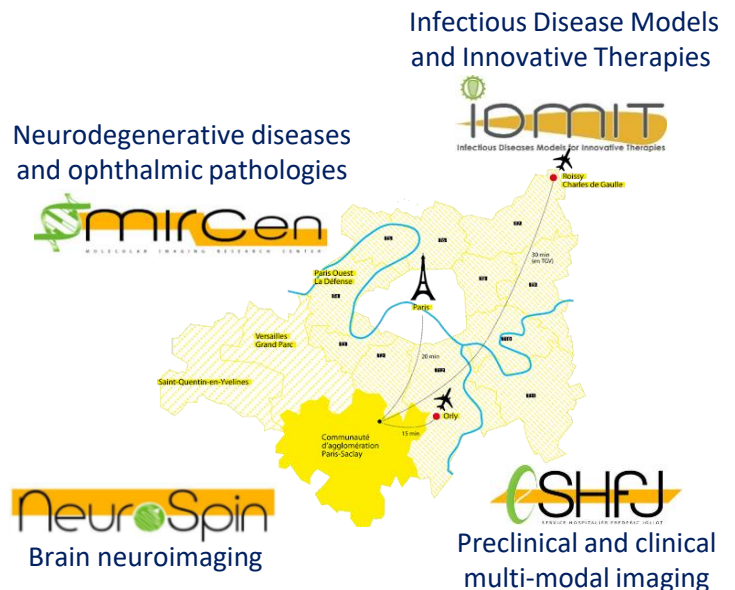


# State-of-the-art *in vivo* imaging

## MRI ASSETS

# A SYNERGY OF IN VIVO IMAGING EXPERTISE & TECHNOLOGIES TO SUPPORT INNOVATIVE PROJECTS

**Four complementary and multidisciplinary centers (IDMIT, MIRCen, SHFJ and NeuroSpin) contributing to major advances in various research fields**



From preclinical POC to drug development in patients



PET, MRI, ultrasound, multimodal imaging and radiopharmaceutical production

**Expertise and state-of-the-art translational in vivo imaging platforms:**

- \* 4 medical research imaging centers
- \* 34 technological platforms for preclinical and clinical research
- \* 10 research laboratories

**An access to a full range of scientific and technological solutions through one-stop shop and a dedicated project manager to support partner innovative developments from preclinical to clinical stages**

# PRECLINICAL MRI

## OUR ACTIVITY

- ✓ High and ultrahigh MRI
- ✓ Multimodal imaging: PET/MRI – MRI/US
- ✓ Metabolic imaging ( $^1\text{H}$  or  $^{31}\text{P}$  MR Spectroscopy, Chemical Exchange Saturation Transfer for Glutamate, Glucose, Creatine)
- ✓ Diffusion weighted imaging, anatomical connectivity
- ✓ T1, T2, T2\* and susceptibility weighted imaging, parametric imaging
- ✓ Functional MRI (task and resting state)
- ✓ Optimized sequences for brain spectroscopy  $^1\text{H}$ ,  $^{13}\text{C}$  and  $^{31}\text{P}$
- ✓ ZTE imaging for  $^{17}\text{O}$
- ✓ BSL 1 to 3 environment
- ✓ Complementary assets: animal housing, histology, immunohistochemistry

## THERAPEUTICAL FIELDS

- ✓ Infectious diseases
- ✓ Neurodegenerative diseases
- ✓ Oncology
- ✓ Ophthalmology

## EXPERTISE

- ✓ Research of new contrast agents
- ✓ Animal model validation
- ✓ Evaluation of new therapies
- ✓ Anatomic and functional imaging
- ✓ Co-registration of reconstructed 3D-histological volumes of multimodal data acquired in vivo and/or ex vivo imaging

## OUR STRENGTH

- ✓ Long-standing experience in multimodal imaging processing in preclinical models
- ✓ Complementary experts: biologists, physicists, pharmacologists, radiochemists, radiopharmacists, nuclear doctors, physicians
- ✓ Well-established partnerships with public and industrial players

# PRECLINICAL MRI

## APPLICATIONS

### ❖ Therapeutic fields

- ✓ Neurodegenerative diseases
- ✓ Oncology

### ❖ Expertise

- ✓ Animal model validation
- ✓ Evaluation of new therapies
- ✓ Study of drug-target interactions
- ✓ Pharmacokinetics study

## EQUIPMENT

MRI 1.5T  
MRI 7T

Achieva (whole-body)  
Primate

Philips  
Agilent

MRI 7T  
MRI 11.7 T  
MRI 17.2 T  
PET/MRI 3T (Primates)

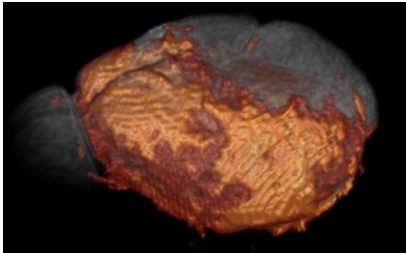
Biospec, Avance III (small animal)  
Biospec, Avance III (small animal)  
Biospec, Avance III (small animal)  
SIGNA

Bruker BioSpin  
Bruker BioSpin  
Bruker BioSpin  
GE

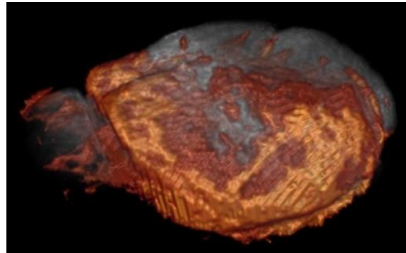
# PRECLINICAL CASE STUDIES

## Manganese Enhanced MRI

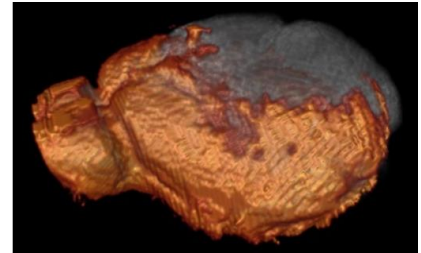
TR1



TR2

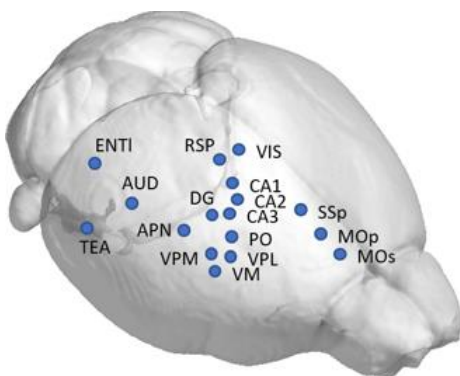


TR3

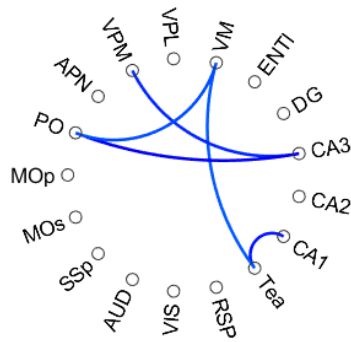


Drug effects on functional neuroimaging  
(Droguerre et al, Sci Rep. 2019)

## Resting state functional MRI biomarkers in neurodegenerative diseases

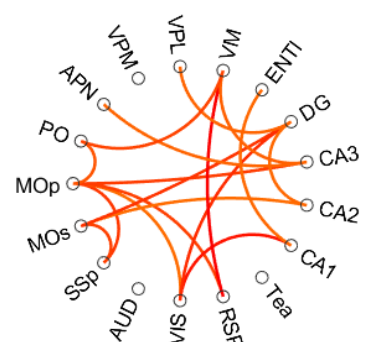


6M

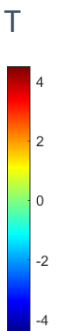


*hypoconnectivity*

12M



*hyperconnectivity*



Connectivity differences in AD vs WT  
(Droguerre et al., Proceedings of the ESMRMB Meeting, 20202020)

# CLINICAL MRI

## APPLICATIONS

### ❖ Therapeutic fields

- ✓ Infectious diseases
- ✓ Neurodegenerative diseases
- ✓ Oncology

### ❖ Expertise

- ✓ Biomedical research protocol management
- ✓ Recruitment of healthy volunteers,
- ✓ Acquisition of in vivo brain imaging data from healthy or diseased humans
- ✓ In vitro acquisition of anatomical parts
- ✓ Development and implementation of MRI sequences (anatomy, diffusion, functional MRI, NMR spectroscopy)
- ✓ Imaging data analysis and processing

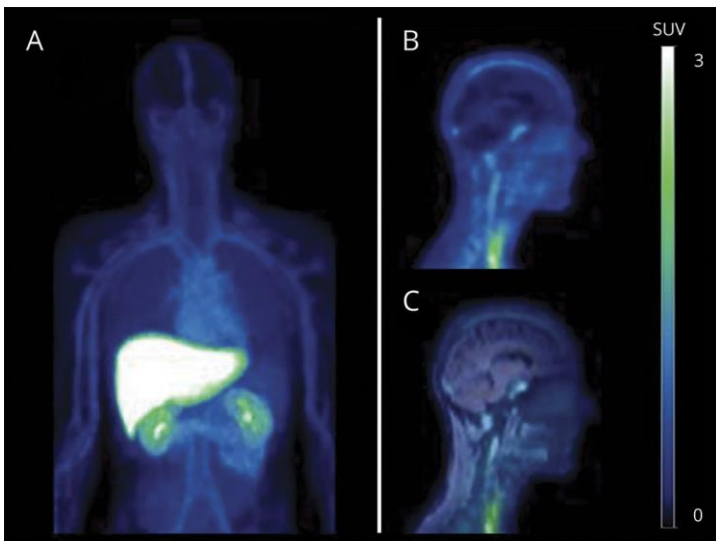
## EQUIPMENT

MRI 3T  
MRI 7T  
MRI 11.7T

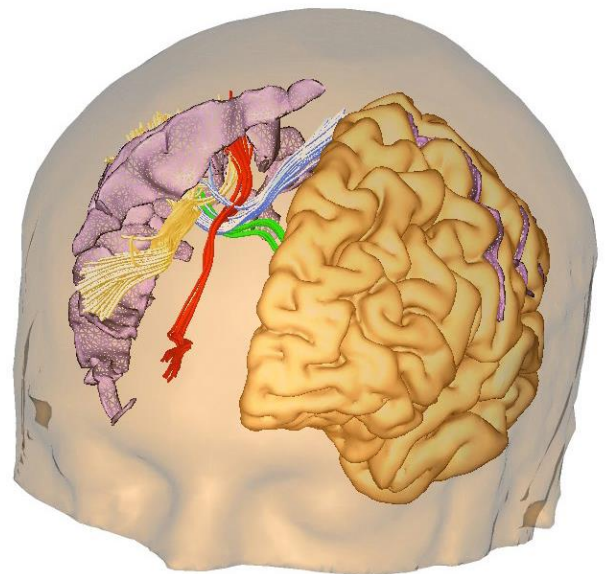
Magneton Prisma fit      Siemens  
Magnetom 7T                Siemens  
Project ISEULT (France – Germany) dedicated to brain

# CLINICAL CASE STUDIES

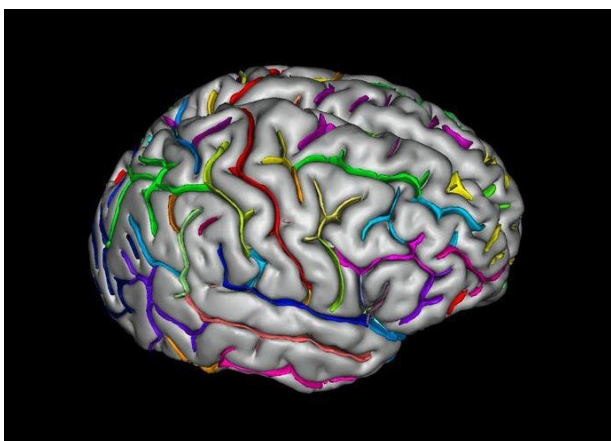
## PET/MRI



Biodistribution of marketed drug using  
PET / MRI microdosing  
(Marie et al., 2019)



Diffusion MRI image  
© J-F.Mangin / V El Kouby /  
M.Perrin / Y. C.



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