Unité en Sciences Biologiques et Biotechnologies

UMR 6286
CNRS / Nantes University

History

2004

U3B
Biocatalyse
Biotechnologie
Biorégulation

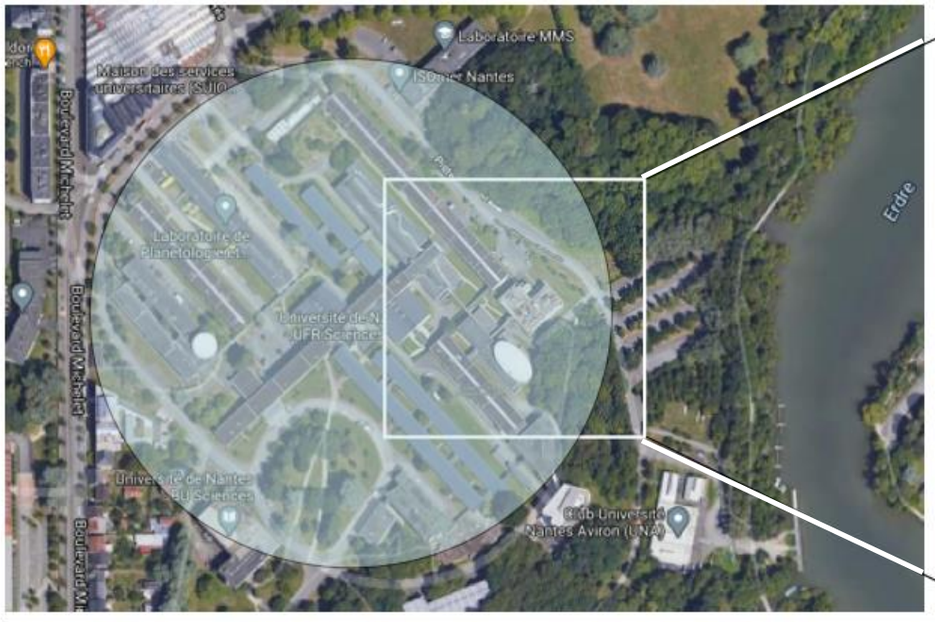
2012

UFIP
Unité Fonctionnalité et
Ingénierie des Protéines

2020

Implantations

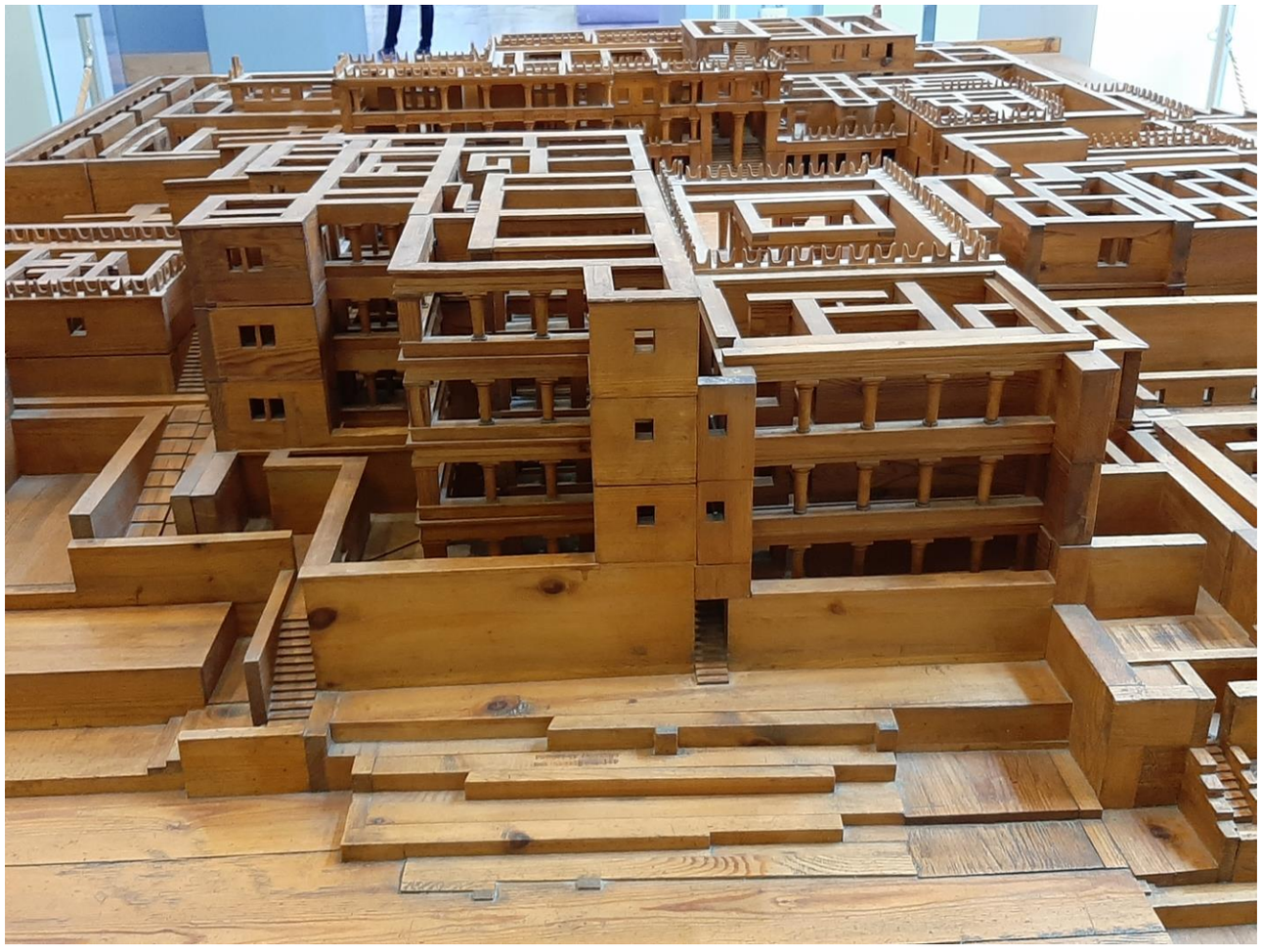
- Nantes University, Faculty of Sciences & Techniques, on the borders of Erdre river
- Institut de Cancérologie de l'Ouest (ICO)



https://www.institut-cancerologie-ouest.com

Implantations

Implantations



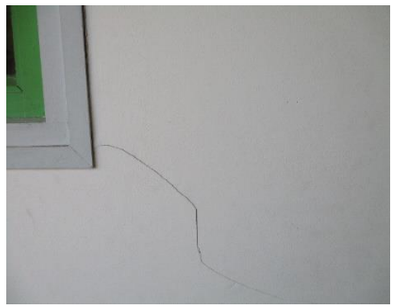
Implantations

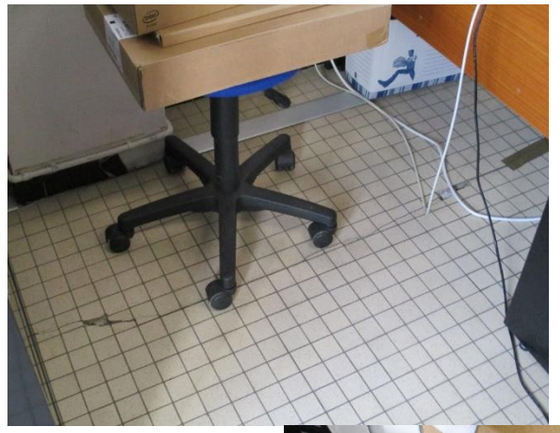
Implantations

Implantations

Laboratoires

Bureau



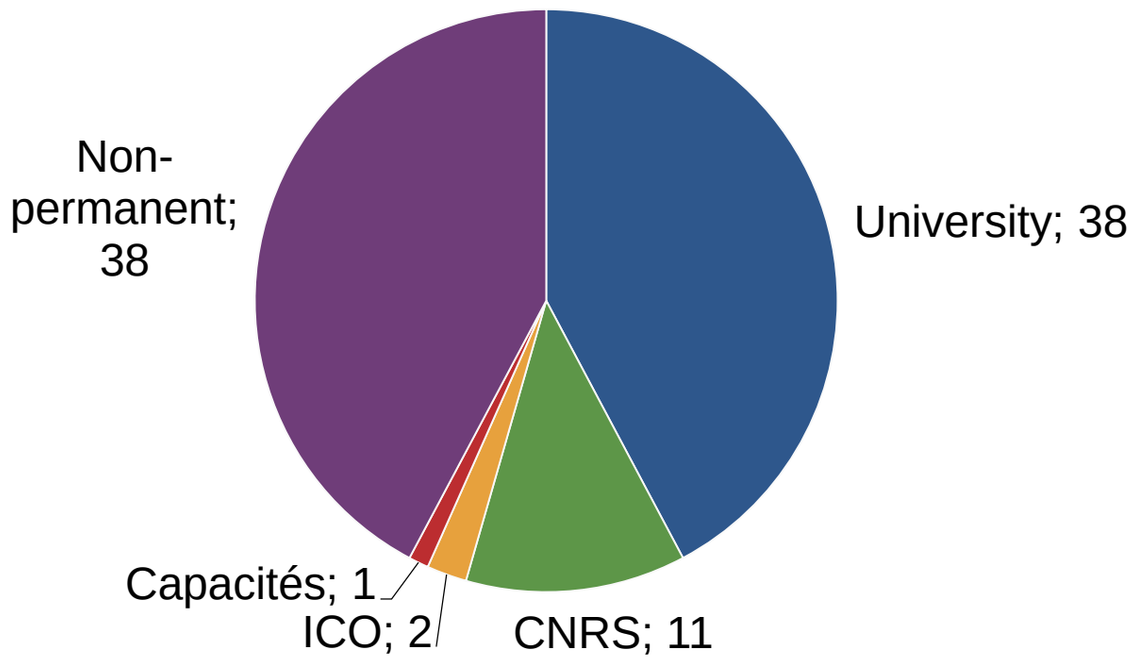


Secrétariat

Implantations

Staff

- Staff: 92 members
  (as from Sept 25, 2023)
  - 54 permanent members
    - 25 university faculties
    - 4 CNRS researchers
    - 2 ICO researchers
    - 13 ITRF (1 admin)
    - 7 ITA CNRS
    - 1 Capacités
    - 2 COB
  - 38 non-permanent members
    - 22 PhD students (13 foreigners)
    - 4 Post-Docs (2 foreigners)
    - 12 ITRF or ITA (2 admin)



Highly involved in training

Scientific organisation

Unité en Sciences Biologiques et Biotechnologies (US2B)

Directeur : Bernard Offmann (PU Univ) - Directeurs adjoints : Cyrille Grandjean (DR CNRS) et Philippe Simier (PU Univ)

- Équipe de Bioinformatique Structurale (YH Sanejouand, DR CNRS)
- Ingénierie moléculaire et glycobiologie (C. Grandjean, DR CNRS)
- Mécanismes et régulation de la réparation de l'ADN (F. Fleury, PU Univ)
- Epigénomiques des microalgues et interactions avec l'environnement (L. Tirichine, DR CNRS)
- Interactions plante-plante et signaux rhizosphériques (Ph. Delavault, PU Univ)

- Plateforme IMPACT (C. Charlier)
- Cellule de compétences DZYME (C. Grandjean)

Functional organisation

LAB COUNCIL
Life of the Unit
International
Valorisation

Directeur
B. Offmann (PR)

Secrétariat/Gestion

Health and Safety
GMO
Rehab bldg 8
Security IT

Scientific animation

COMPETENCY CELL
CAPACITÉS

SFR SANTÉ
ED BIOLOGIE-SANTÉ

Dir. Adj.
Cyrille Grandjean (DR)

Dir. Adj.
Philippe Simier (PR)

SFR QUASAV
ED VAAME

Eq 1 :
Bioinformatique structurale
Y-H. Sanejouand
(DR CNRS)

Eq 2 :
Ingénierie moléculaire et glycobiologie
C. Grandjean
(DR CNRS)

Eq 3 :
Mécanisme et régulation de la réparation de l'ADN
F. Fleury (PR)

Eq 4 :
Interactions plante-plante et signaux rhizosphériques
Ph. Delavault (PR)

Eq 5 :
Epigénomique des microalgues et interactions avec l'environnement
L. Tirichine (DR CNRS)

In-house platforms: IMPACT (Molecular Interactions), *Biological Cultures, Epigenomics*
Network of Platforms: Biogenouest

Scientific orientations

- **Our vision:** develop a high level **basic research** in **biochemistry** and **biology** (*in silico*, *in vitro*, *in cellulo & in vivo*) and keep a strong multidisciplinary expertise.
- **Our aim within next 5 yrs:** develop a high level **integrative biochemistry** and **biology** research for
  - deciphering how **protein function** and **biological activity** are regulated
  - developing **innovative biotechnologies**

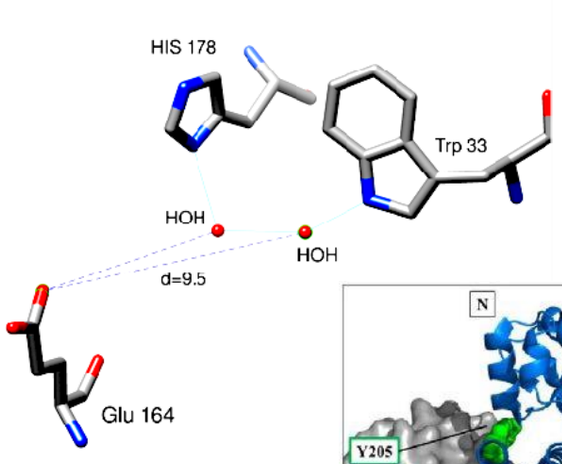
Research topics

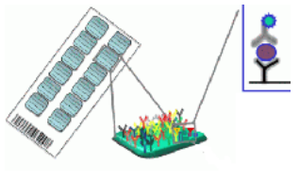
Main topic

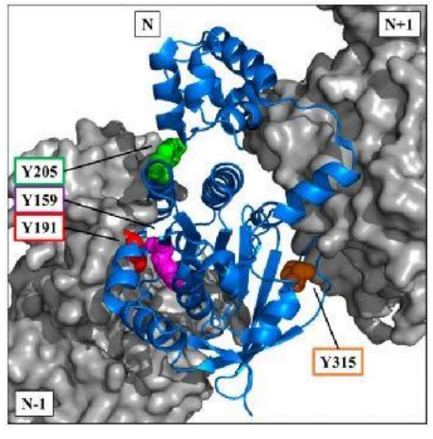
Functions of proteins and bio-regulation

Protein biochemistry

regulation of protein function, structure prediction, molecular interactions, protein design

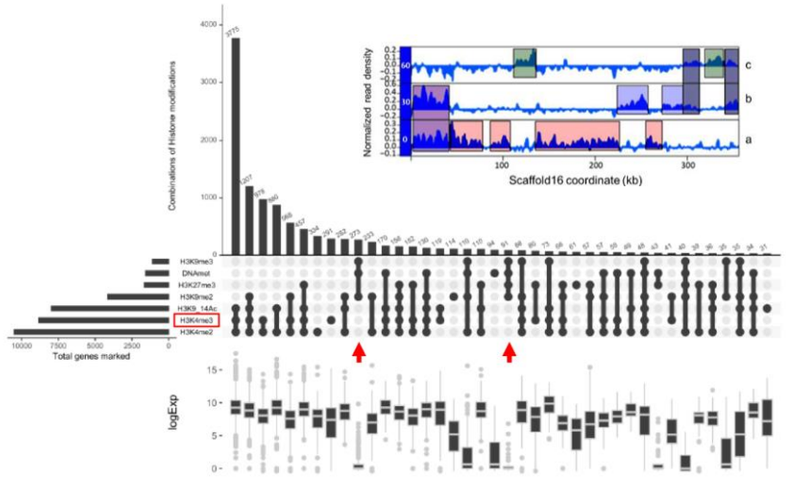




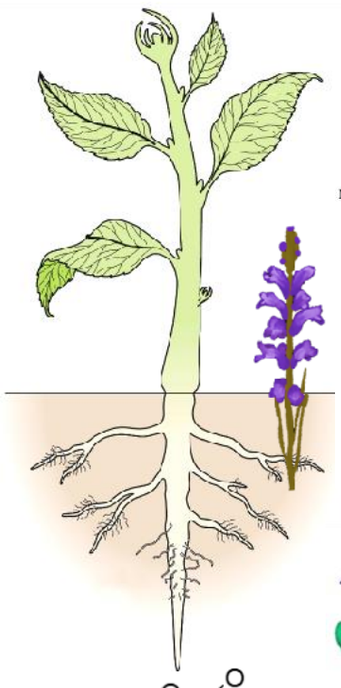


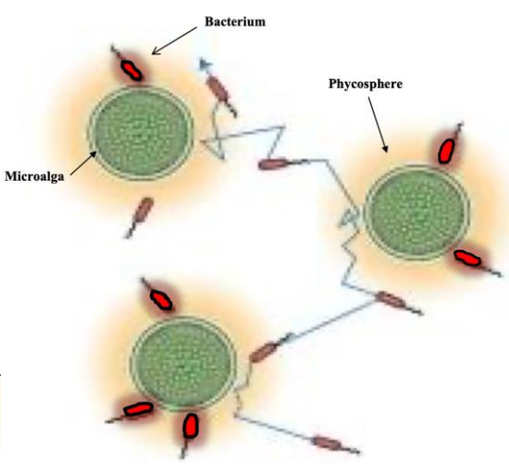
Epigenetic regulation

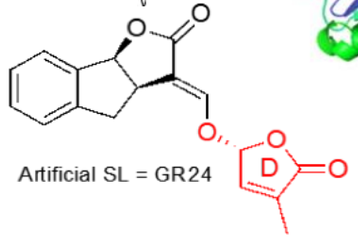
Epigenomics



Molecular basis of biological inter-actions







Nantes Université

Unité en Sciencas Biologiques et Biotechnologies

#4: Plant-Plant interactions and rhizospheric signals

Philippe Delavault (11 permanent + 5 PhD members)

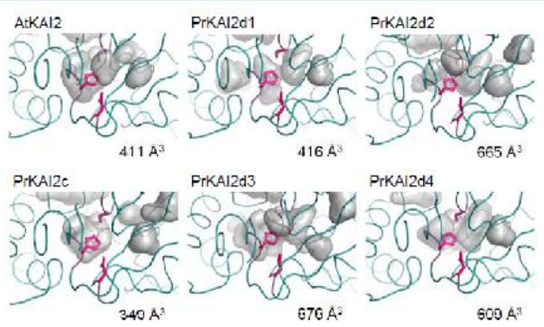
Philippe Delavault (PR)
Hocine Benharrat (MCU)
Grégory Montiel (MCU)
Lucie Poulin (MCU)
Jean-Bernard Pouvreau (MCU)
Philippe Simier (PR)
Séverine Thoiron (MCU)
Christophe Véronesi (MCU)

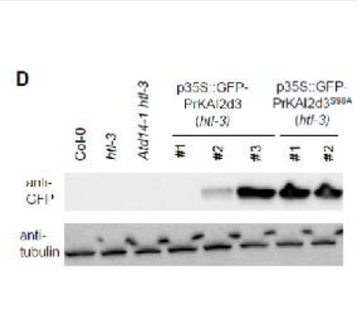
Sabine Delgrange (AJT)
Adeline Dintheer (TCH CDD)
Johannes Schmidt (TCH)

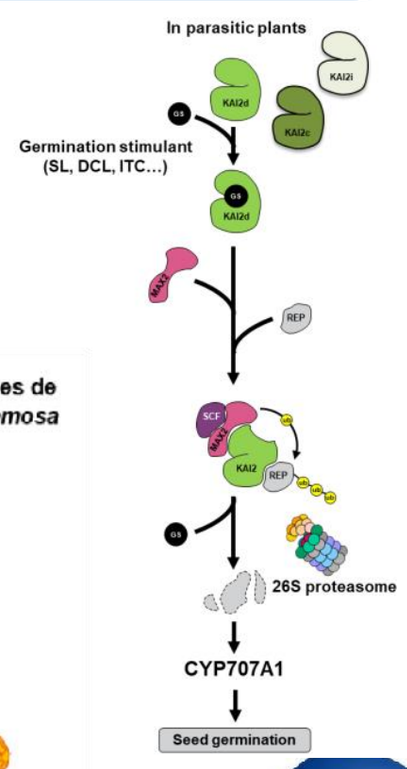
OBJECTIVES

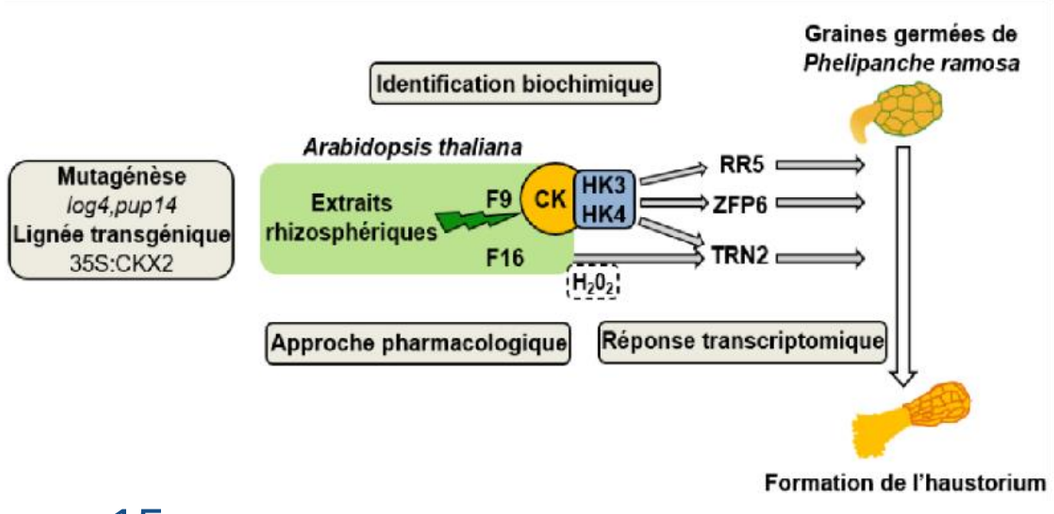
- **Molecular determinisms of plant - parasitic plant interactions:** chemical factors and receptors involved
- **Involvement of rhizospheric microbiota:** reconstitution of tripartite model interactions
- **Genetic ressources and applications**

- **Main expertises:**
  - Protein biochemistry, metabolomics, transcriptomics, plant biology and physiology, molecular biology, genetic engineering









#5: Epigenomics of micro algae and interactions with the environment

Leila Tirichine (4 permanent + 11 non-permanent members)

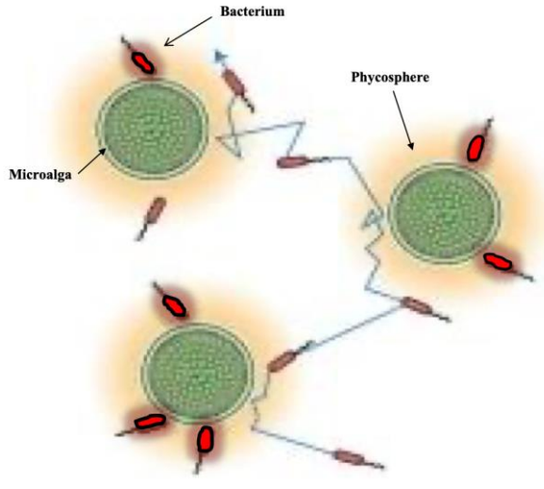
Leila Tirichine (DR CNRS)
Céline Duc (MCU)
Agnès Sebart-Groisillier (IR CNRS)
Carine Pruvost (AJT) 20%

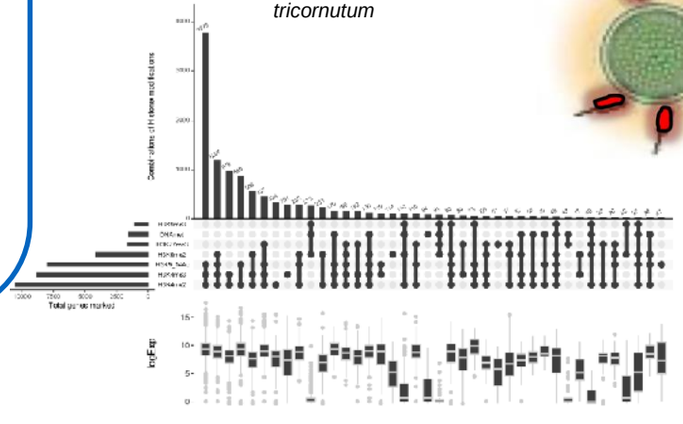
OBJECTIVES

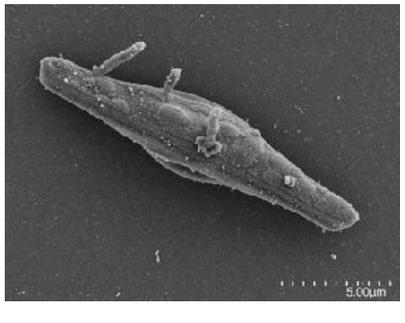
- ***P. tricornutum* epigenomics:** reference epigenome, natural accessions diversity
- **Molecular mechanisms of microalgae-bacteria cross talk**: for nitrogen fixation
- **Socio-microbiology:** phenotypic heterogeneity of nitrogen fixing bacteria in the phycosphere
- **100 diatoms genomes**
- **µAlgae factories**

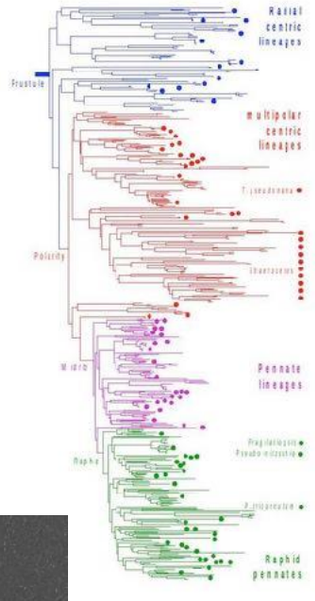
- **Main expertises:**
  - environmental epigenetics & epigenomics, bioinformatics, microbiology, cell biology, molecular biology, genetic engineering

Phaedactylum tricornutum









#3: Mechanism and regulation of DNA repair

Fabrice Fleury (19 permanent + 10 non-permanent members)

Equipe 3
Mécanisme et régulation de la réparation de l'ADN

Fabrice Fleury (PR)
Houda Benhelli-Mokrani (MCU)
Christine Bobin-Dubigeon (MCU-PH)
Alain Defontaine (COB)
Yvonnick Chéraud (MCU)
Antoine Chalopin (PH ICO)
Dominique Heymann (PU-PH)
Marie-Christine Heymann (PU-PH ICO)
Dimitri Levitsky (COB)
Javier Munoz-Garcia (Ch ICO)
Vincent Potiron (Ch ICO)
Axelle Renodon-Cornière (CR CNRS)
Stéphane Supiot (PU-PH)
Pierre Weigel (MCU)

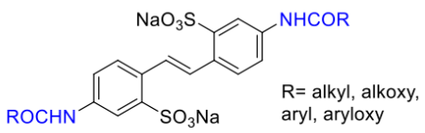
Franck Bertorelle (IR CNRS) 50%
Damien Marquis (TCH)
Vanessa Ménil (TCH CNRS)
Carine Pruvost (AJT) 40%
Céline Robiou du Pont (AJT)

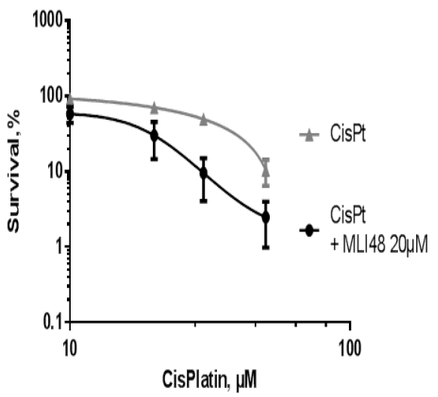
OBJECTIVES

- **Modulation of Rad51 activity:** chemical inhibitors, (synthetic and natural molecules), *in vivo* screening
- **Role of a new phosphorylation of Rad51**: *in cellulo* studies, new cellular models (CRISPR/Cas9), appl. to TNBC screening
- **Biotechnological development**: carbon dots, biosensors, xenograft

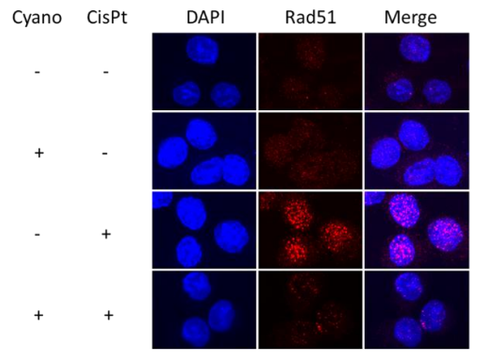
Expertises

- protein biochemistry,
- cell biology, protein arrays,
- drug screening, biophysics
- nanotechnology

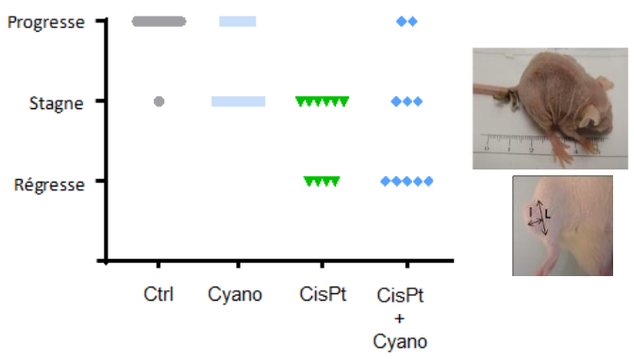




Clonogenic assay
(CisPt treatment +/- MLI48 at 20µM)



RAD51 foci formation (CisPt treatment)



Tumoral progression (*CisPt treatment +/- MLI48*

#3: Mechanism and regulation of DNA repair

Fabrice Fleury (19 permanent + 10 non-permanent members)

Equipe 3
Mécanisme et régulation de la réparation de l'ADN

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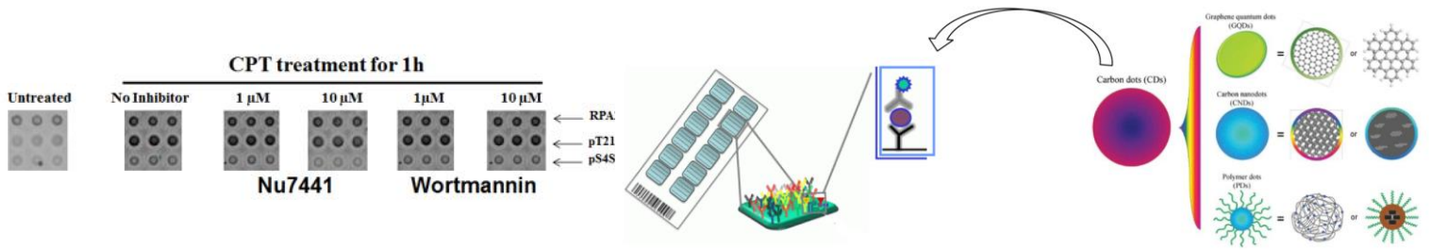
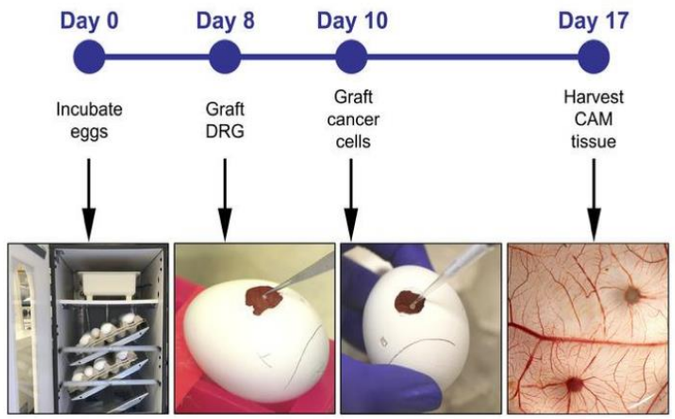
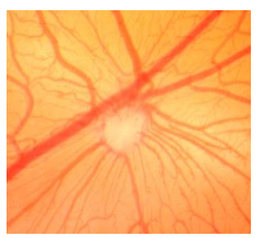
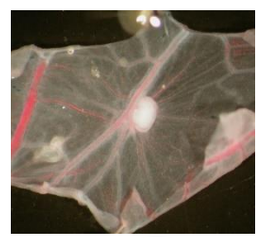
- **Biotechnological development**: carbon dots, biosensors, xenograft (chorio-allantois Membrane)

- **Expertises**
  - protein biochemistry,
  - cell biology, protein arrays,
  - drug screening, biophysics
  - nanotechnology









Plateforme IMPACT

IMPACT
Interactions Moléculaires Puces ACTivités

EXPERTISE : PROTÉOMIQUE FONCTIONNELLE

PROFILING

Profils d'abondance protéiques

Profils des modification de protéines cibles (MPT)

CRIBLAGE MOLECULAIRE

Identification de modulateurs d'interaction : protéines, peptides, petites molécules

CARACTERISATION/VALIDATION DES INTERACTIONS

Affinité, K_{on}, K_{off}, stœchiométrie, contributions enthalpique et entropique

ANALYSE ET INTEGRATION DE DONNEES

Développement de nouveaux outils ✧Galaxy

Spotter sciFLEXARRAYER S3 (Scienion)

Scanner Odyssey CLx (LiCor)

Protein arrays

SPR - Biacore 3000
Biacore T200 (GE)

Technologies Alpha et Label Free
EnSpire (Perkin Elmer)

SPRiplex II
(Horiba)

☑ Profiling
☑ Criblage
☑ Caractérisation
☑ Contrôle qualité

Technologie BLI
BLItz System
(ForteBIO – Pall Life Sciences)

Fluorescence/anisotropie fluorescence
Spectrofluorimètre FP-6500
Photomètre de polarisation
de fluorescence FP-715 (Jasco)

Dichroïsme Circulaire et linéaire
Spectropolarimètre J-810 (Jasco)

Microcalorimètre Auto iTC200 (GE)

HTRF / BRET / FRET / AF
Mithras LB940

LOCALISATION

IMPACT

2 sites

Unité de fonctionnalité et ingénierie des protéines
UFIP - UMR 6286 CNRS

Centre de Recherche en Cancérologie et Immunologie Nantes-Angers
CRCINA
INSERM UMR1232 CNRS
ERL6001

Faculté des Sciences
Campus Lombarderie 2, rue de la Houssinière
44 000 Nantes

SFR Santé F. Bonamy
FED 4203/UMS Inserm 016/CNRS 35568
IRS 2 - 22 Boulevard Benoni Goullin
44200 Nantes

17/03/2020 Gen2Bio

INNOVATION

BIOPUCES ANALYTIQUES / DIAGNOSTIC

Diagnostic & recherche pharmaceutique

Nouveaux systèmes d'analyse

BIOPUCES FONCTIONNELLES

Interactions protéine-protéine, protéine-ligands

Etudes des MPT (Phosphorylation, glycosylation ..)

Puces à cellules/interactions aux interfaces

Etudes de complexes multimoléculaires

ANALYSE ET INTÉGRATION DE DONNÉES

Données MTS et HTS issues des profils d'expression ou du criblage

Données publiques (ou analyses de la plateforme) et données virtuelles

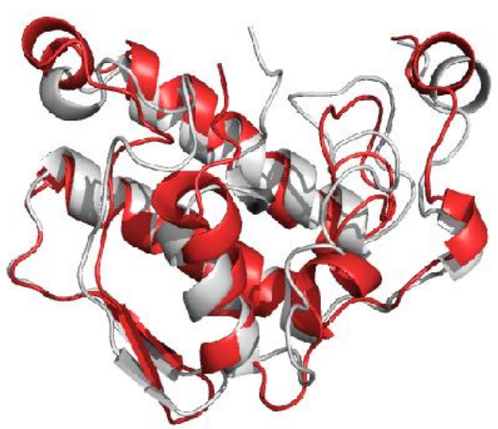
Nantes Université

#1: Structural Bioinformatics Team

Yves-Henri Sanejouand (5 permanent + 2 non-permanent members)

Equipe 1
Bio-informatique structurale

Yves-Henri Sanejouand (DR CNRS)
Bernard Offmann (PR)
Stéphane Téletchéa (MCU)
Johann Hendrickx (IE CNRS)
Lionel Hoffmann (IE CNRS)



OBJECTIVES

- **Development of methods** to understand
  - the **sequence-structure relationship** (fold recognition, protein design)
  - **structure-flexibility-function relationship** (sampling methods, role of the zero-point energy)
- **Applications of standard methods:** molecular recognition, drug design, protein engineering

- **Main expertises**
  - structural bioinformatics
  - molecular modelling
  - machine learning
  - software development

$$A_{\mathrm{vib}} = \sum^{n_{\mathrm{dof}}} \frac{1}{2} h\nu_i + \sum^{n_{\mathrm{dof}}} kT \ln\left(1 - e^{-\frac{h\nu_i}{kT}}\right)$$

Fold recognition

```
SNISRQAYADMFGPTVGDKVRLADTELWIEVED
DLTTYGEEVKFGGGKVIRDGMGQGQMLAADCVD
LVLTNALIVDHWGIVKADIGVKDGRIFAIGKAG
NPDIDIQPNVTIPIGAATEVIAAEGKIVTAGAS
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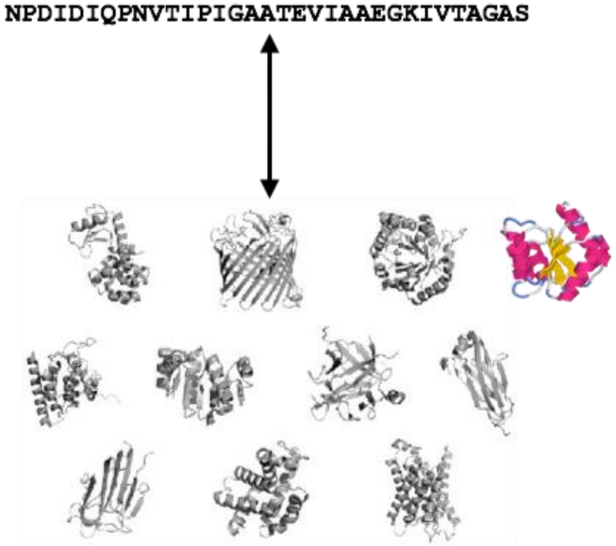

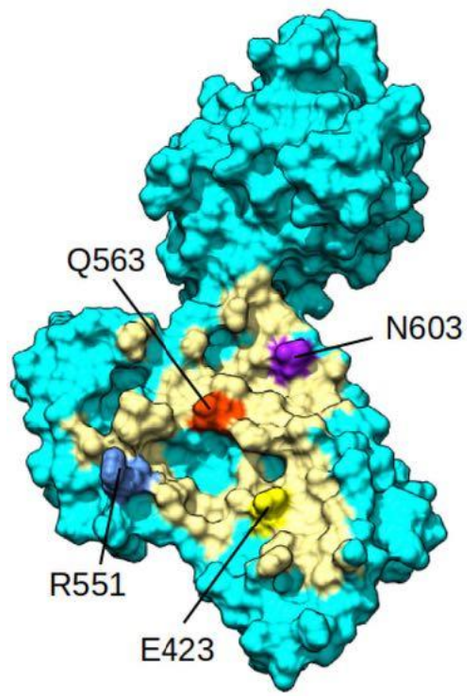

Nantes Université

#2: Molecular engineering and glycobiology

Cyrille Grandjean (14 permanent + 7 non-permanent members)

Cyrille Grandjean (DR CNRS)
Corinne André-Miral (MCU)
Emilie Camberlein (MCU)
Franck Daligault (MCU)
François Delavat (MCU)
Richard Guillonneau (MCU)

Emmanuelle Courtois (AI)
Amina Fateh (AJT)
Franck Bertorelle (IR CNRS) 50%
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- **Glyco-recognition engineering**: inhibitors for galectins, lectin engineering
- **Anti-infectious glyco-technology**: glycoconjugate vaccines, bacterial sialidase inhibitors

- **Main expertises:**
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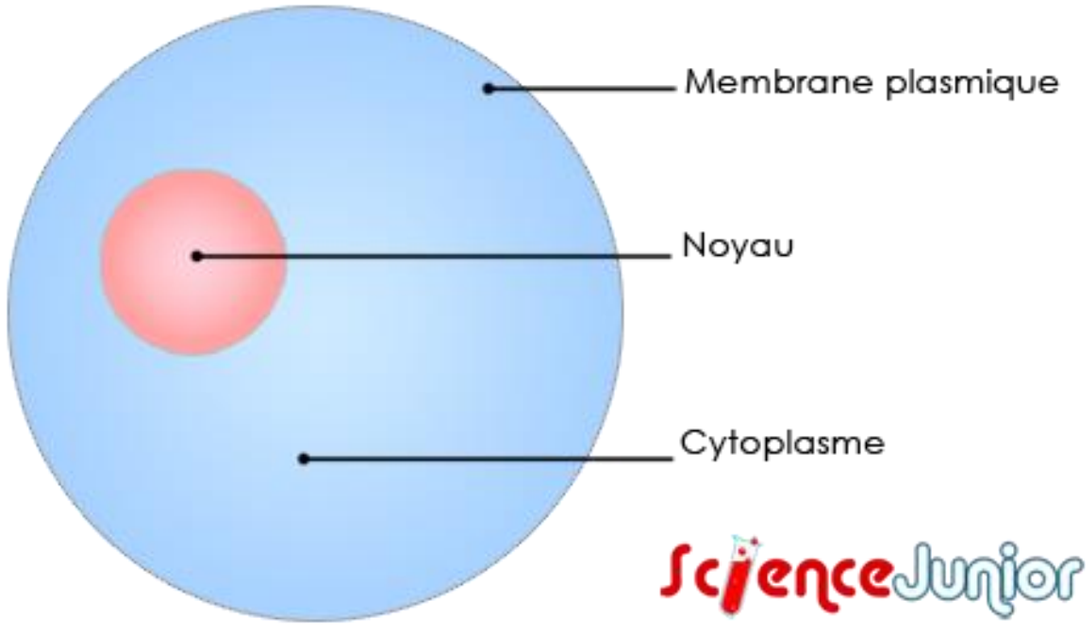

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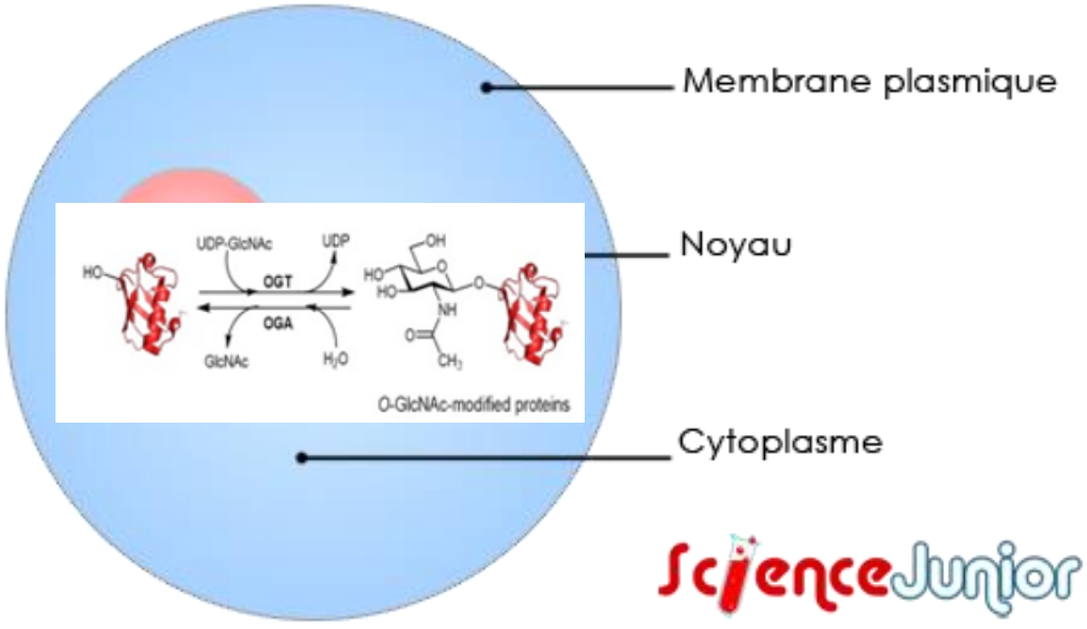

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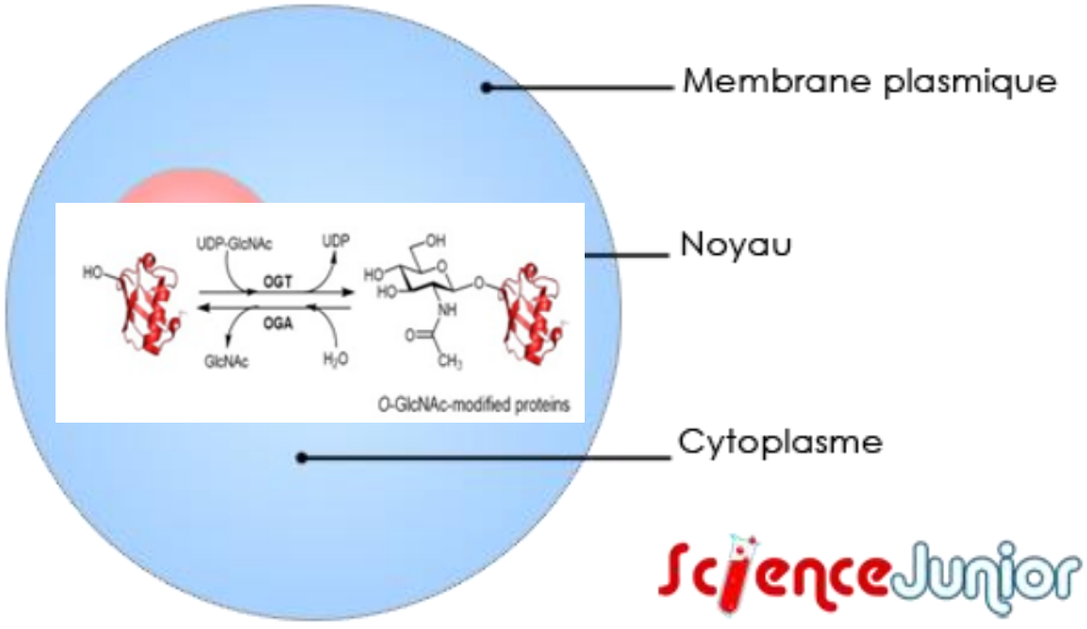

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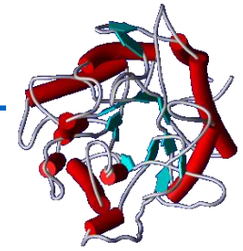

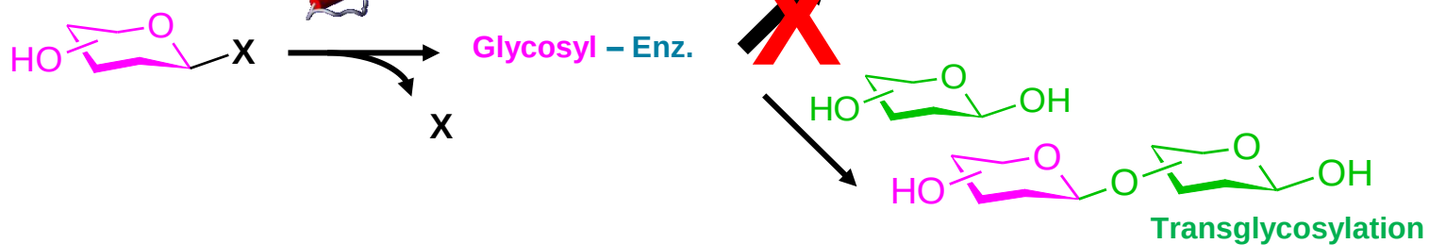

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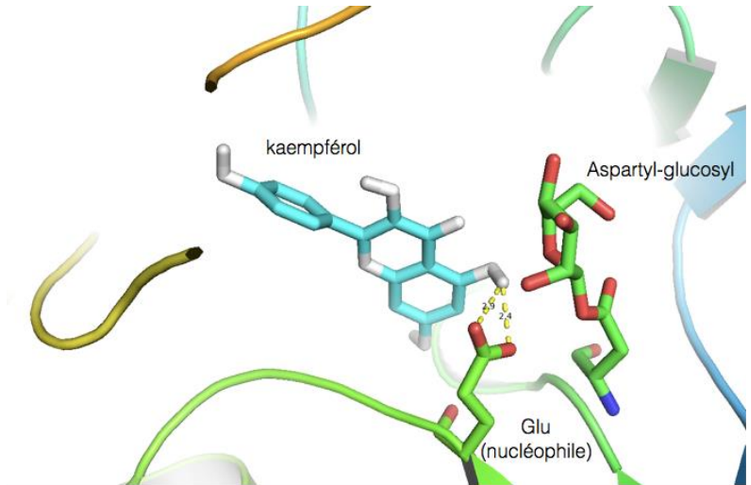

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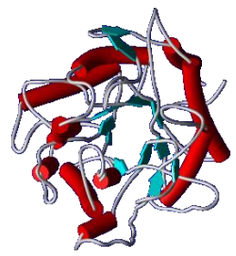

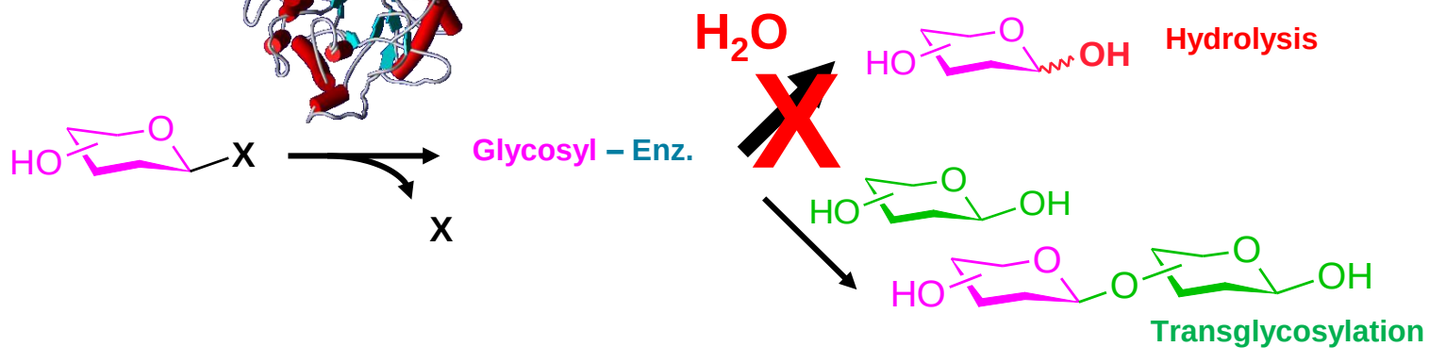

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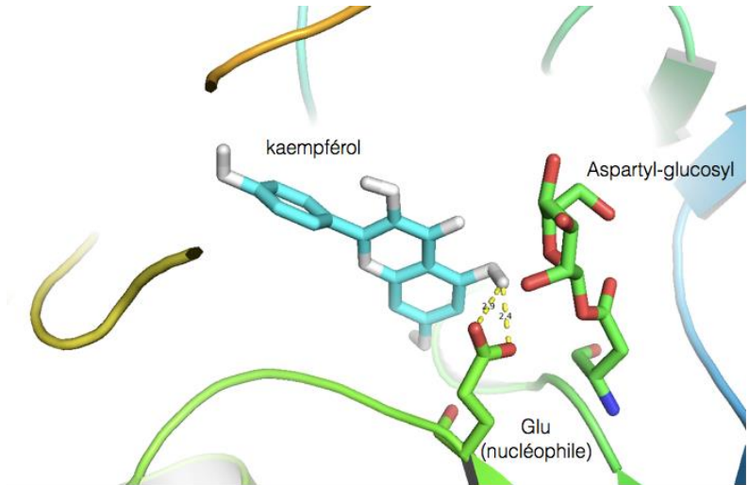

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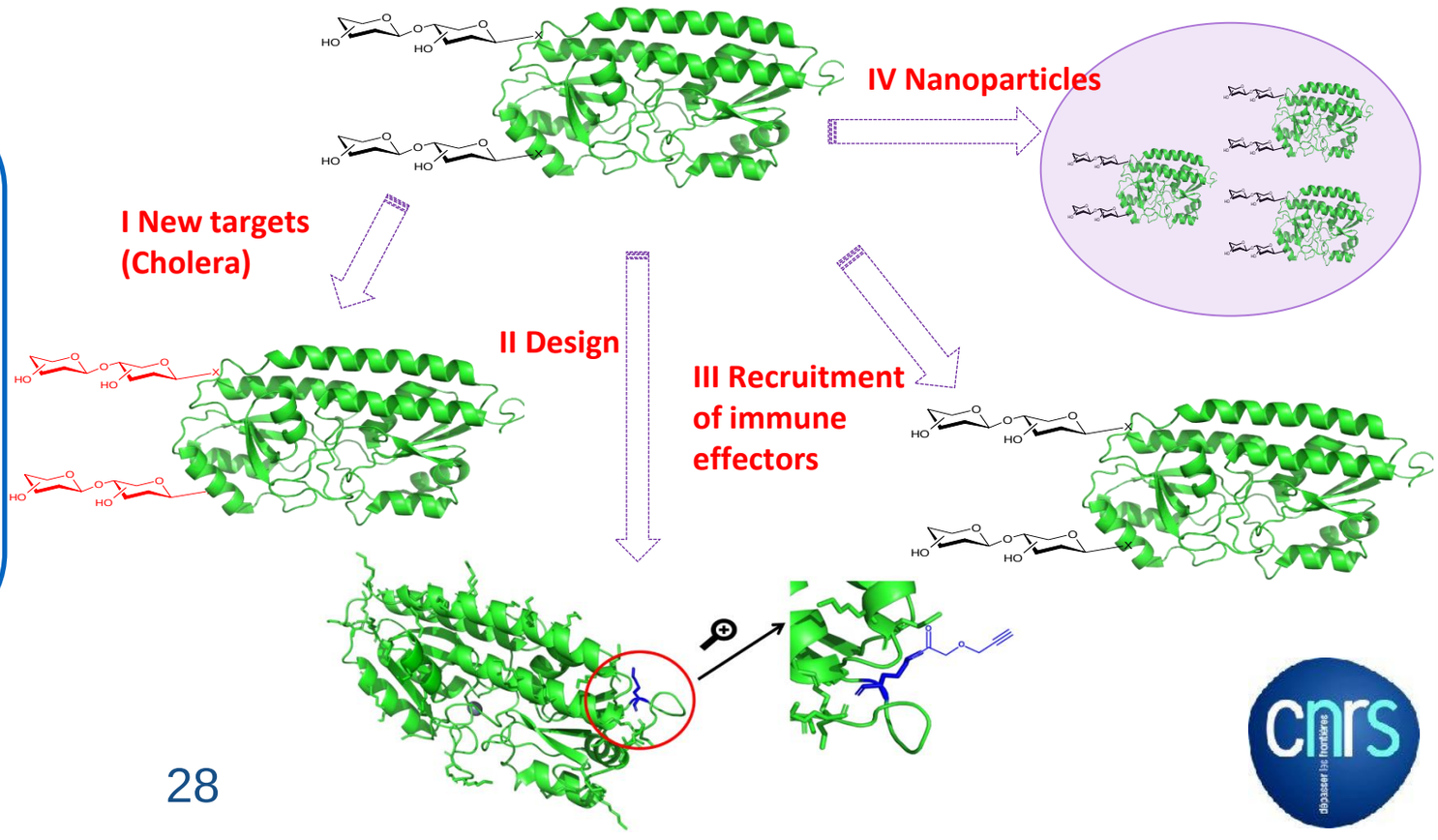


DZYME (valorisation of our expertise)

Snapshot:

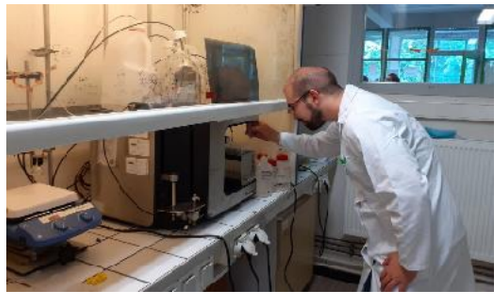
Enzymology & glycochemistry

Our services are based on the association of our expertise in enzymology and glycosciences

Enzymology

Ingénierie enzymatique | Évolution dirigée | Mutagenèse aléatoire | Optimisation de procédés | Synthèse enzymatique

Glycochemistry



Synthèse de glycosides | Elaboration de glycoconjugués | Dosage de glycomolécules

Glycoconjugation

Modélisation d'interactions | Production de lectines/glycosidases | Mesures d'affinité et d'activité

Applied glycotechnologies

Cosmétique | Santé | Nutracéutique | Feed & food

Supporting labs

DZYME's clients:

Nantes Université

US2B
Unité en Sciences Biologiques et Biotechnologies

cnrs
dépasser les frontières

Thank you for your attention