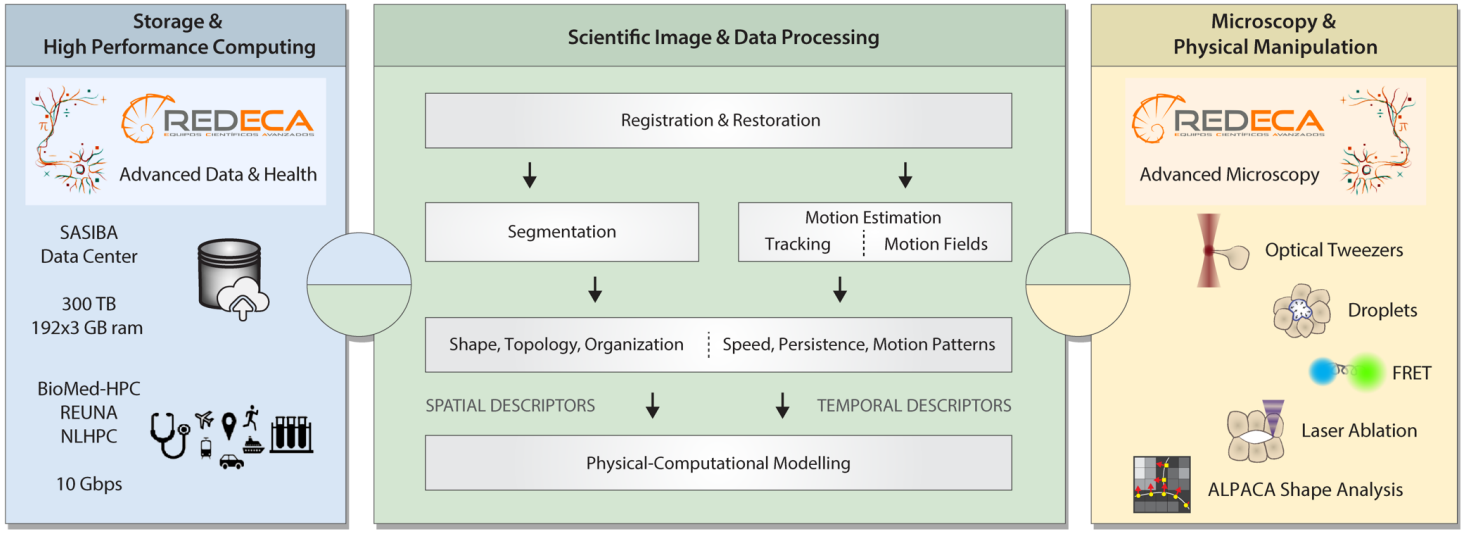

Storage &
High Performance Computing
REDECA
Advanced Data & Health
SASIBA
Data Center
300 TB
192x3 GB ram
BioMed-HPC
REUNA
NLHPC
10 Gbps
Scientific Image & Data Processing
Registration & Restoration
Segmentation
Motion Estimation
Tracking
Motion Fields
Shape, Topology, Organization
Speed, Persistence, Motion Patterns
SPATIAL DESCRIPTORS
TEMPORAL DESCRIPTORS
Physical-Computational Modelling
Microscopy &
Physical Manipulation
REDECA
Advanced Microscopy
Optical Tweezers
Droplets
FRET
Laser Ablation
ALPACA Shape Analysis


c
L
R
cc
d
bso
e
1st paa
f
cp
26
32
38


g
asymmetry
laterality index
shape
1st ev
box length
ev/box elongation
2nd ev
box width
ev flatness
box flatness
3rd ev
box heigth
ev rel. elongation
box rel. elongation
ev sphericity
box sphericity
ev entropy
box entropy
compaction
n° of neighbours
box single overlap
scd max
mocd
alignment
1st pa
2nd pa
3rd pa
26 28 30 32 34 38




Proteinase K (PK)
Intracellular and Extracellular Proteins
Glycoside-Hydrolases (GHs)
Exopolysaccarides
Mutanolysin (Mut)
Peptidoglycan Cell Wall

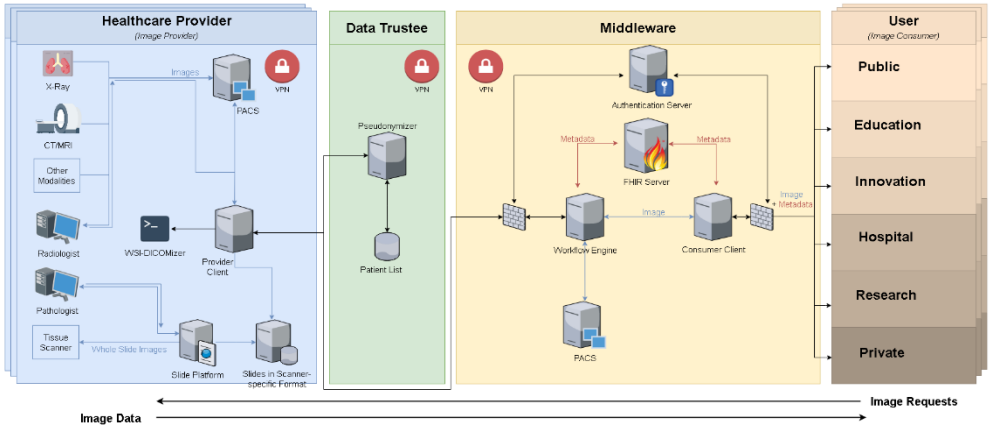


GLOBAL BIOIMAGING
growing collaboration

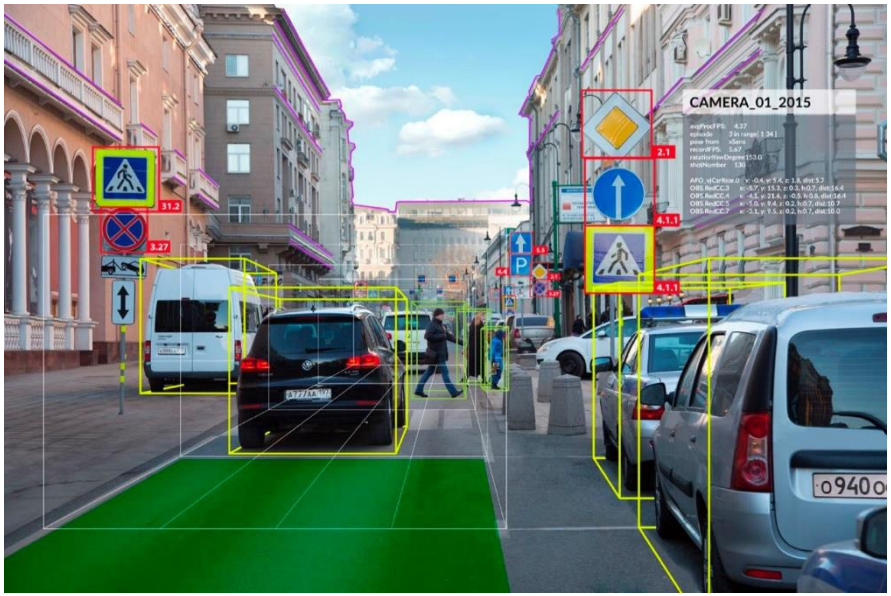
- **Exchange of experience**
- **Training**
- **Shadowing**
- **Document Galleries**

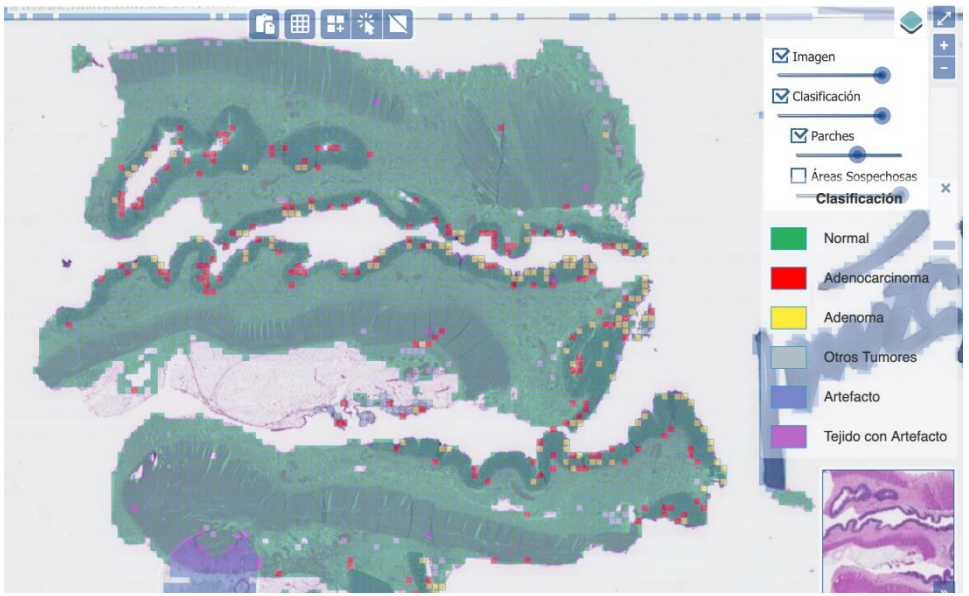
A Global View of Standards for Open Image Data Formats and Repositories.
Nature Methods, *2021*
Swedlow Jason et al

Architecture for a Distributed Medical Image Network



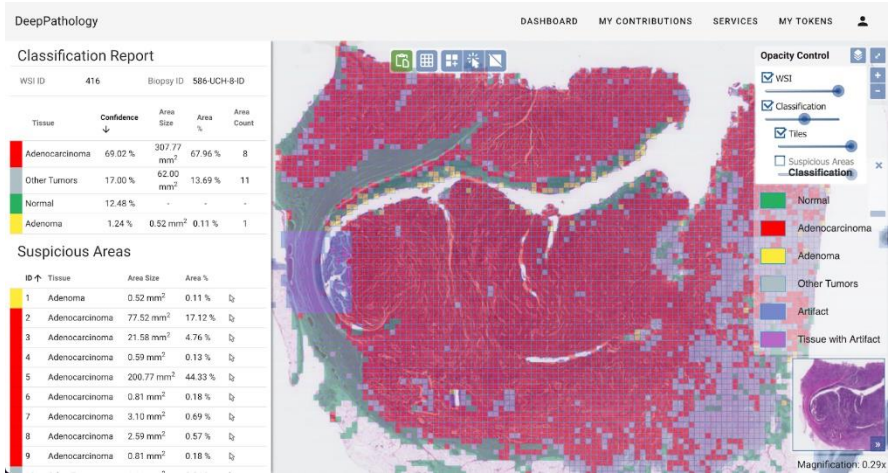
¿En qué se aplica la IA? · Visión Computacional





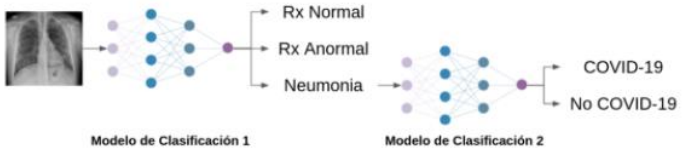
Proyecto ID19I10334, Concurso IDeA I+D 2019

DeepPathology : Plataforma de TelePatología Distribuida Basada en *Blockchain* y Diagnóstico Colaborativo Apoyado por *Deep Learning*

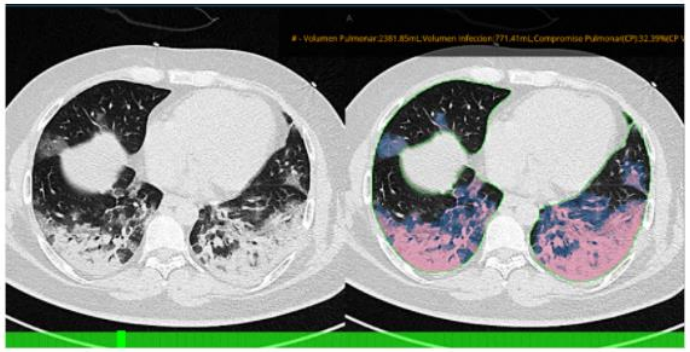


2020-2021 ANID COVID0733: Härtel S, Cabrera G, CIMT, HCUCH, UdeC

IA·TRAD CHILE: Inteligencia Artificial para apoyo diagnóstico y procesos de atención en radiología y tele-radiología clínica



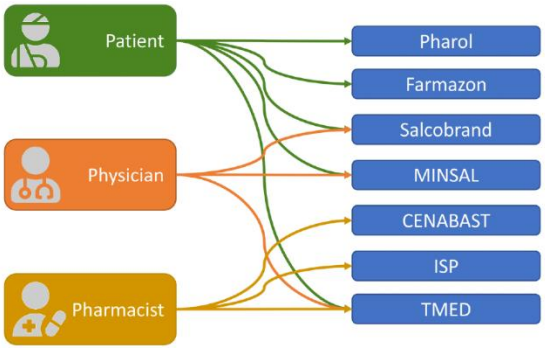
Categorización Rayos-X



Segmentación y cuantificación en CT de tórax

2015-2017 InnovaChile/CORFO Bien Público Estratégico de Alto Impacto para la Competitividad, 15BPE-47278

Terminología Farmacéutica Chilena, condición habilitante para receta electrónica y otros sistemas de información en el sector salud.



TMED … an effort to create the first vendor-neutral, standardized, and interoperable information database using FHIR/HL7. The information model accommodates the Chilean pharmaceutical sector, enabling users to search for and view **bioequivalent generic** and **brand medications** as well as **innovator products**. TMED supports identification of medication type by qualities and features and provides the possibility of grouping medications by principal active substances. **This fosters data democratization and empowers stakeholders within the pharmaceutical sector.**

Sigle et al JMIR Mhealth Uhealth 2020;8(6):e16648

2017-2021 InnovaChile/CORFO Bien Público Estratégico de Alto Impacto para la Competitividad, 16BPE-62299

Diseño de un modelo de información, conceptual y semántico, para caracterizar los prestadores de salud en Chile. Condición habilitante para la interoperabilidad entre sistemas de información.

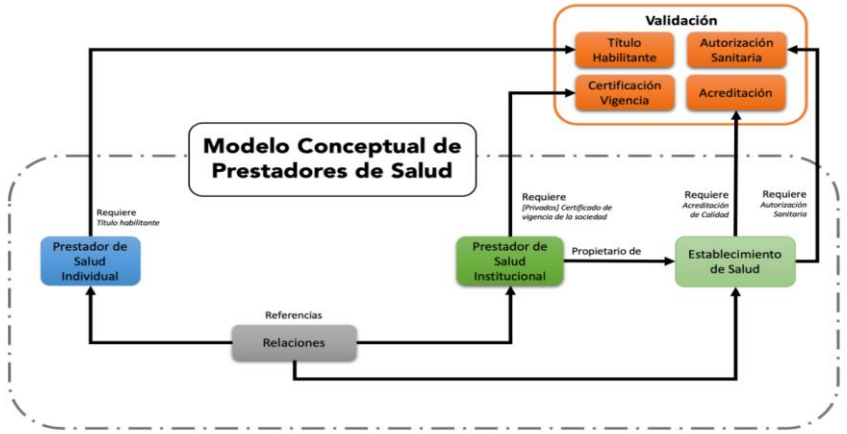


Figura 2: Modelo Conceptual de Prestadores de Salud, representando al Prestador de Salud Individual y al Prestador de Salud Institucional con su Establecimiento de Salud, juntos con relaciones vinculantes como Requerimientos de Validación y Referencias.

For instance, in South America the situation is diverse. While countries like Chile, Argentina, and Brazil have implemented bioimaging national networks and even a few examples for biomedical data resources, other countries such as Uruguay, Colombia, or Perú are in earlier stages. The most important challenge for this region is the limited funding to implement and develop national and regional data resources.

It is impractical to suppose or recommend that a single data format can satisfy the wide range of imaging applications used by the global community of imaging scientists. Thus, we have developed a series of specifications and recommendations for potential standards that Global BioImaging members, imaging scientists, journals, technology manufacturers, funders and institutions may adopt and use in the future. These recommendations are built upon the successful use of standards in imaging communities, e.g., DICOM (Digital Imaging and Communications in Medicine, https://www.dicomstandard.org), OME-TIFF [4], imzML [5], Nifti (https://nifti.nimh.nih.gov), and many others. These community standards have had different levels of success depending on the quality of implementation and maintenance of the format.

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A Global View of Standards for Open Image Data Formats and Repositories.
Nature Methods, *2021*
Swedlow Jason et al

Latin America Bioimaging

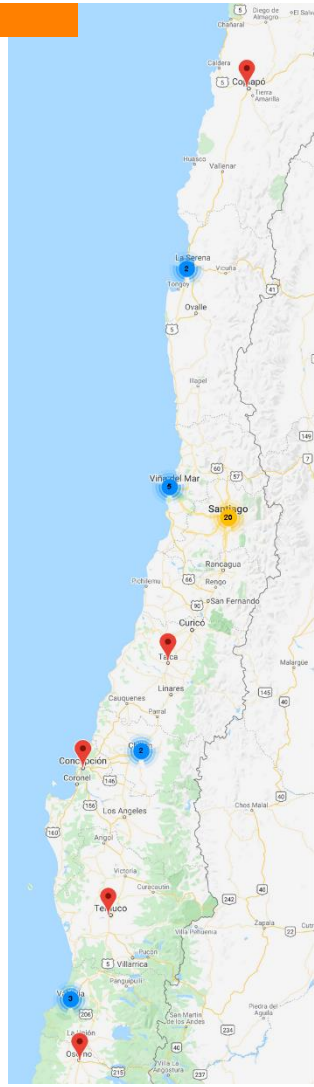
Tecnologías de bioimaging existentes en el país

Agencia Nacional de Investigación y Desarrollo
Ministerio de Ciencia, Tecnología, Conocimiento e Innovación
Gobierno de Chile

FONDEQUIP ...

~40 microscopios ópticos y electrónicos con financiamiento estatal FONDEQUIP (2011 →)
https://servicios.conicyt.cl/buscadorequipos/#/search_result/microscopio

- 10 microscopios @REDECA (F-Med, U-Chile)
- 7 entre CEMC y otras facultades (F-Med, U-Chile)
- 6 microscopios ópticos y 2 TEM 2 SEM a @ PUC
- 9 microscopios @ CMA Bio Bio (U-Concepción)
- 3 microscopios @ U-Mayor



Bioimaging en Chile.

FONDEQUIP ...

@ Red de Equipamiento Científico Avanzado
12 Microscopios Ópticos Avanzados
+ 1 Data Center

Latin America Bioimaging

1st LATIN AMERICA BIOIMAGING MEETING

"International Cooperation for Building Bioimaging Capacities in Latin America"

Hybrid Meeting
September 12th - 13th, 2022
Montevideo, Uruguay

Satellite Events

- Exchange of Experience VII
- Imaging Latin America

- Registration Open & Free
  Deadline: August 22nd
- Travel Grants Available!!!
  Deadline: August 8th

Organized by

Latin America Bioimaging

@UruMex Microscopía

Financed by

FONDO MÉXICO URUGUAY

auci AGENCIA URUGUAYA DE COOPERACIÓN INTERNACIONAL

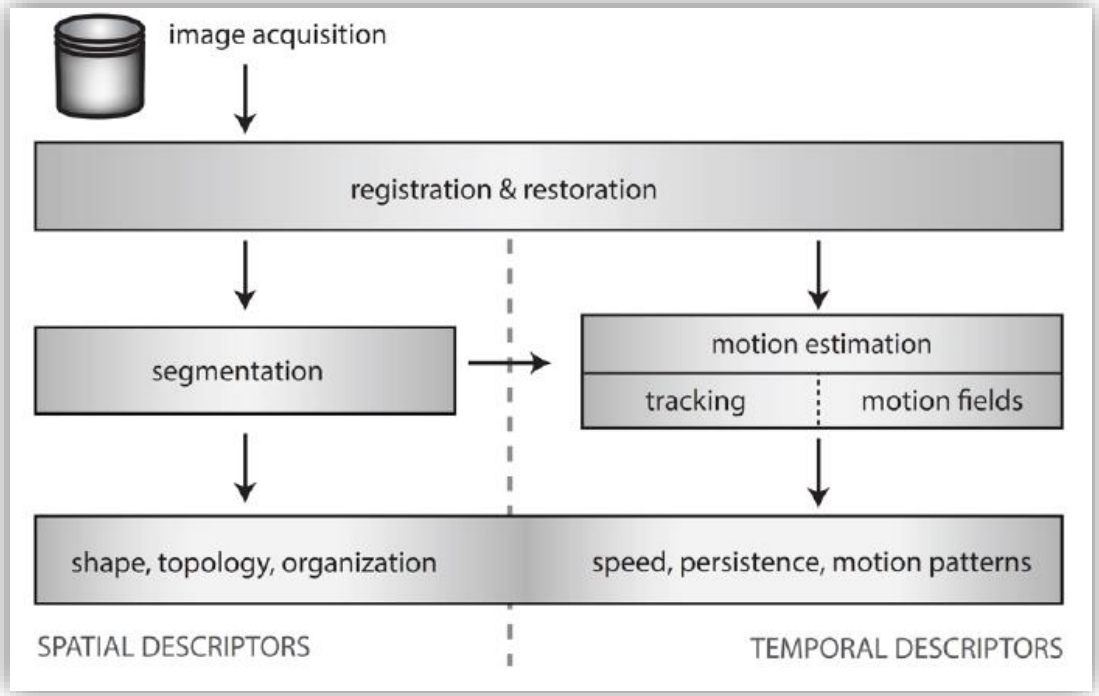
AMEXCID AGENCIA MEXICANA DE COOPERACIÓN INTERNACIONAL PARA EL DESARROLLO

CHAN ZUCKERBERG INITIATIVE

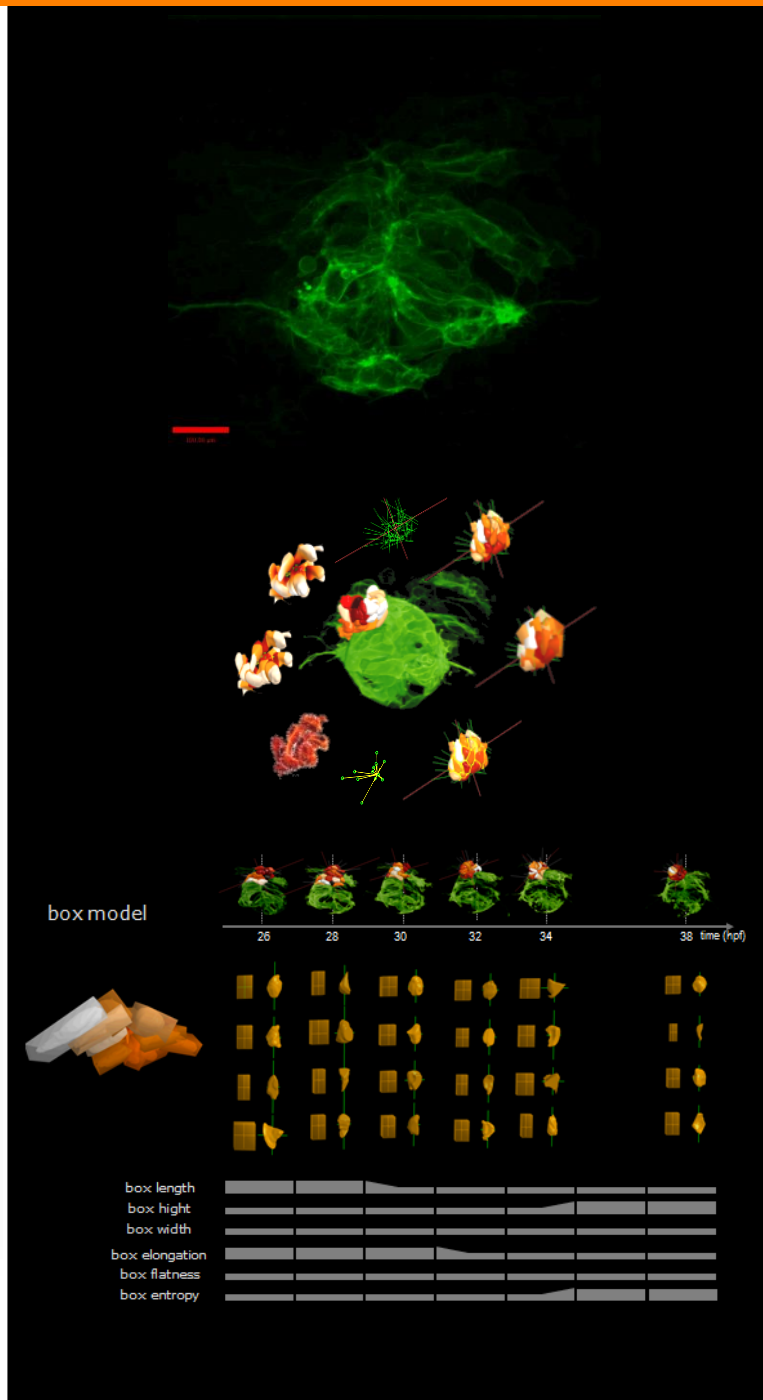
Heidelberg Collaboratory for Image Processing

University->Faculty of Mathematics and Computer Science->HCI
University->Faculty of Physics and Astronomy->HCI
Universitv->IWR->HCI

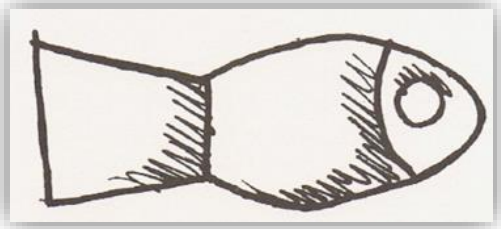
- Computer Vision(Ommer lab)
- Digital Image Processing (Jähne lab)
- Image and Pattern Analysis (Schnörr lab)
- Image Processing and Modelling (Garbe lab)
- Multidimensional Image Processing (Hamprecht lab)

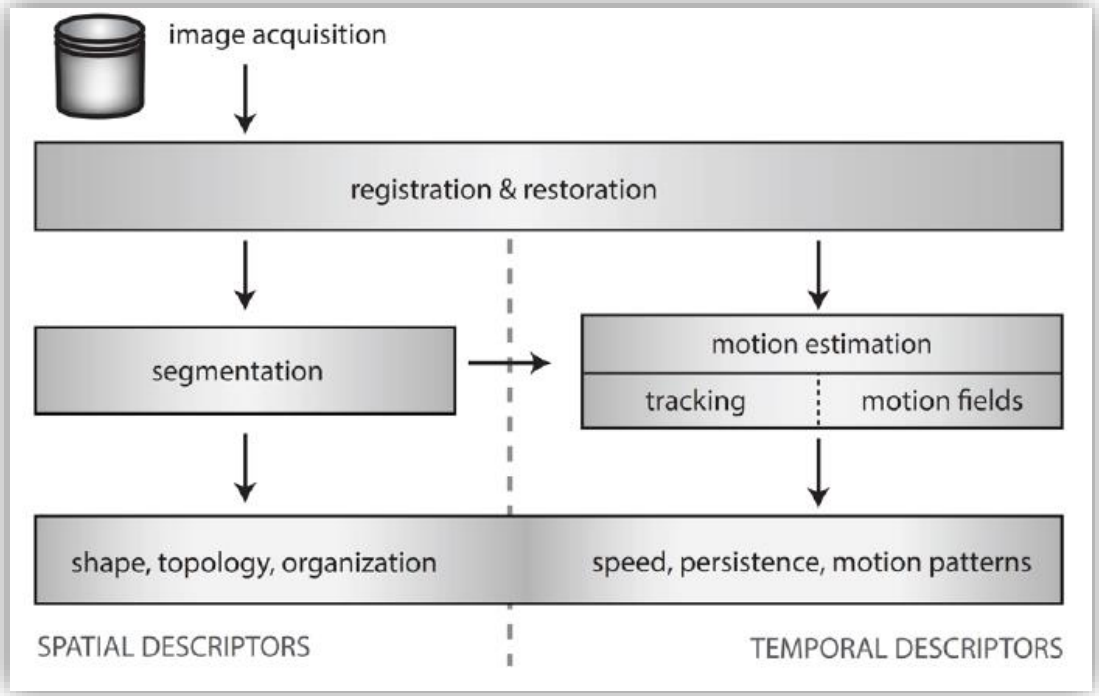


Castañeda et al 2014

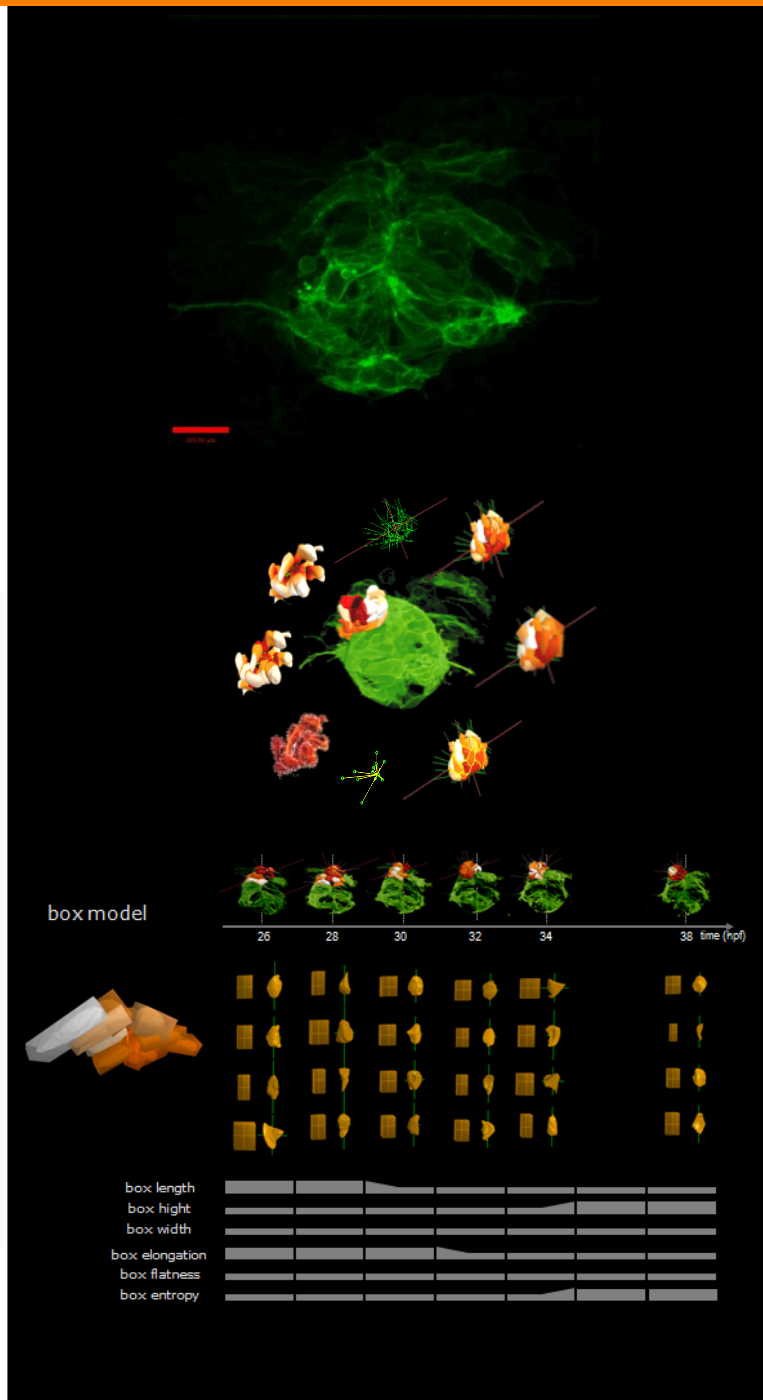


Miguel Concha
Biología del Desarrollo



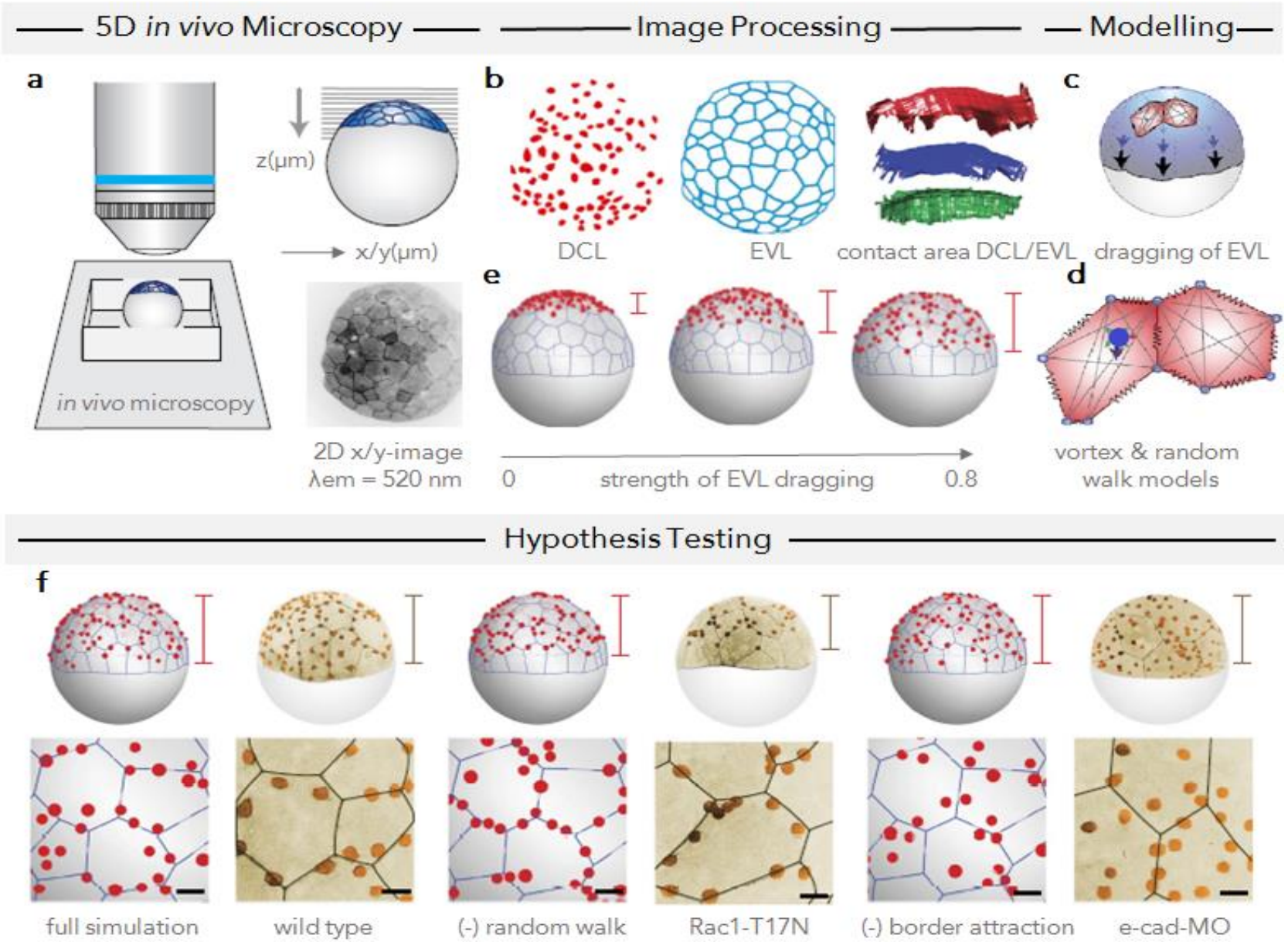


Castañeda et al 2014



nature COMMUNICATIONS

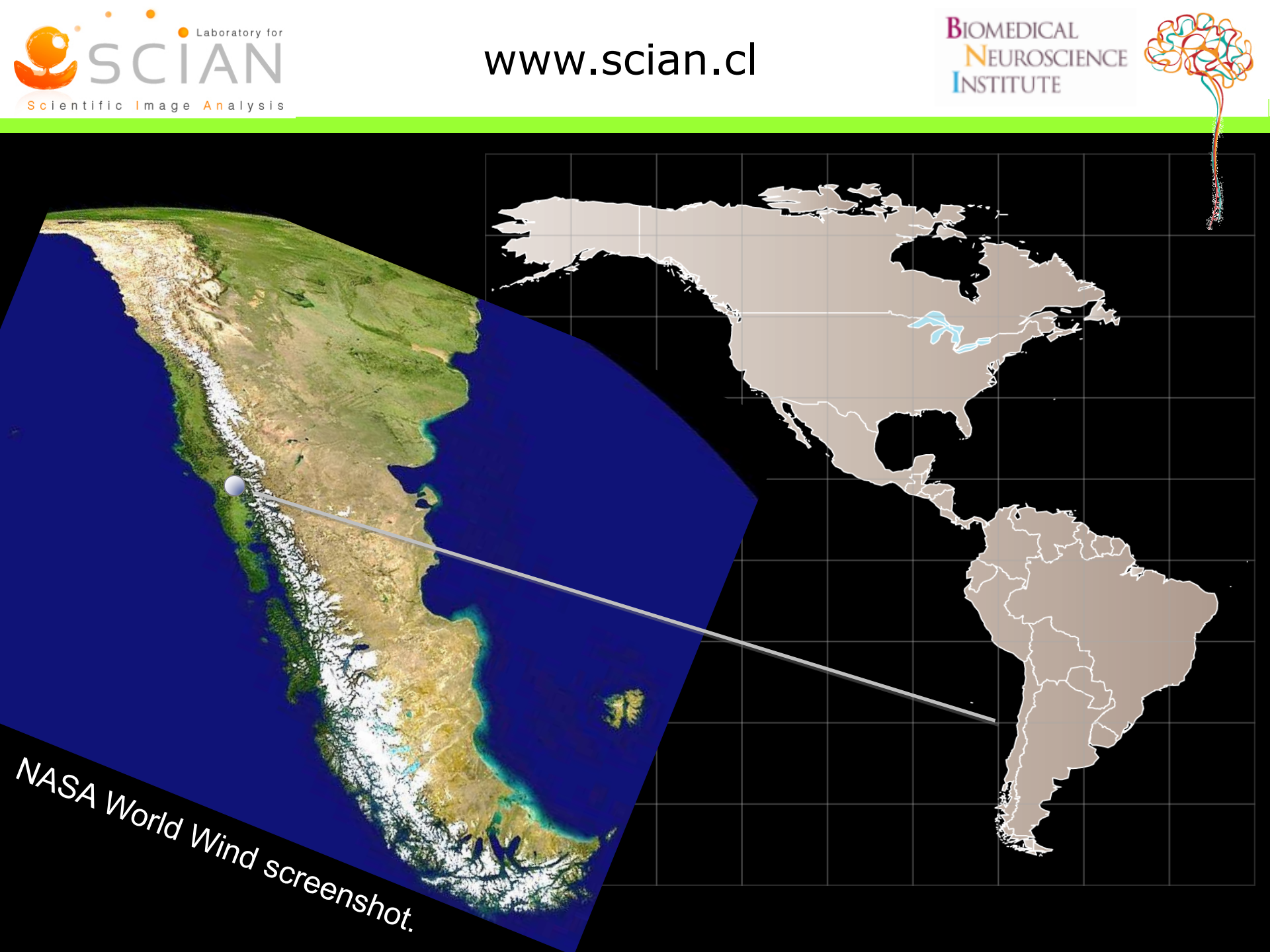
Extra-embryonic tissue spreading directs early embryo morphogenesis in killifish.German Reig, Mauricio Cerda, Néstor Sepúlveda, Daniela Flores, Victor Castaneda, Masazumi Tada, Steffen Härtel, Miguel Concha



Laboratory for SCIAN Scientific Image Analysis

www.scian.cl

BIOMEDICAL NEUROSCIENCE INSTITUTE



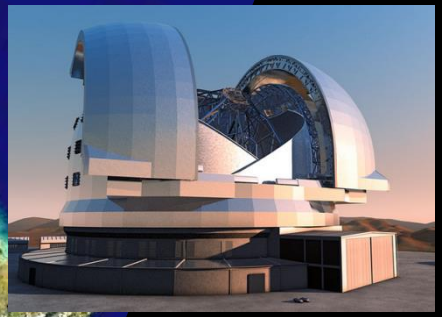
Laboratory for SCIAN
Scientific Image Analysis

www.scian.cl

BIOMEDICAL NEUROSCIENCE INSTITUTE

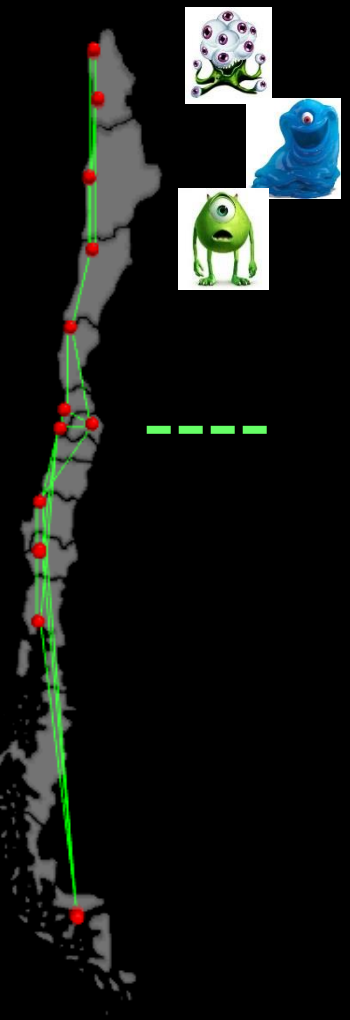
Very Large Telescope (VLT),
4 Telescopes, 8m, 2600 m

Atacama Large Millimeter/submillimeter Array (ALMA), 66 Antenna, 5000 m



E-ELT European Extremely Large Telescope, 39 m, 3000 m

NASA World Wind screenshot



Extraterrestrial Monster Science produces:
TeraB, PetaB, ExaB, ZettaB, YottaB

… Tera is a unit prefix in the metric system denoting multiplication by 10E12 or 1.000.000.000.000 !

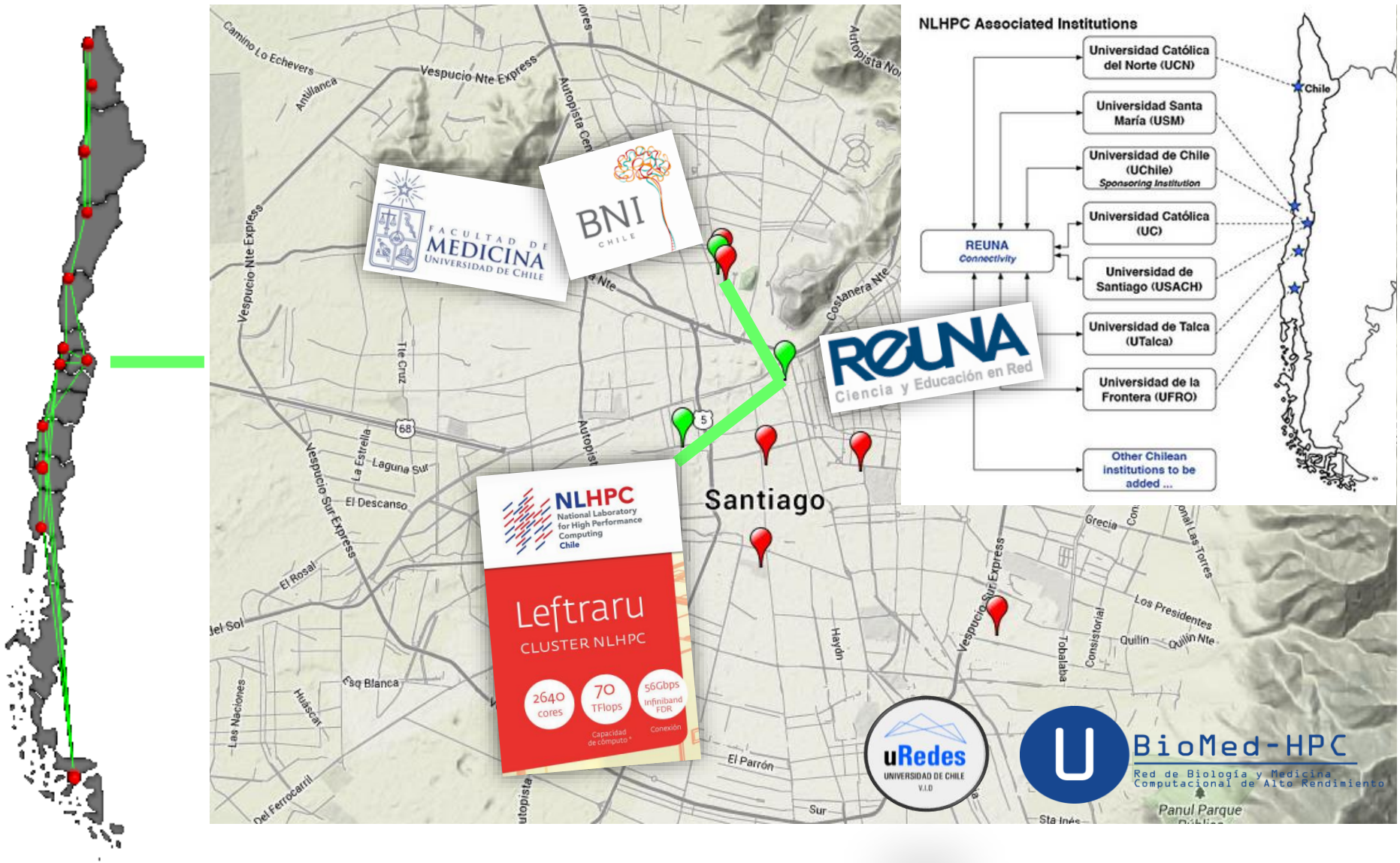
… Tera is derived from Greek τέρας (teras), meaning “monster”.

… Tera was confirmed for use in the SI in 1960…. Wiki !

Metric prefixes

Prefix	Symbol	1000^m	10^n	Decimal	English word[n 1]	Since[n 2]
yotta	Y	1000^8	10^{24}	1 000 000 000 000 000 000 000 000	septillion	1991
zetta	Z	1000^7	10^{21}	1 000 000 000 000 000 000 000	sextillion	1991
exa	E	1000^6	10^{18}	1 000 000 000 000 000 000	quintillion	1975
peta	P	1000^5	10^{15}	1 000 000 000 000 000	quadrillion	1975
tera	T	1000^4	10^{12}	1 000 000 000 000	trillion	1960
giga	G	1000^3	10^9	1 000 000 000	billion	1960
mega	M	1000^2	10^6	1 000 000	million	1960
kilo	k	1000^1	10^3	1 000	thousand	1795
hecto	h	$1000^{2/3}$	10^2	100	hundred	1795
deca	da	$1000^{1/3}$	10^1	10	ten	1795
		1000^0	10^0	1	one	–
deci	d	$1000^{-1/3}$	10^{-1}	0.1	tenth	1795
centi	c	$1000^{-2/3}$	10^{-2}	0.01	hundredth	1795
milli	m	1000^{-1}	10^{-3}	0.001	thousandth	1795
micro	μ	1000^{-2}	10^{-6}	0.000 001	millionth	1960
nano	n	1000^{-3}	10^{-9}	0.000 000 001	billionth	1960
pico	p	1000^{-4}	10^{-12}	0.000 000 000 001	trillionth	1960
femto	f	1000^{-5}	10^{-15}	0.000 000 000 000 001	quadrillionth	1964
atto	a	1000^{-6}	10^{-18}	0.000 000 000 000 000 001	quintillionth	1964
zepto	z	1000^{-7}	10^{-21}	0.000 000 000 000 000 000 001	sextillionth	1991
yocto	y	1000^{-8}	10^{-24}	0.000 000 000 000 000 000 000 001	septillionth	1991

SCIAN-Lab: BioMedHPC connects via 10 Gbps F-Med, FCFM, STI, REUNA

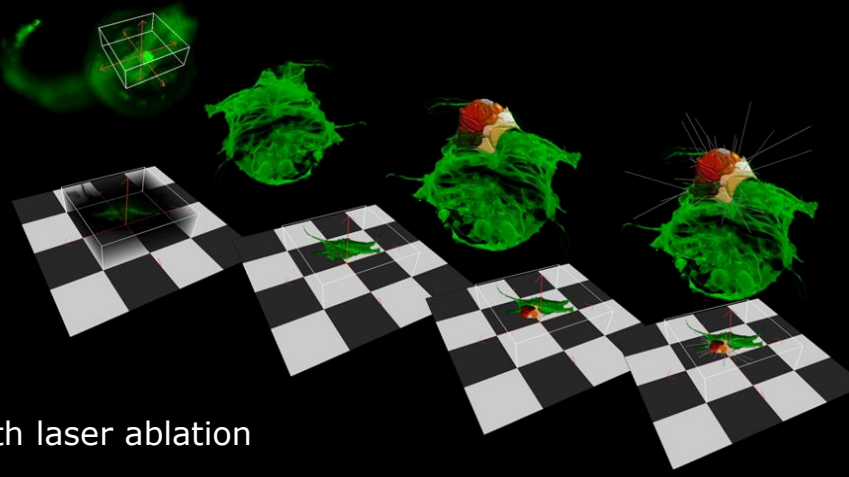


redeca.med.uchile.cl

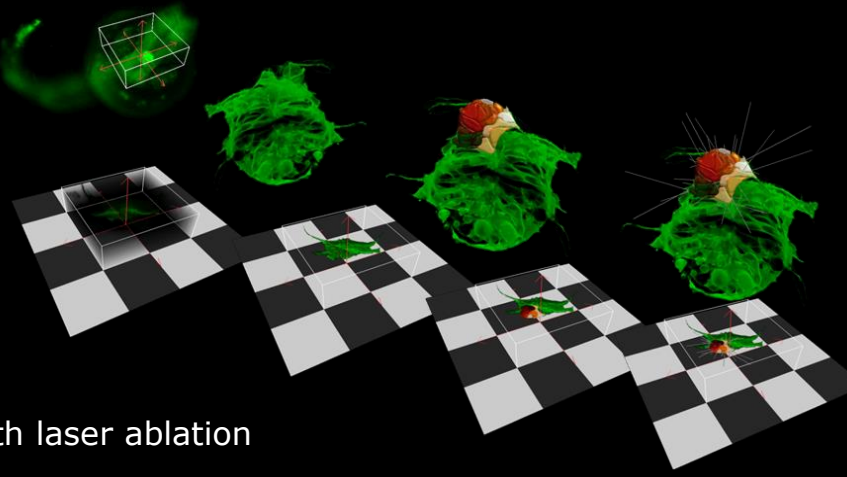
Bienvenid@s a REDECA

REDECA provee apoyo tecnológico, acceso y acompañamiento en el uso de servicios y equipos avanzados. Usuarios de la institución y externos pueden solicitar asistencia para la selección de servicios o equipos adecuados a sus desafíos experimentales, el almacenamiento y el análisis de sus datos.

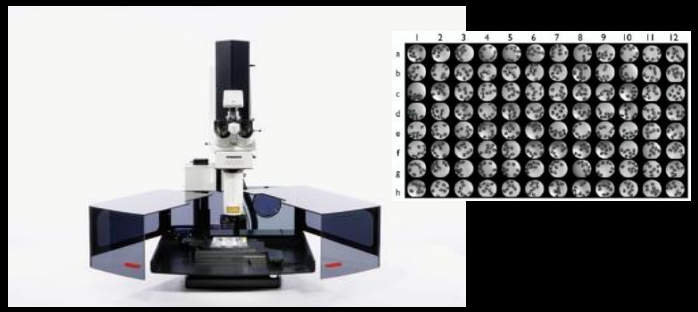
¡ REDECA… haz ciencia con nosotros !

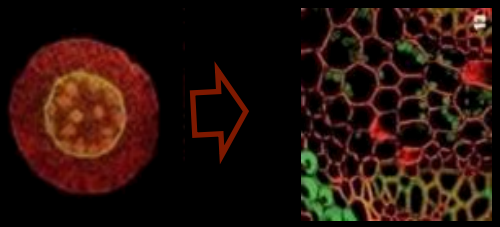


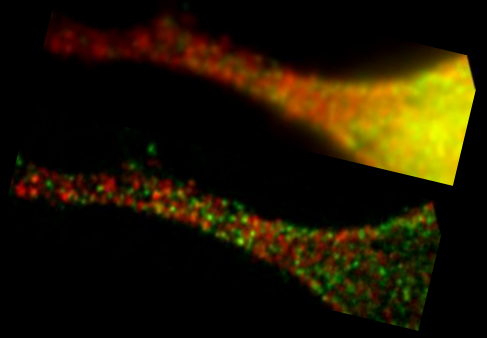
Scian/Leo-Lab: Perkin Elmer Spinning Disk with laser ablation



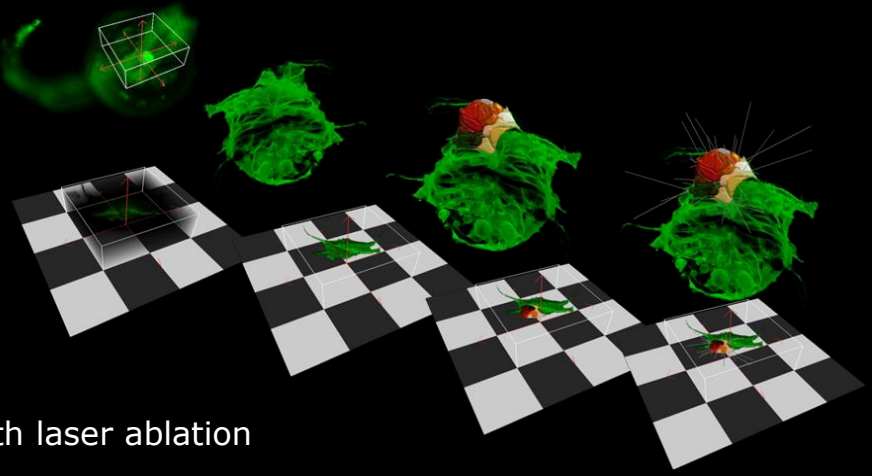
Scian/Leo-Lab: Perkin Elmer Spinning Disk with laser ablation







SCIAN-Lab Leica TCS LSI Super Zoom Spectral Confocal + Superresolution Optical Fluctuation Imaging SOFI



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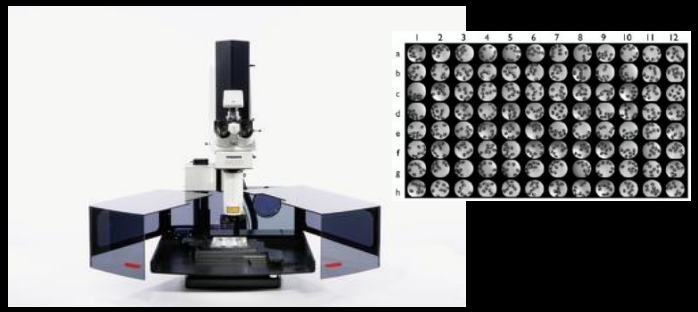

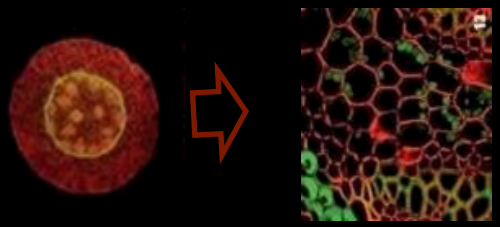

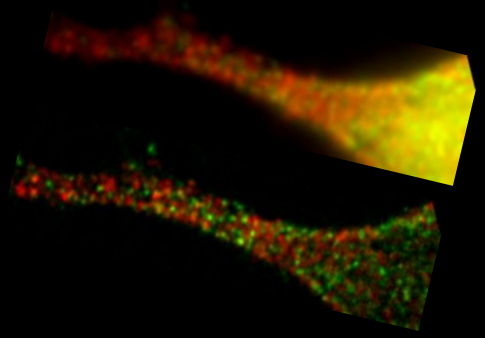

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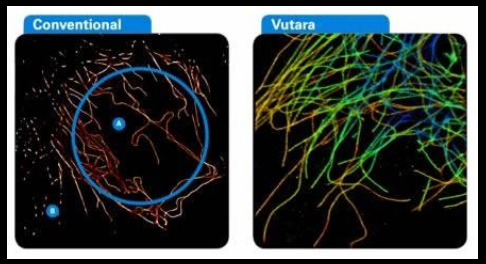
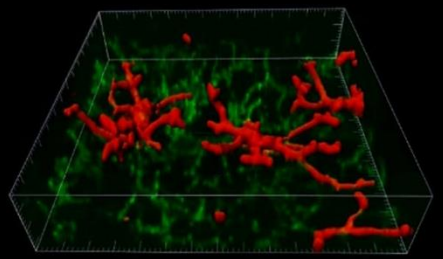
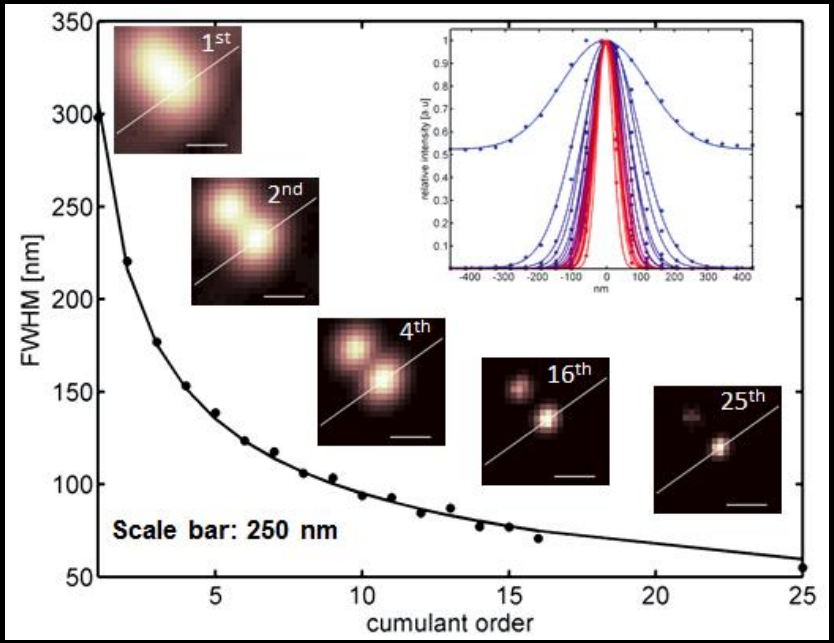
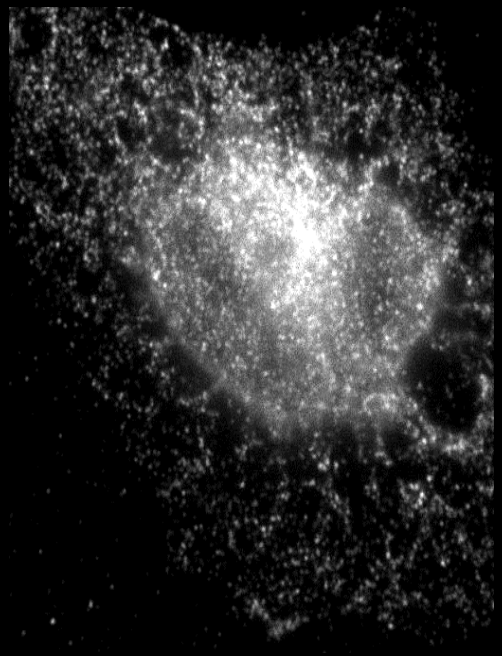


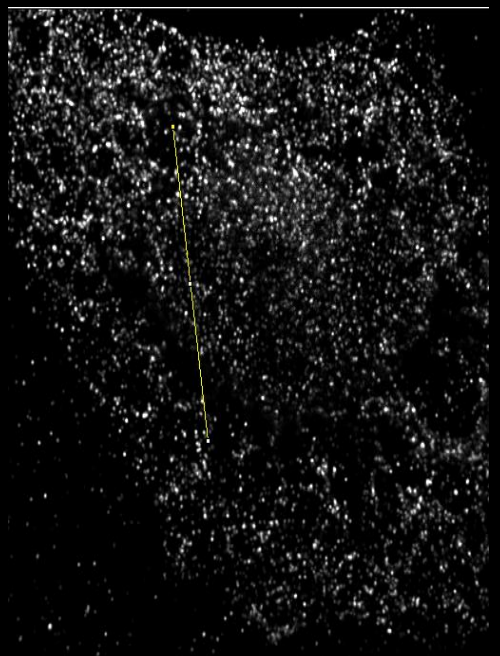


Couve-Lab PALM Vtarar 200, Bliplane 3D



Dertinger et al 2009 PNAS



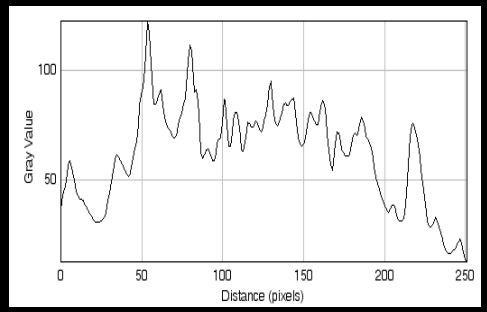


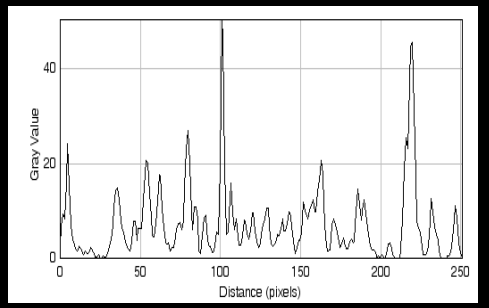
COS7 myc-GABABR1 conjugados con QDots 525 nm

Jörg Enderlein
Gôttingen

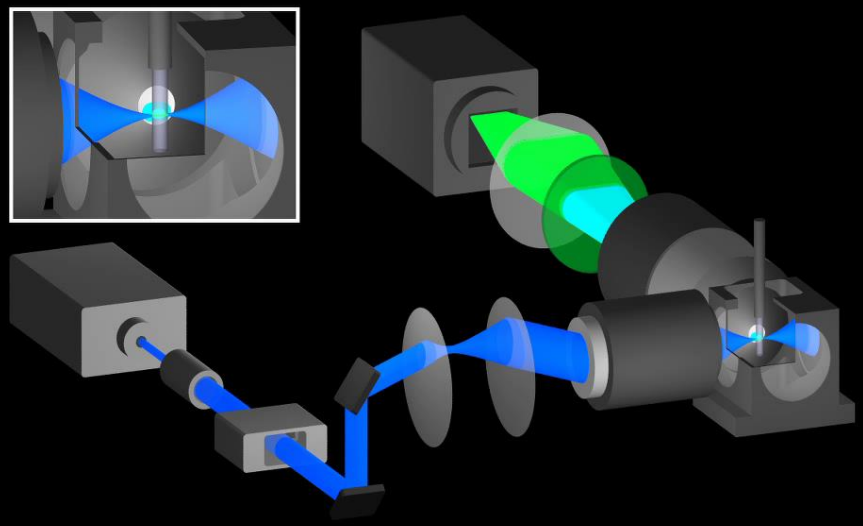
Mayor Challenges:

- vibrations
- computational backbone
- sustainability

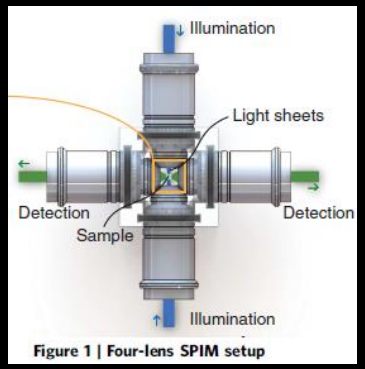




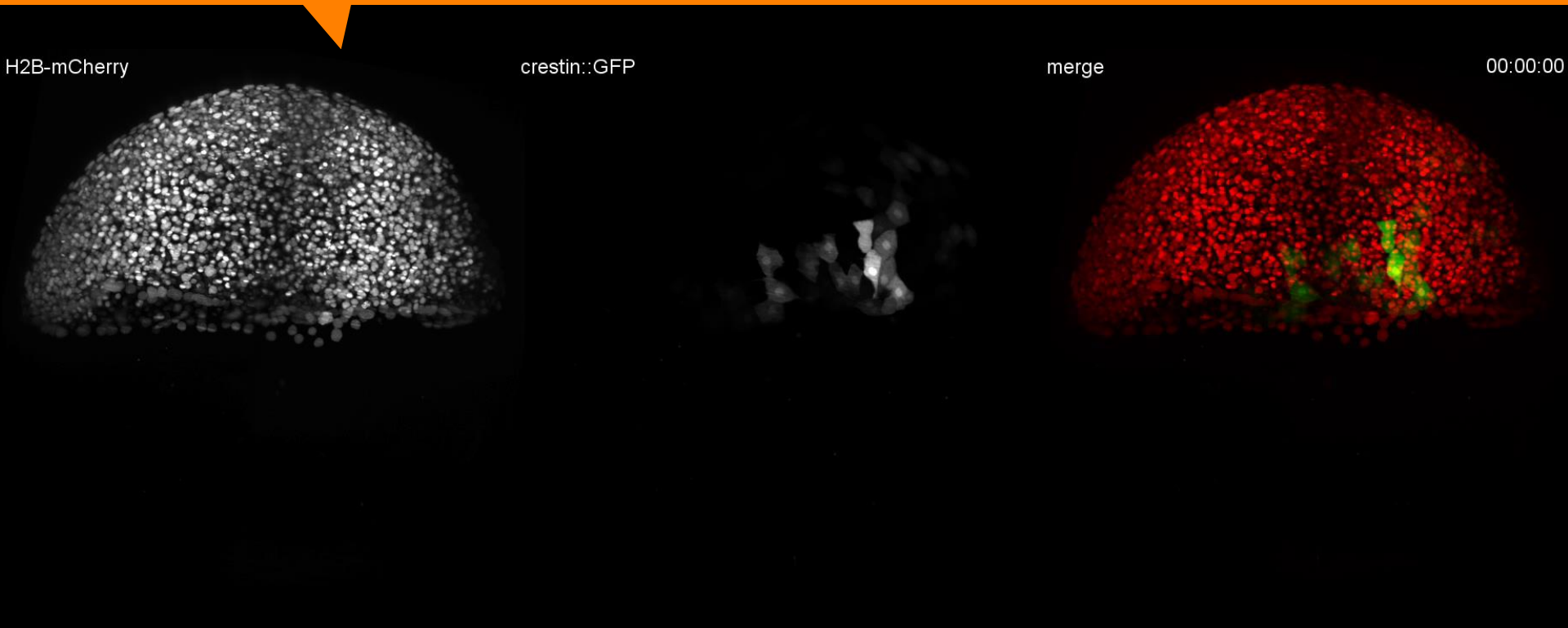
Pulgar, Keller, Concha, unpublished



Ulrich Kubitscheck
Bonn



Jan Huisken
Dresden



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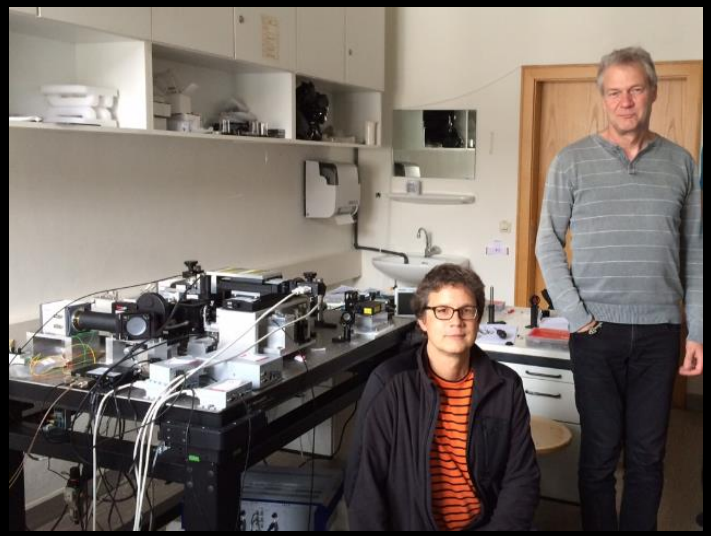
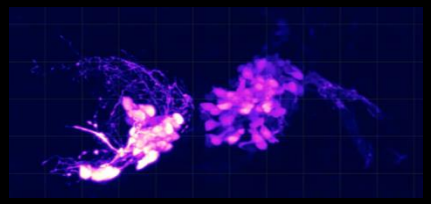


¿Qué hay de la conectividad a gran escala en alta resolución?

Si no puede mejorar su óptica, amplíe la muestra.

La Microscopía de Expansión puede ampliar el cerebro del pez cebra por factor 4.



Juan Eduardo Rodríguez
Kubitscheck-Lab
Bonn University

Karina Palma
Leo/SCIAN
U-Chile

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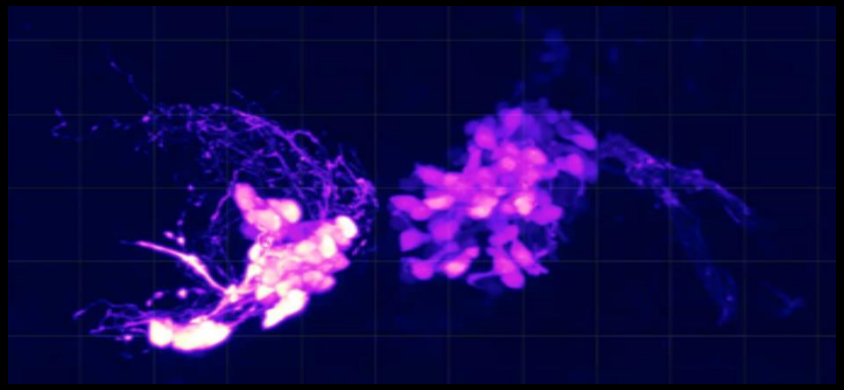

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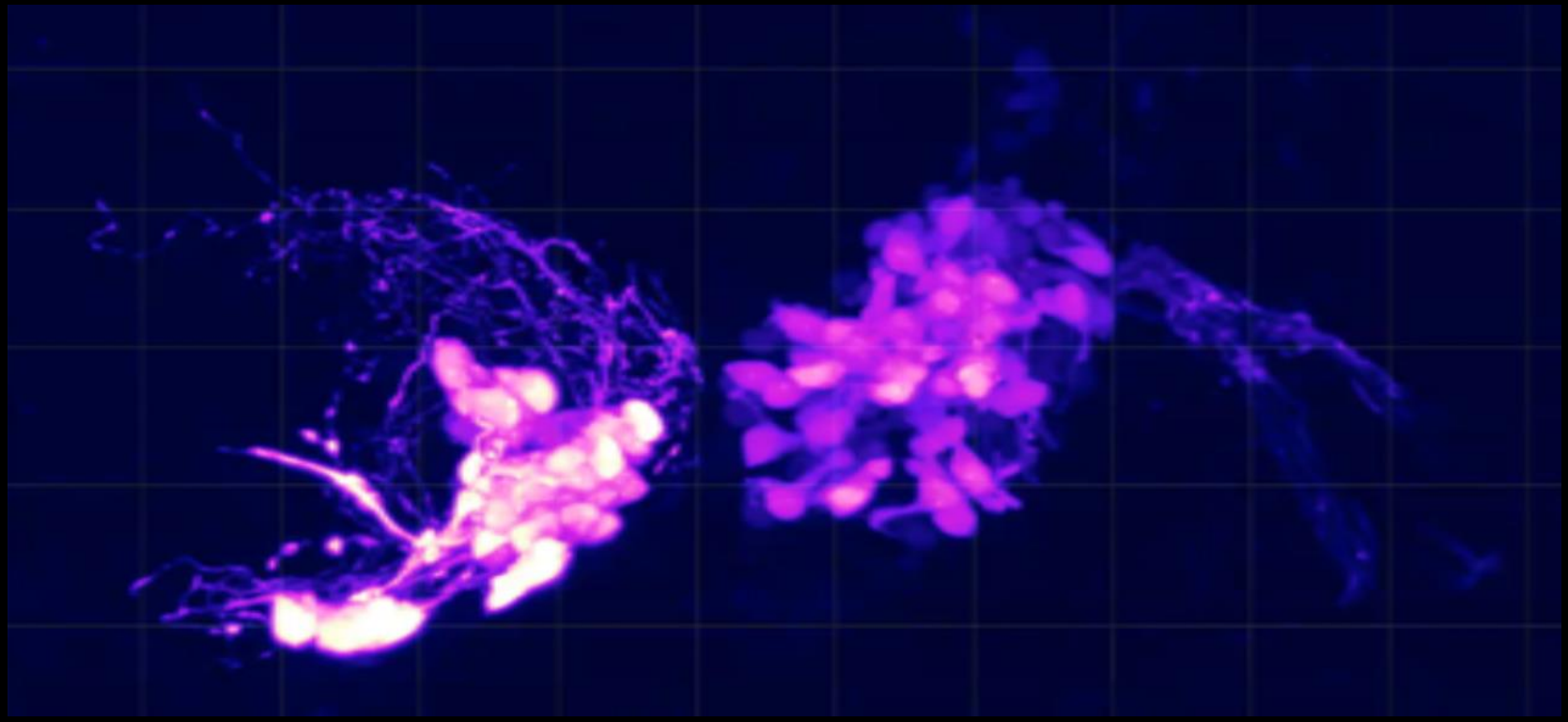
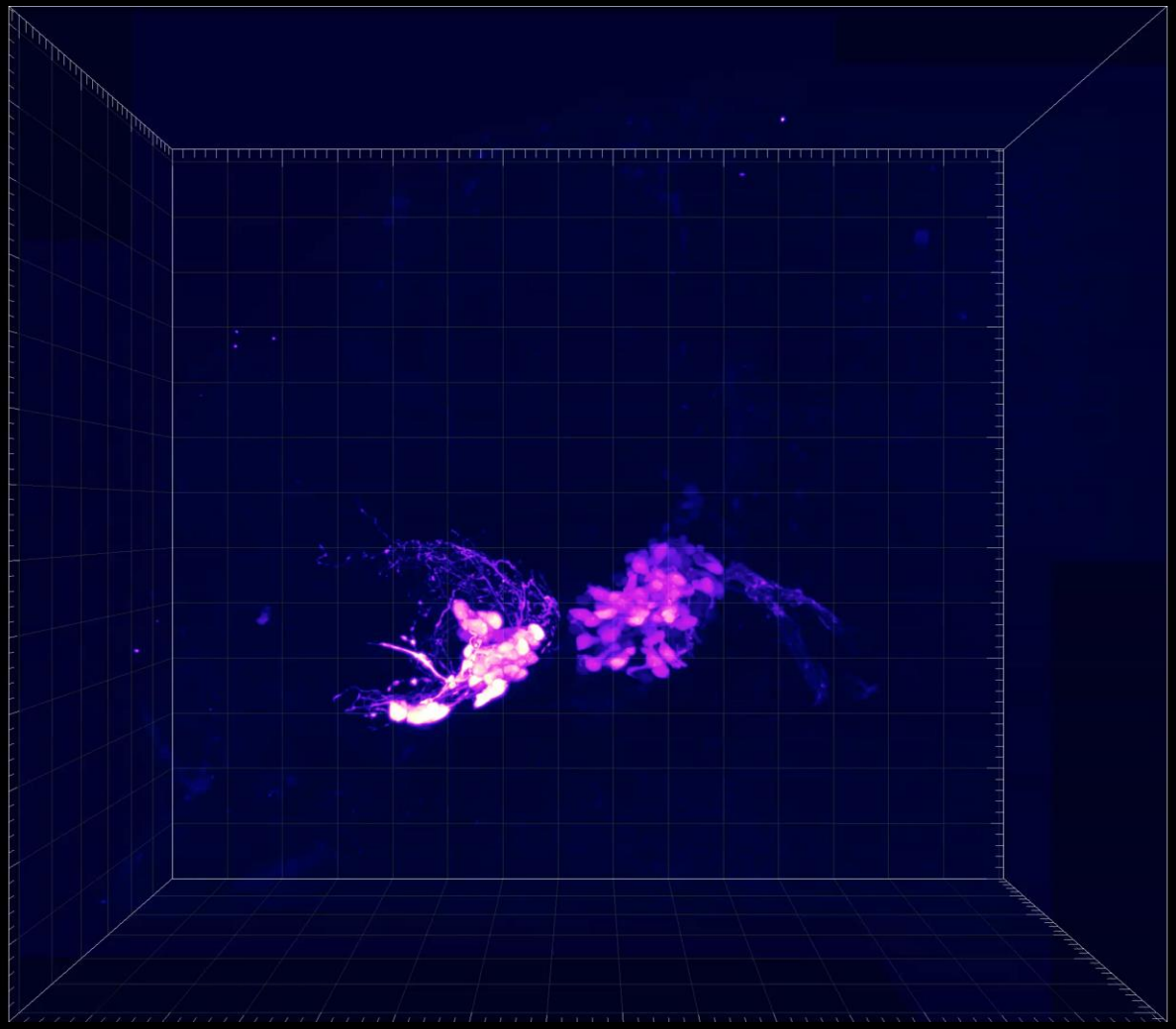


Laboratory for SCIAN Scientific Image Analysis

Zebrafish: Pineal complex

BIOMEDICAL NEUROSCIENCE INSTITUTE

Video of a 3D view comprising 1687 slices. Volume size 1133 x 954 x 954 µm³ (~113 GB)



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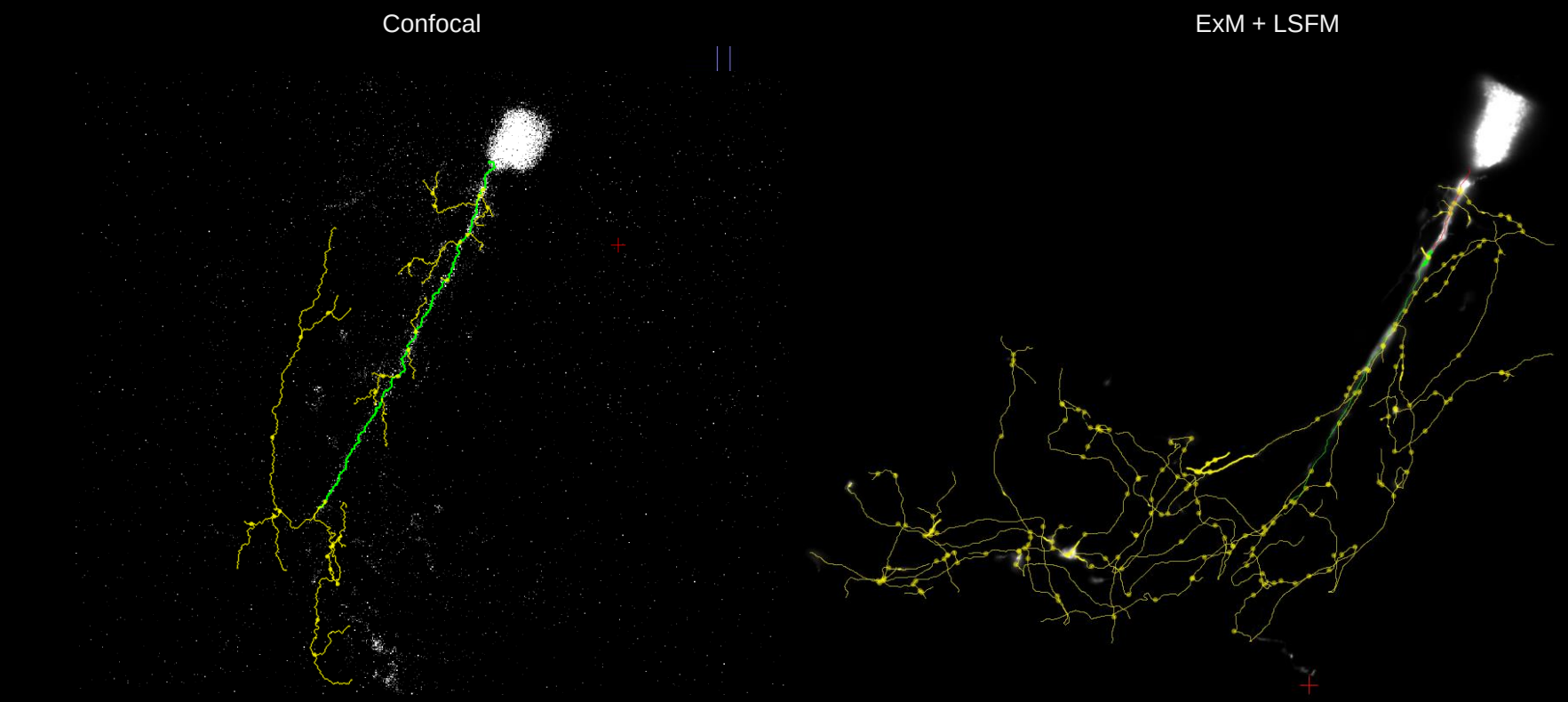
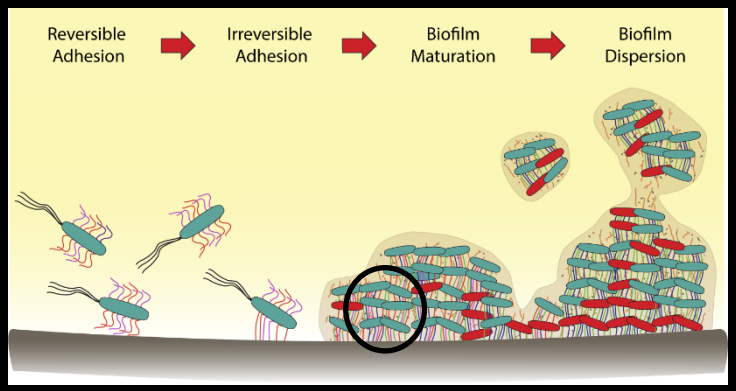
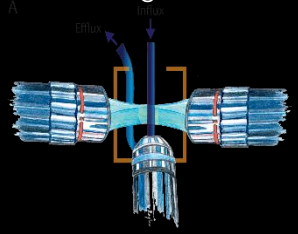
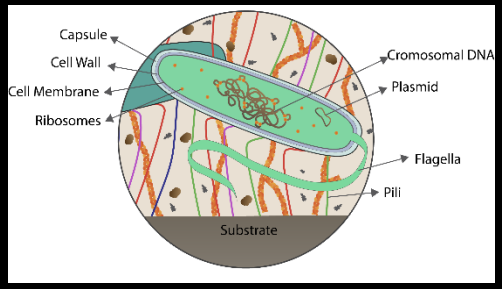


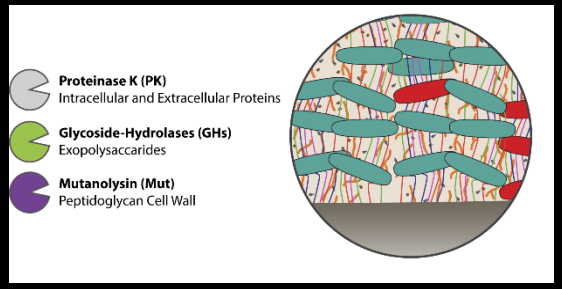


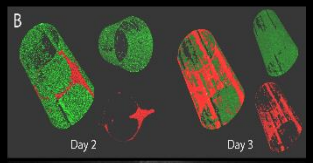
Dante Castagnini,
SCIAN-Lab, Bioquímico

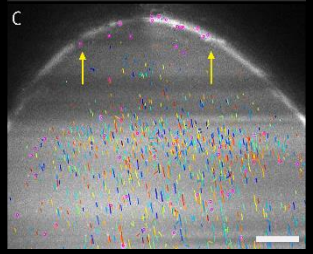
MSc(c) Nicole Canales,
T. Médico, SCIAN,
Microbiología

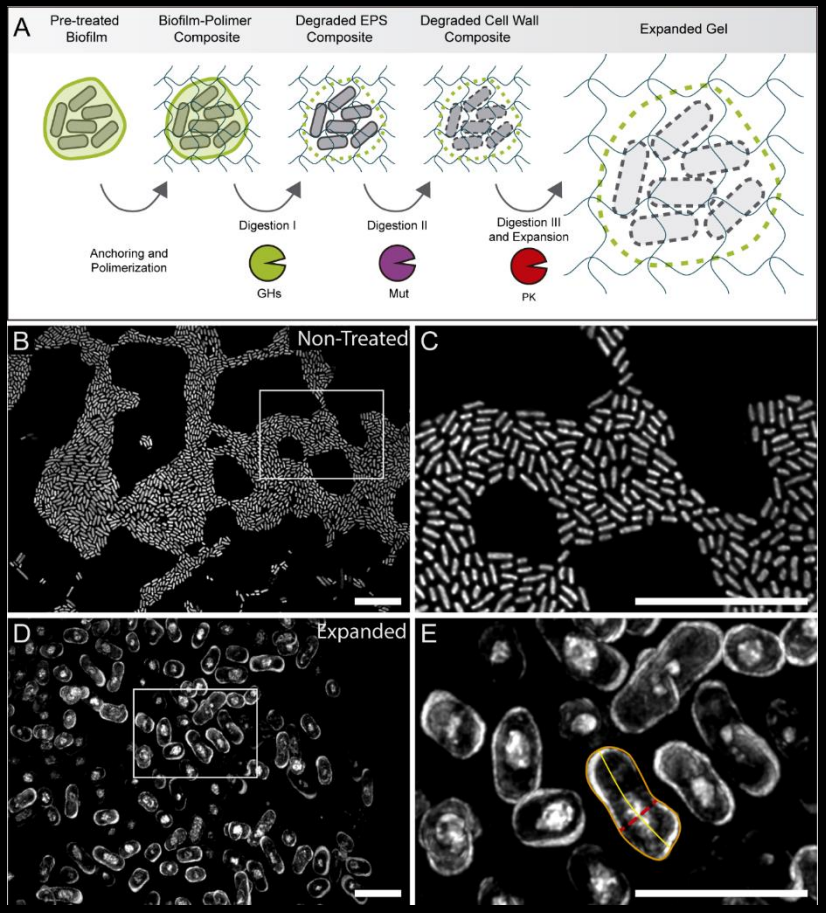




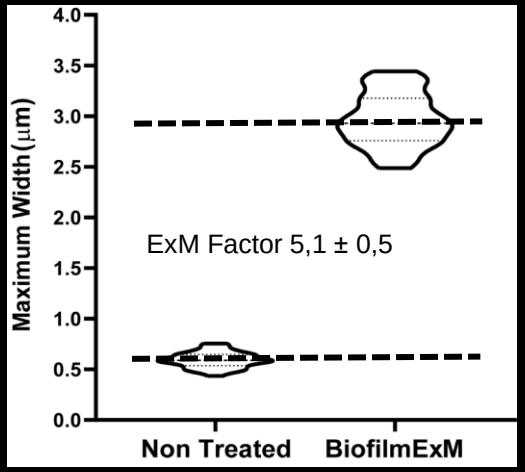








Dante Castagnini,
SCIAN-Lab, Bioquímico



EQUIPOS DEL IIBCE Y BNI SE CAPACITAN EN TÉCNICAS DE MICROBIOLOGÍA Y PROCESAMIENTO DE IMÁGENES GRACIAS A PROYECTO DE COOPERACIÓN INTERNACIONAL (AGCID)

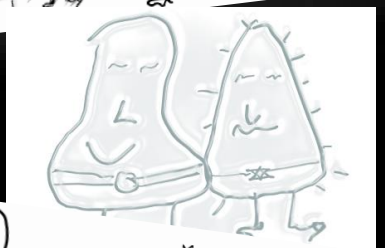
by Malcolm Moreno | Ene 31, 2020

Grupos científicos de Chile y Uruguay han impulsado un proyecto para compartir capacidades relacionadas con el procesamiento de imágenes microscópicas de última generación y el estudio de estructuras de microorganismos bacter… …tan a establecimientos hospitalarios del cono sur.

TRABAJANDO EN CARACTERIZACIÓN Y ENTENDIMIENTO DE LAS BACTERIAS MULTI-RESISTENTES

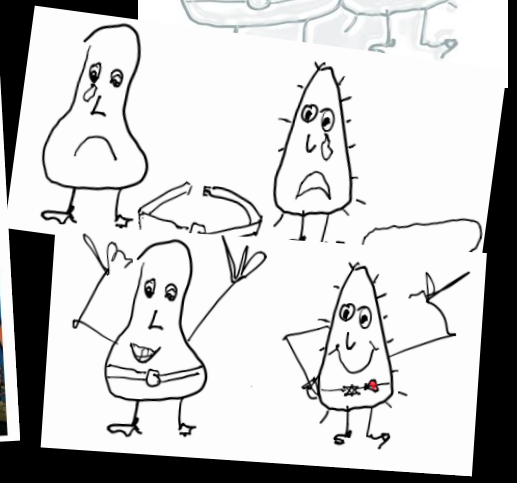
by Malcolm Moreno | Ene 31, 2020

El laboratorio de procesamiento de imáge… Instituto Clemente E… realizar caracteri… tiempo desarrolla… trabajo.



KIT DE SUPERVIVENCIA PARA LA CUARENTENA

by Malcolm Moreno | Jun 20, 2020



Hetz-Lab: Drug Discovery

Natural Chilean compounds

Preclinical models

SCIAN-Lab: Digital Pathology

High Speed Whole Slide Imaging

Digital Patholoy

Quantitative Microscopy

Medical Education & Outreach

BNI
BIOMEDICAL NEUROSCIENCE INSTITUTE
CHILE

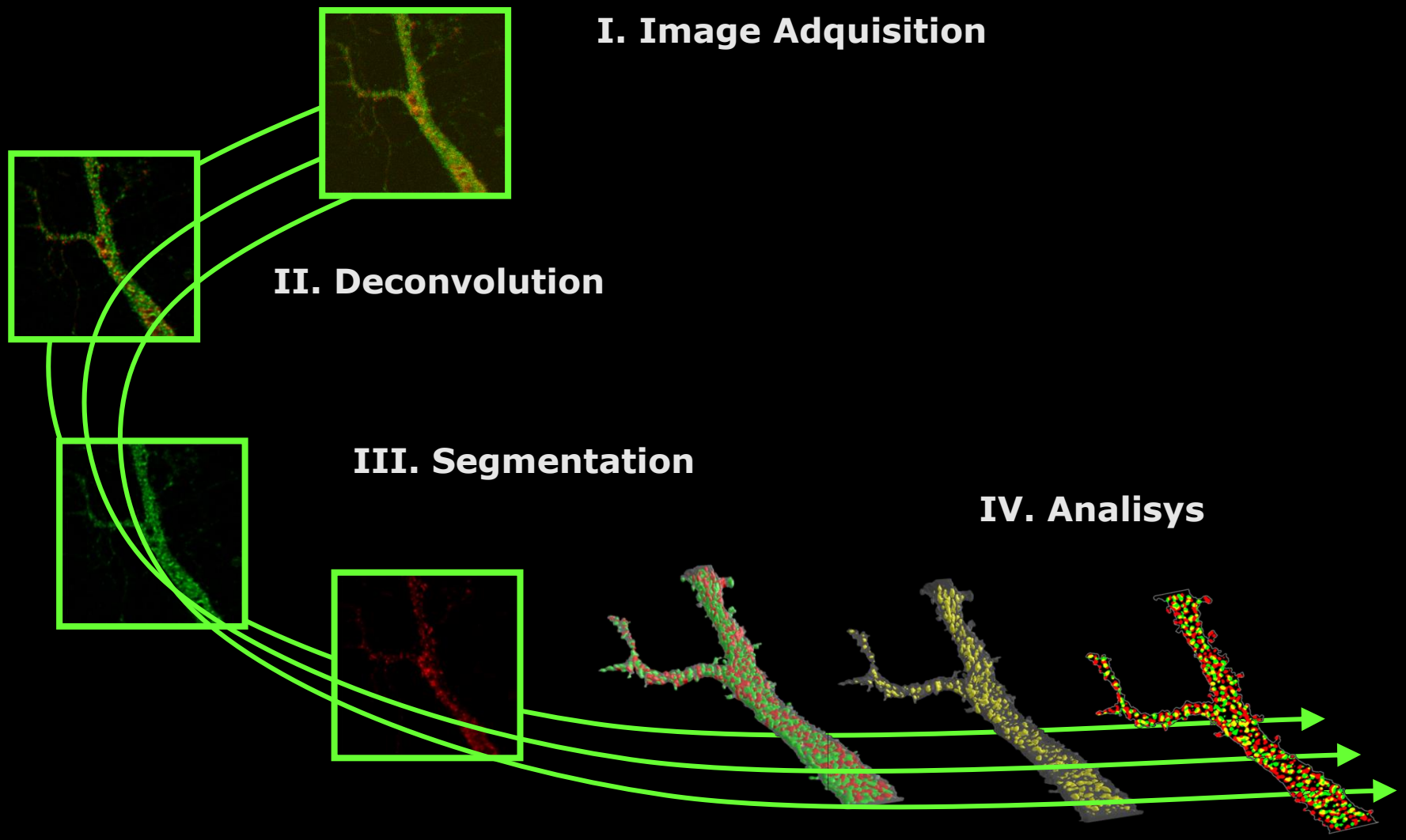
R&D: Applied Science

Impact on Health System

Impact on Public Opinion

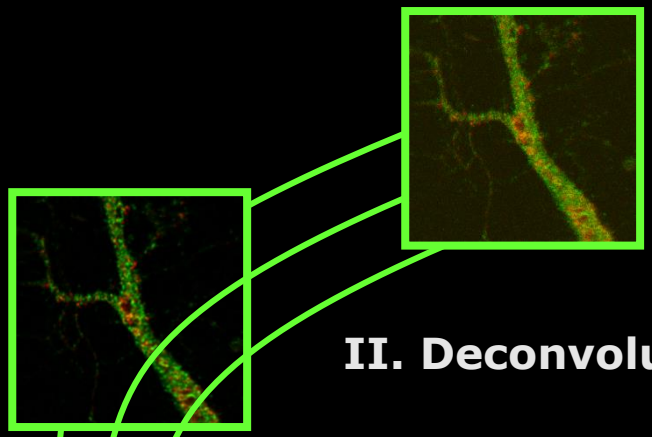
Laboratory for SCIAN Scientific Image Analysis

BIOMEDICAL NEUROSCIENCE INSTITUTE



Laboratory for SCIAN Scientific Image Analysis

BIOMEDICAL NEUROSCIENCE INSTITUTE



I. Image Adquisition

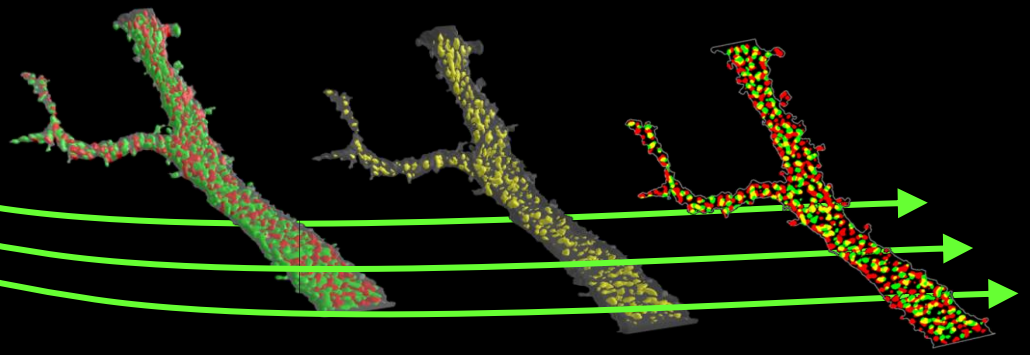
I.a|-> Fundamentos de la microscopía confocal

I.b|-> Fundamentos de la fluorescencia

II. Deconvolution

III. Segmentation

IV. Analisys



"It is very easy to answer many of these fundamental biological questions. You just look at the thing !

Make microscopes a hundred times more powerful and many problems of biology would be made very much easier."

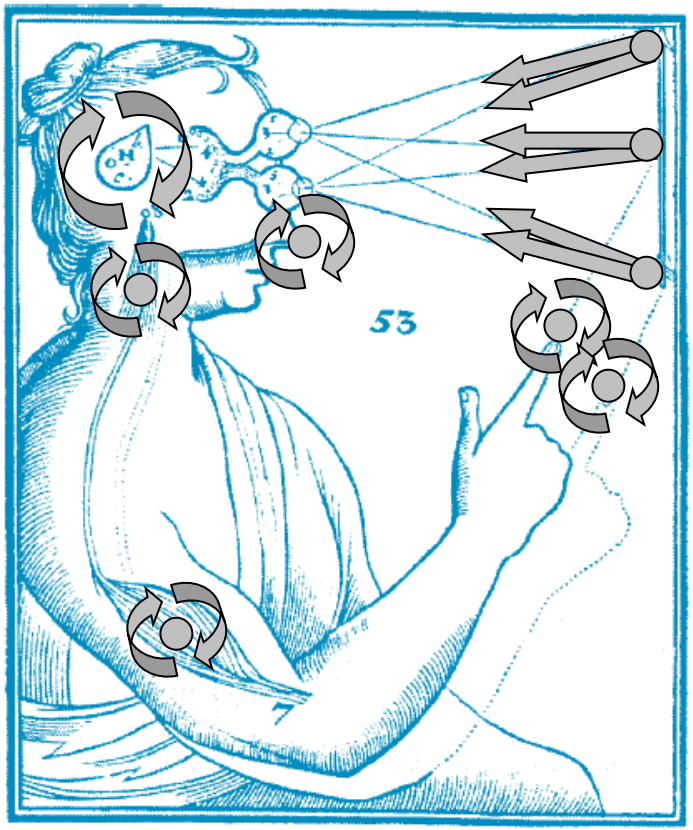
Richard Feynman (1918-1988)

René Descartes (1596-1650)

… just look at the thing …
¿ Human visual perception ?

***Treatise of man* (~ 1637)**

***Passions of the soul* (~ 1649)**



***glandula pinealis* / pineal organ**

A combination of ...

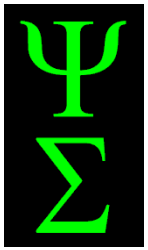
1| direct signals ...

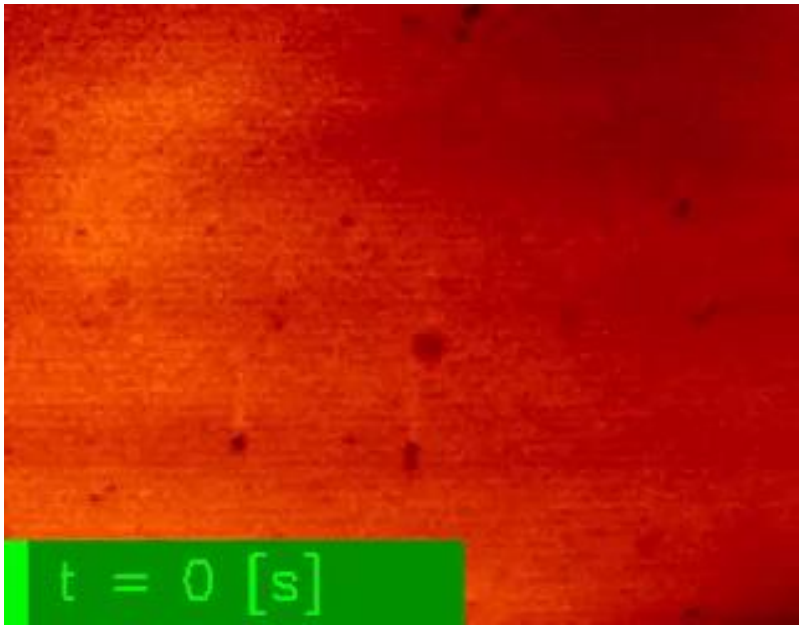
2| signals from other senses ...

3| feedback loops ...

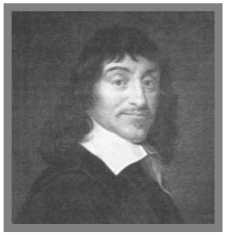
... produce a symbolic representation of an object.

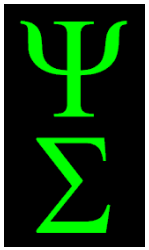
| Best resolution in t & x …

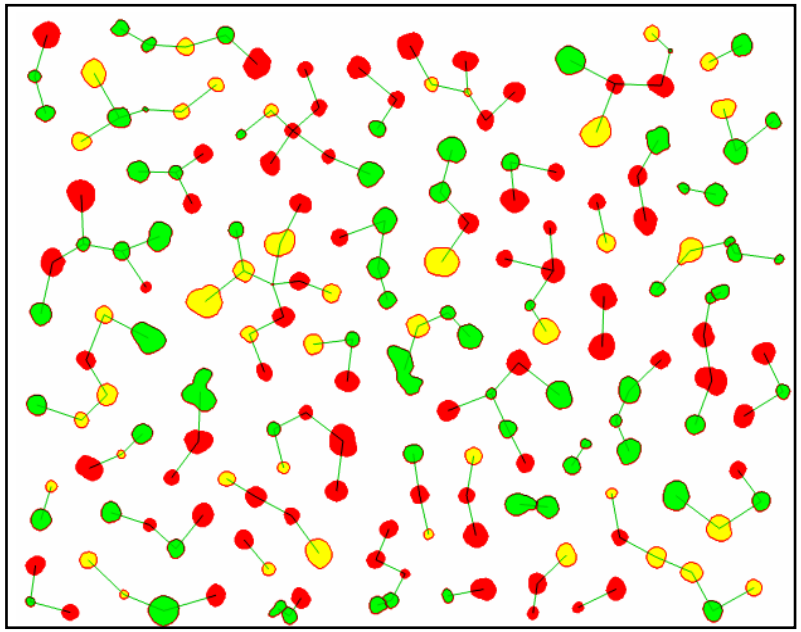


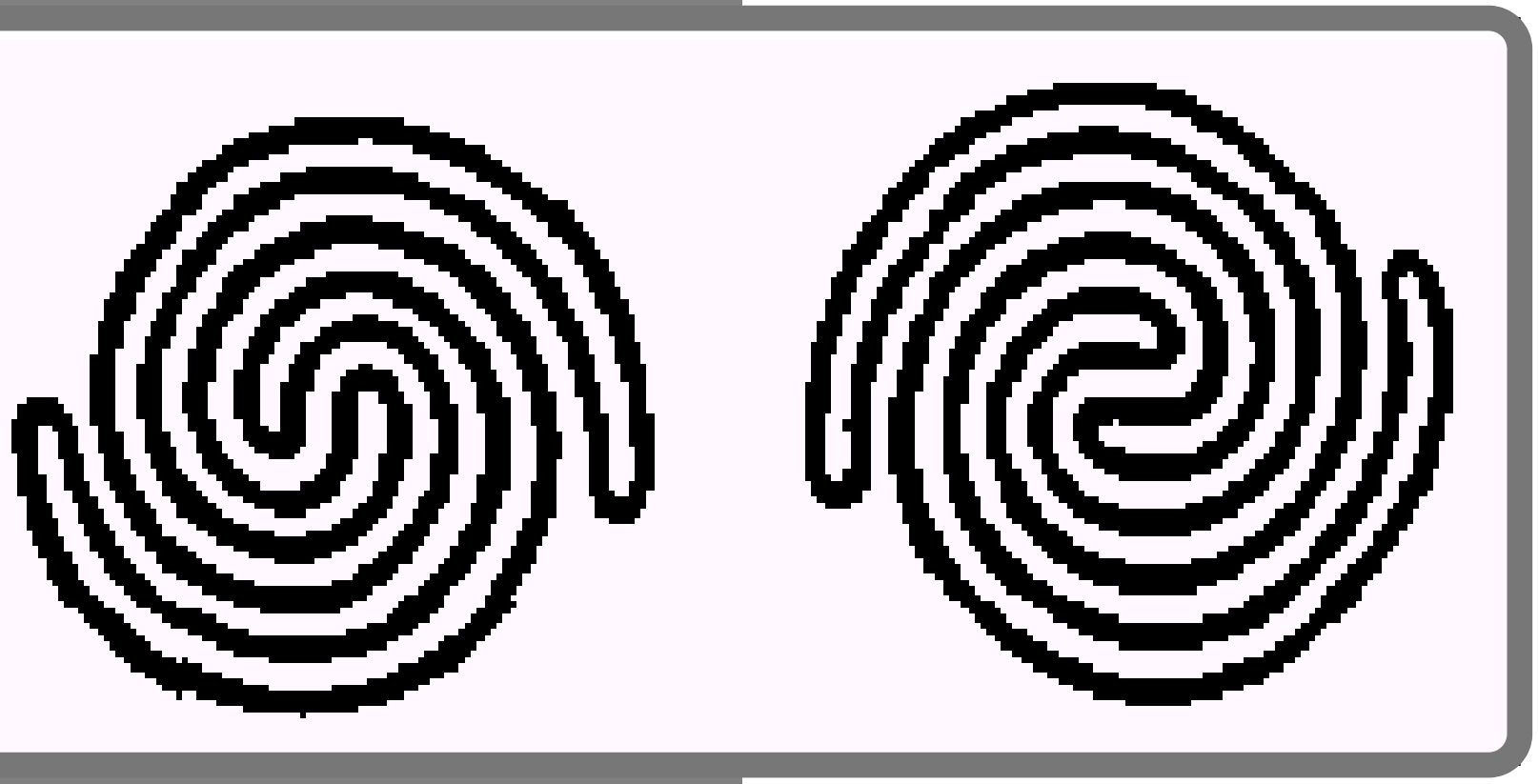


|| Humas vs machine vision





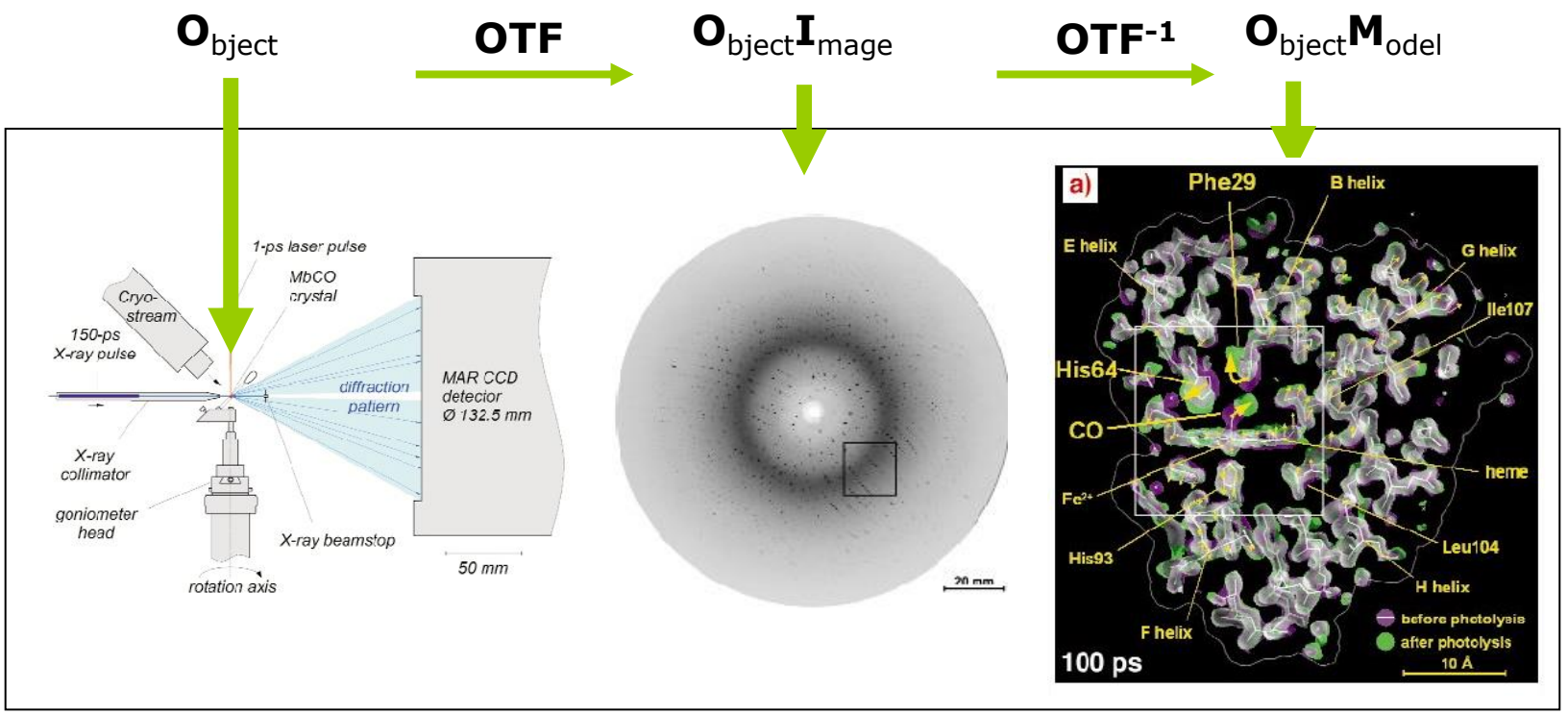




OTF: Object/Optical Transfer Function

Myoglobin in Action |Picosecond Laue Crystallography Diffraction Data

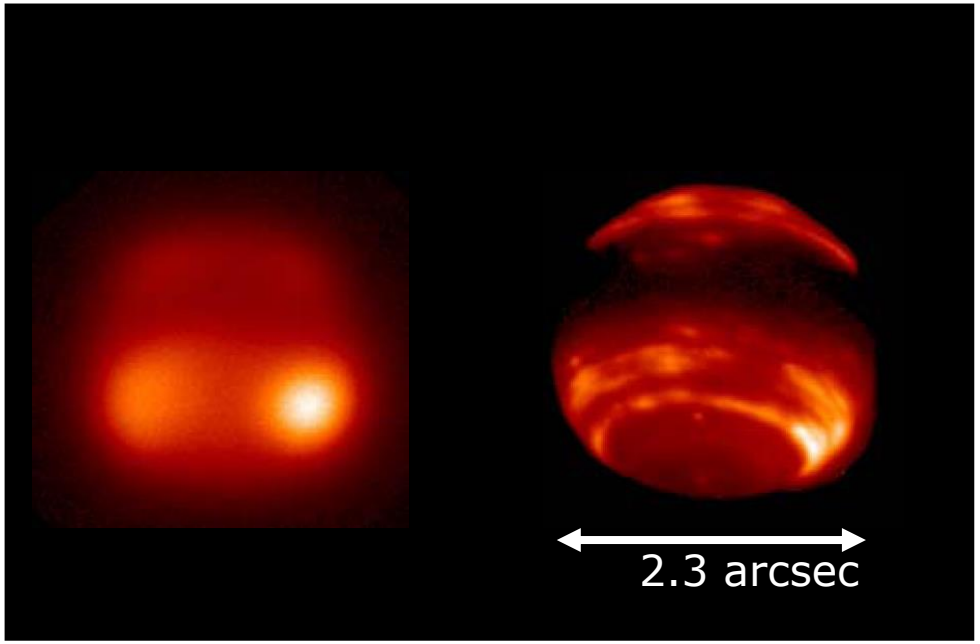
Schotte et al (2003) Science



http://www.youtube.com/watch?v=lnKIBZYarzM

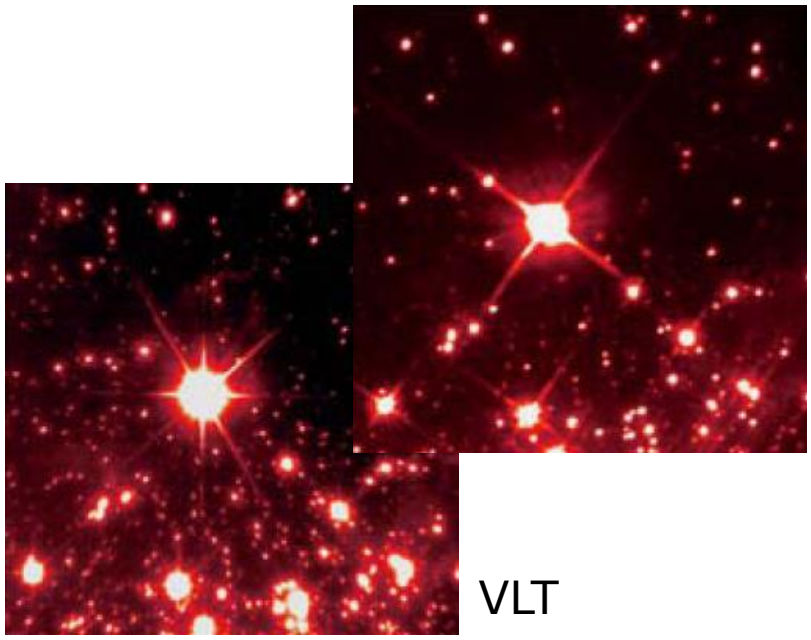
Diffraction Limited Resulution for a 10m telescope ~ λ/D ~ 0.01 arcsec
is limited to ~ 0.5 arcsec by the turbulent atmosphere.
NAOS creates an artificial star at 90 km altitude in the Earth´s mesosphere.
The Laser Guide Star is used to correct atmospheric effects

O_{bject} → **OTF** → $O_{bject}I_{mage}$ → OTF^{-1} → $O_{bject}M_{odel}$



Diffraction Limited Resulution for a 10m telescope ~ λ/D ~ 0.01 arcsec is limited to ~ 0.5 arcsec by the turbulent atmosphere.

O_{bject} → **OTF** → $O_{bject}I_{mage}$ → OTF^{-1} → $O_{bject}M_{odel}$



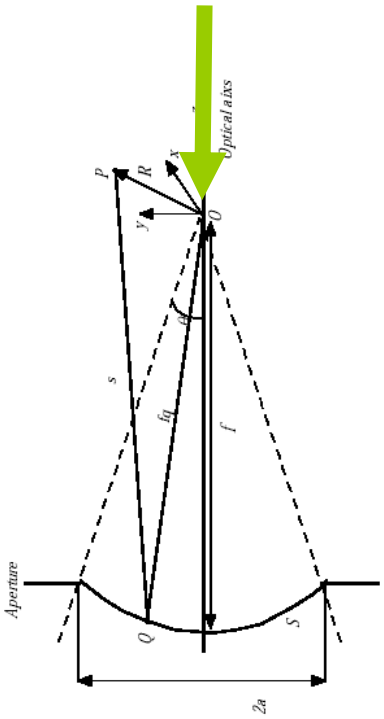
Hubble

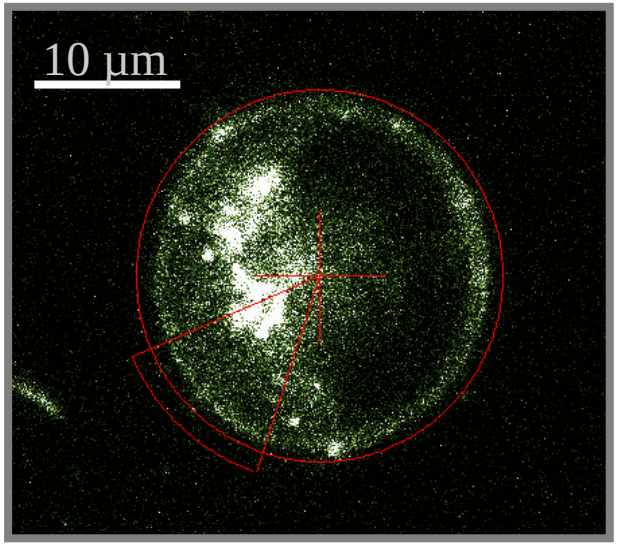
VLT

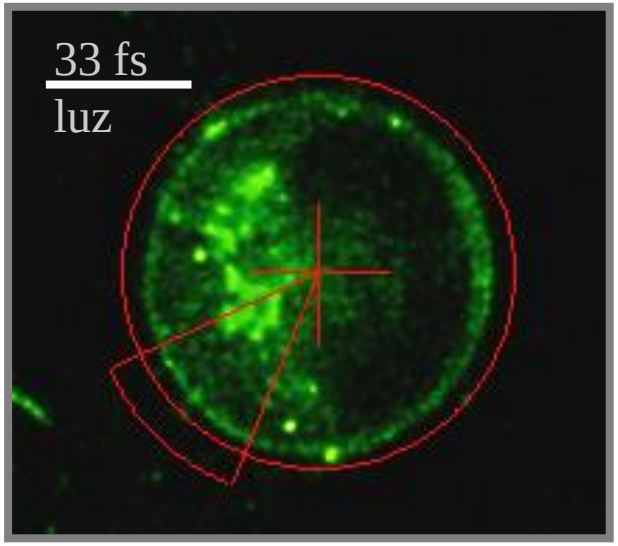
Confocal Microscopy | From Geometric Optics to Diffraction Theory

Diffraction: The deviation of an electromagnetic wavefront from the path predicted by geometric optics when the wavefront interacts with a physical object such as an opening or an edge.

Object → **OTF** → **O**bject**I**mage → **OTF^{-1}** → **O**bject**M**odel



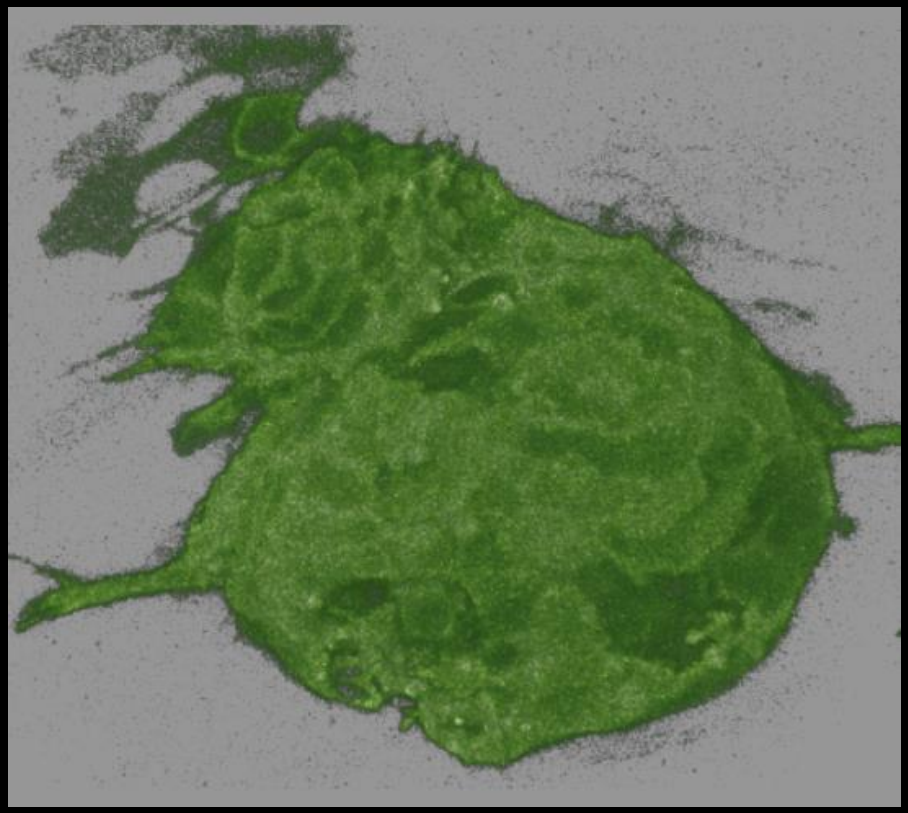


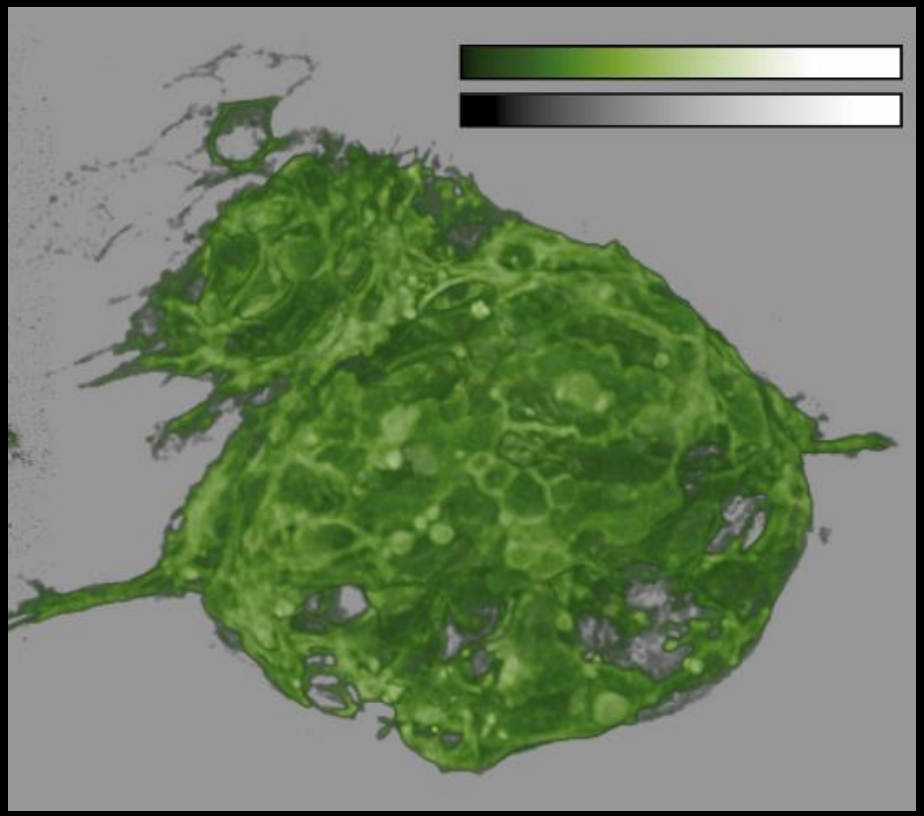


Laboratory for SCIAN Scientific Image Analysis

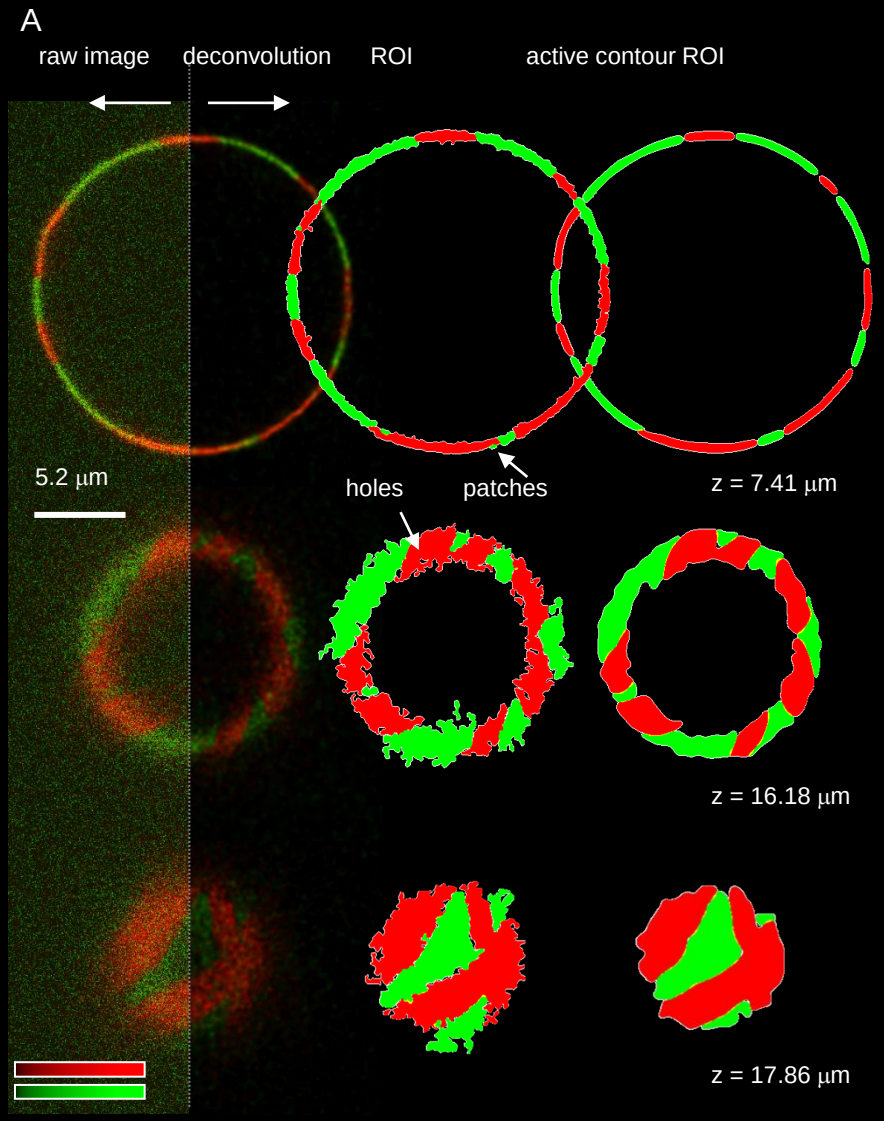
|-> Deconvolution

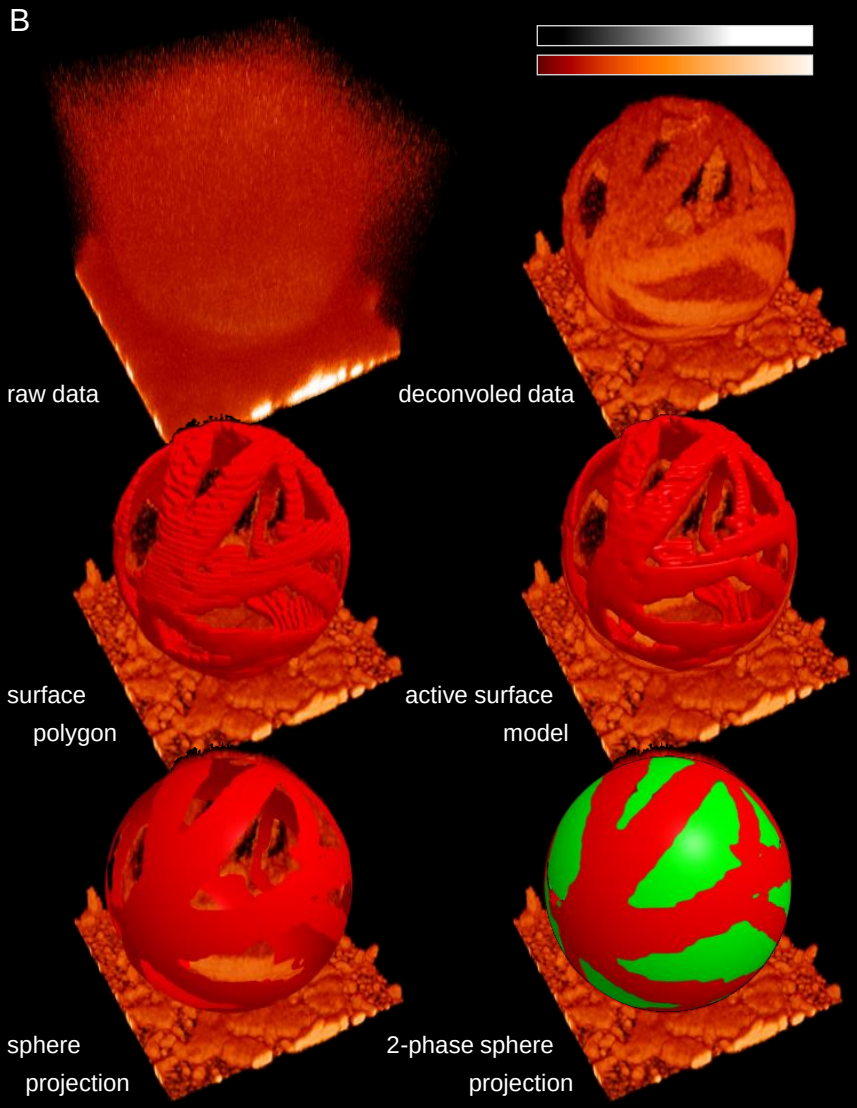
BIOMEDICAL NEUROSCIENCE INSTITUTE





|-> Deconvolution





|-> Microscopy

Seeing is believing? Alison J. North, The Journal of Cell Biology, Vol. 172, No. 1, January 2, 2006 9–18

THE JOURNAL OF CELL BIOLOGY

Seeing is believing? A beginners' guide to practical pitfalls in image acquisition

Imaging can be thought of as the most direct of experiments. You see something; you report what you see. If only things were truly this simple. Modern imaging technology has brought about a revolution in the kinds of questions we can approach, but this comes at the price of increasingly complex equipment. Moreover, in an attempt to market competing systems, the microscopes have often been inappropriately described as easy to use and suitable for near-beginners. Insufficient understanding of the experimental manipulations and equipment setup leads to the introduction of errors during image acquisition. In this feature, I review some of the most common practical pitfalls faced by researchers during image acquisition, and how they can affect the interpretation of the experimental data.

This article is targeted neither to the microscopy gurus who push forward the frontiers of imaging technology nor to my imaging specialist colleagues who may wince at the overly simplistic comments and lack of detail. Instead, this is for beginners who gulp with alarm when they hear the word "confocal pinhole" or sigh as they watch their cells fade and die in front of their very eyes time and time again at the microscope. Take heart, beginners, if microscopes were actually so simple then many people (including myself) would suddenly be out of a job!

All data are subject to interpretation

Deliberate scientific fraud exists, but in modern microscopy a far greater number of errors are introduced in complete innocence. As an example of a common problem, take colocalization. Upstairs in the lab, a researcher collects a predominantly yellow merged image on a basic microscope, naturally interpreted as colocalization of green and red signals. But on the confocal microscope, there is no yellow in the merged images.

"When you employ the microscope, shake off all prejudice, nor harbour any favorite opinions; for, if you do, 'tis not unlikely fancy will betray you into error, and make you see what you wish to see." Henry Baker, chapter 15, "Cautions in viewing objects" of The Microscope Made Easy, 1742.

How can this be? Many factors contribute. Here, I take the reader through the imaging process, from sample preparation to selection of the imaging and image-processing methods. Throughout, we will be on the look-out for problems that can produce misleading results, using colocalization as the most common example. Because one short article cannot be an exhaustive "how to" guide, I have also assembled a bibliography of a few highly recommended textbooks and microscopy web sites, which readers should consult for more extensive treatments of the critical issues introduced here.

Sample preparation

"Garbage in = garbage out" is the universal motto of all microscopists. A worrying tendency today is to assume that deconvolution software or confocal microscopes can somehow override the structural damage or suboptimal immunolabeling induced by poor sample preparation. The importance of appropriate fixation, permeabilization, and labeling methods for preserving cellular morphology or protein localization is well known to electron microscopists (Hayat, 2000), but often underestimated in optical microscopy (Fig. 1).

Many labs use one standardized protocol for labeling with all antibodies, irrespective of whether the targets are membrane- or cytoskeleton-associated, nuclear or cytosolic. However, inappropriate fixation can cause antigen redistribution and/or a reduction in antigenicity. It is therefore important to test each antibody on samples fixed in a variety of ways, ranging from solvents such as methanol to chemical cross-linking agents such as paraformaldehyde and glutaraldehyde (for protocols see Beckerman et al., 1995; Allan, 1999), although glutaraldehyde fixation often reduces antigenicity and increases background autofluorescence. Consult textbooks for notorious pitfalls: phalloidin labeling is incompatible with methanol fixation, while microtubules are inadequately fixed by formaldehyde. Moreover, certain cell types, such as yeast cells, require specialized fixation protocols (Hagan and Ayscough, 1999).

Permeabilization is also critical in achieving a good compromise between antigen accessibility and ultrastructural integrity. Specific detergents will produce different effects (for example, Saponin treatment produces smaller holes in

The objective lens is the most critical component of a microscope and yet few researchers grasp the differences between specific objective classes.

"When you employ the microscope, shake off all prejudice, nor harbour any favorite opinions; for, if you do, 'tis not unlikely fancy will betray you into error, and make you see what you wish to see." Henry Baker, chapter 15, "Cautions in viewing objects" of The Microscope Made Easy, 1742.

Keep the acquisition settings constant between specimens to be compared quantitatively and particularly between sample and control.

"Remember that truth alone is the matter that you are in search after; and if you have been mistaken, let not vanity seduce you to persist in your mistake." Henry Baker, The Microscope Made Easy, 1742.