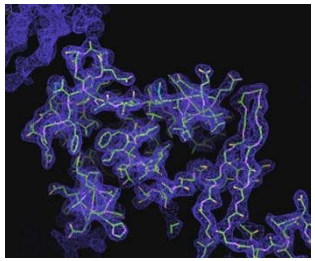
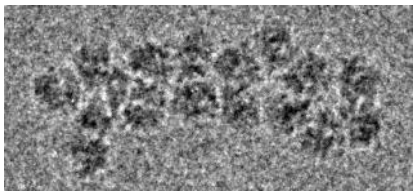
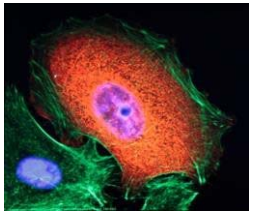




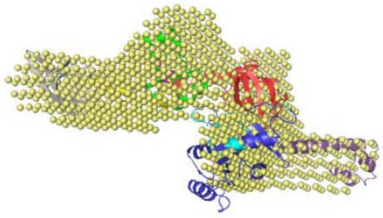


RéNaFoBiS

Réseau National de Formation en Biologie Structurale Intégrative

École Nationale de Biologie Structurale Intégrative

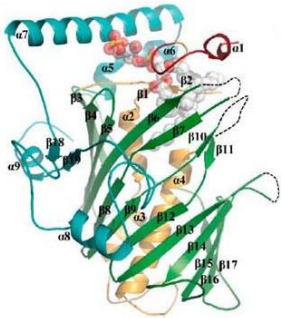
18 -25 Juin 2021, Ile d'Oléron, France



FRISBI

Integrated Structural Biology

INVESTISSEMENTS D'AVENIR



Anton Paar

ThermoFisher SCIENTIFIC

DECTRIS detecting the future

AFC

NovAliX

SARTORIUS

HKL Research, Inc.

Sfμ

nanoTEMPER

JEOL Solutions for Innovation

Fidabio

igbmc institut de génétique et de biologie moléculaire et cellulaire

INVESTISSEMENTS D'AVENIR

FRISBI Integrated Structural Biology

cea DE LA RECHERCHE À L'INDUSTRIE

Instituts thématiques Inserm Institut national de la santé et de la recherche médicale

cnrs dépasser les frontières

ESRF The European Synchrotron

SOLEIL SYNCHROTRON

UNIVERSITE PARIS SUD université PARIS-SACLAY

Aix*Marseille université

UNIVERSITÉ DE STRASBOURG

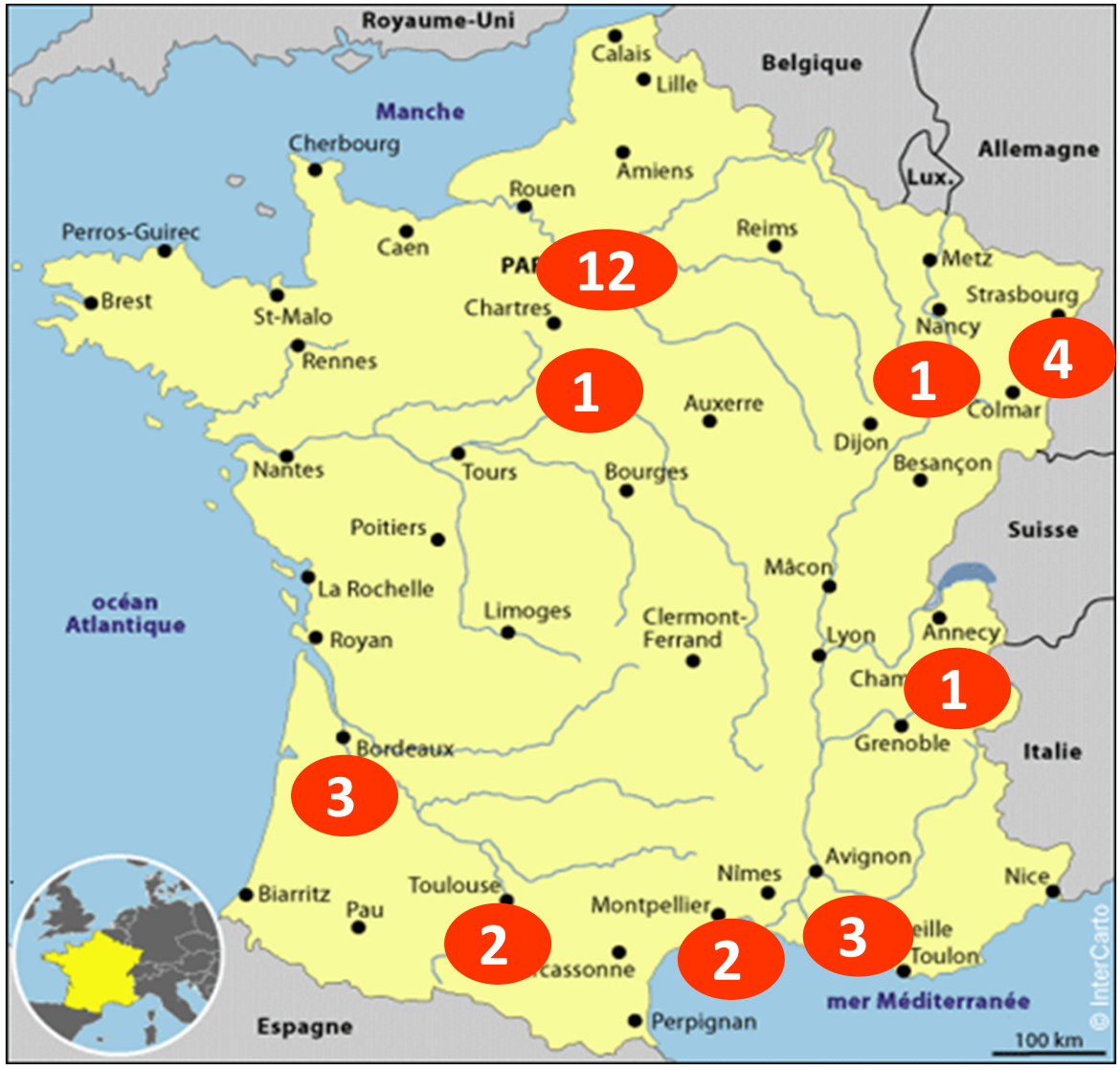
UNIVERSITÉ Grenoble Alpes

UNIVERSITÉ DE MONTPELLIER

29 « students »

24 PhD students, 3 IE/IR, 1 AI, 1 Tech

17 F, 12 M

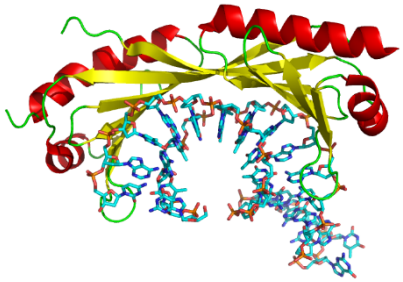


7 tutors « all week »

4 tutors « few days »

2 « remote » speakers

Objectives of Integrated Structural Biology

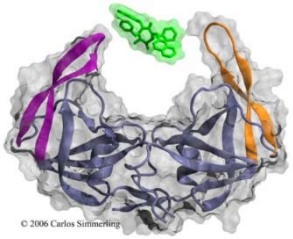


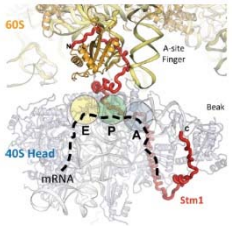
Understand the mechanisms of biological processes

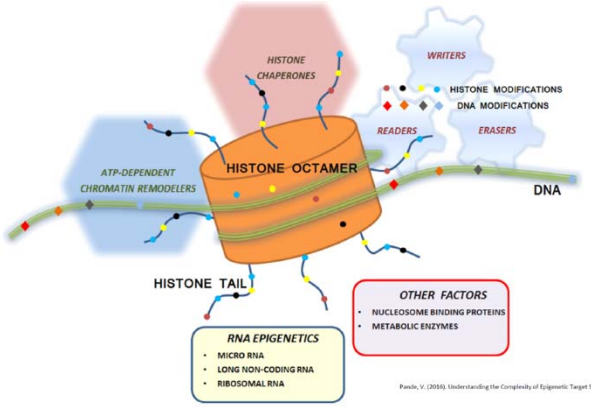
Explore the integration of biological functions in complex molecular and cellular systems.

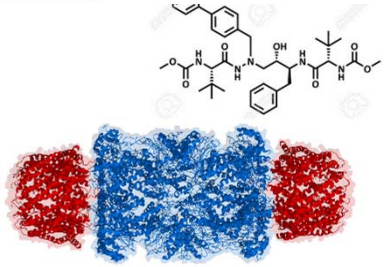
Decipher pathways that lead to pathology

New routes for Drug discovery and Drug design



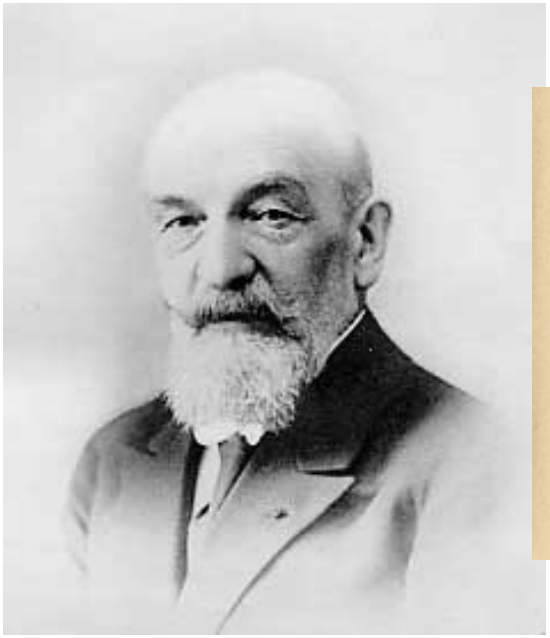


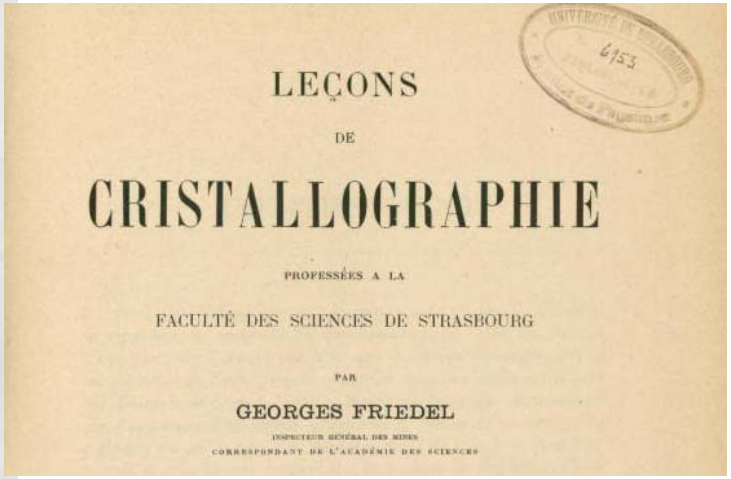




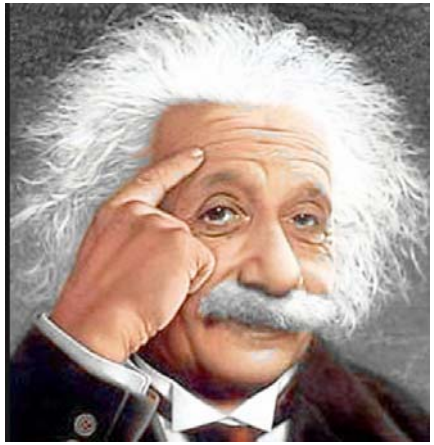

569

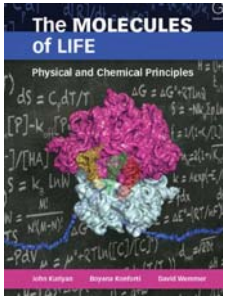
Naissance	19 juillet 1865 Mulhouse (France)
Décès	11 décembre 1933 (à 68 ans) Strasbourg (France)
Nationalité	français
Domaines	Minéralogie
Institutions	École nationale supérieure des mines de Saint-Étienne Université de Strasbourg
Diplôme	École polytechnique (1885)
Renommé pour	Étude des cristaux liquides

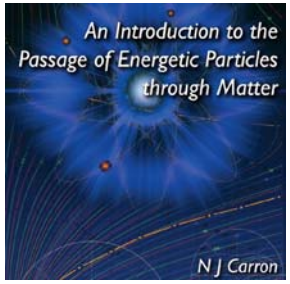


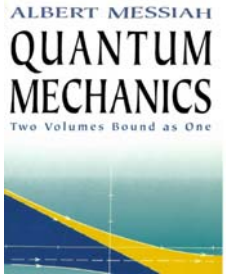


« le but de l'enseignement, et surtout celui de l'enseignement supérieur,
doit être moins d'instruire que d'éduquer et de faire réfléchir ;
moins d'entasser des connaissances que d'apprendre à en digérer quelques-unes ;
moins de glisser sur les difficultés que de les mettre en lumière ;
moins de laisser croire à l'infaillibilité des méthodes en usage et à la certitude des résultats que d'en montrer les points faibles
et de cultiver ainsi l'esprit de critique et de libre examen, base nécessaire de l'esprit de recherche »









Quarterly Reviews of Biophysics 28, 2 (1995), pp. 171–193 171
Printed in Great Britain

The potential and limitations of neutrons, electrons and X-rays for atomic resolution microscopy of unstained biological molecules

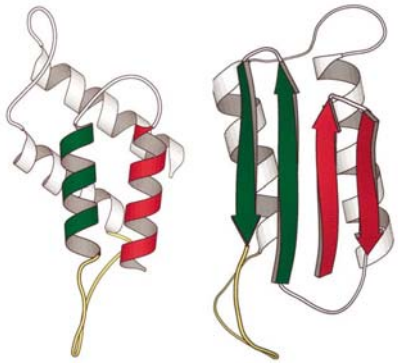
RICHARD HENDERSON
MRC Laboratory of Molecular Biology, Hills Road, Cambridge CB2 2QH, UK

There's Plenty of Room at the Bottom

An Invitation to Enter a New Field of Physics

Lecture on December 29th 1959

by Richard P. Feynman **Nobel Prize in Physics 1965**



What are the most central and fundamental problems of biology today ?

They are questions like:

What is the sequence of bases in the DNA? What happens when you have a mutation ? How is the base order in the DNA connected to the order of amino acids in the protein ? What is the structure of the RNA; is it single-chain or double-chain, and how is it related in its order of bases to the DNA ? How are proteins synthesized ? Where does the RNA go ? How does it sit ? Where do the proteins sit ? Where do the aminoacids go in ? In photosynthesis, where is the chlorophyll; how is it arranged; where are the carotenoids involved in this thing? What is the system of the conversion of light into chemical energy ?

It is very easy to answer many of these fundamental biological questions

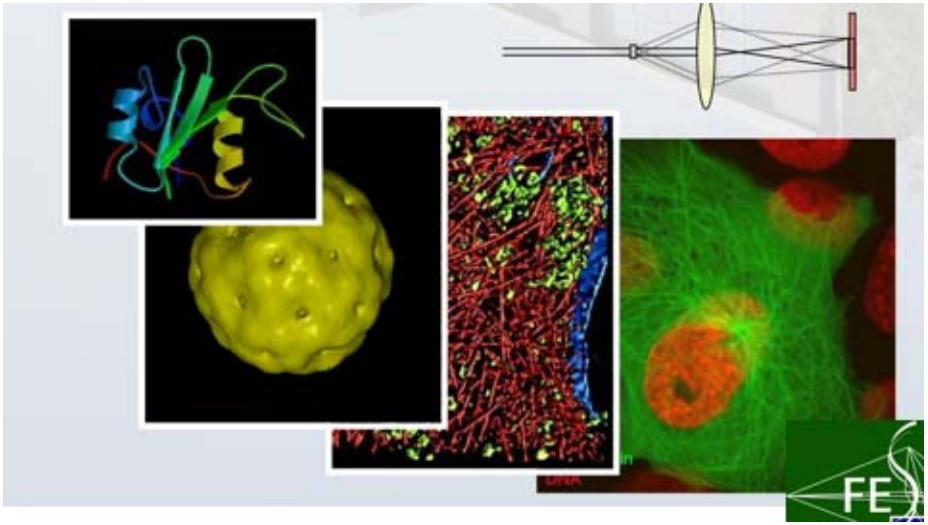
You just *look at the thing!*

Make the microscope one hundred times more powerful, and many problems of biology would be made very much easier.

You know the reason you fellows are making so little progress :

You should use more mathematics

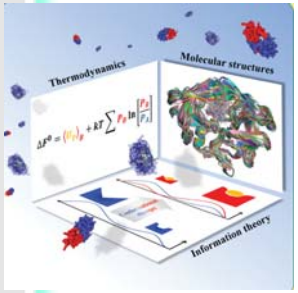
Make the microscope one hundred times more powerful, and many problems of biology would be made very much easier. (1959)



- Develop techniques and methods to see more and more
  - challenges for structural cell biology
- Understand, explain what you see, predict
  - A "new" way of thinking in biology.

    All field of Life Sciences

    At the end of the day, Biology is just Chemistry



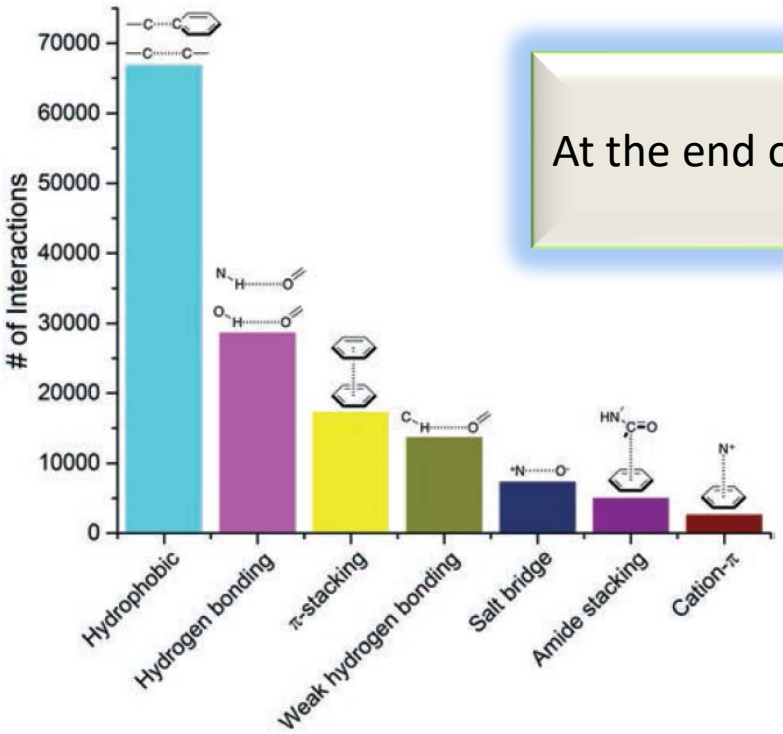
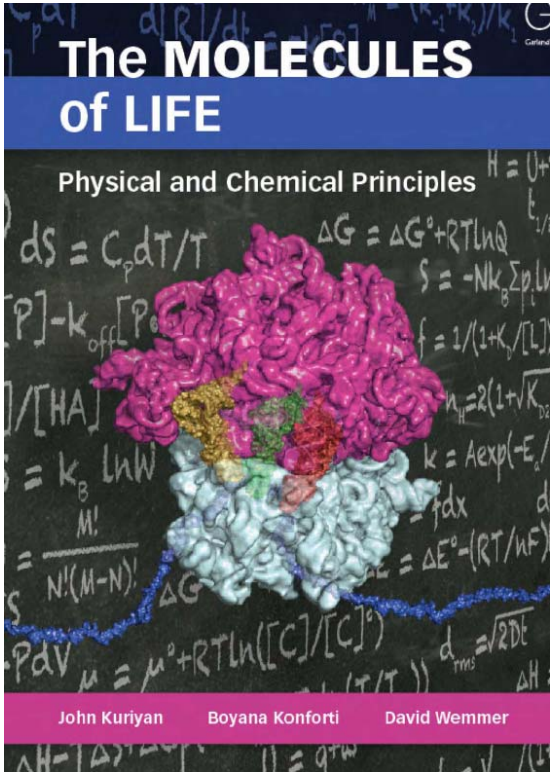


Fig. 1 Frequency distribution of the most common non-covalent interactions observed in protein–ligands extracted from the PDB.

At the end of the day, Biology is Chemistry



Chemistry is not only Thermodynamics but Kinetics

Macromolecular interactions (life) are a compromise between affinity and specificity

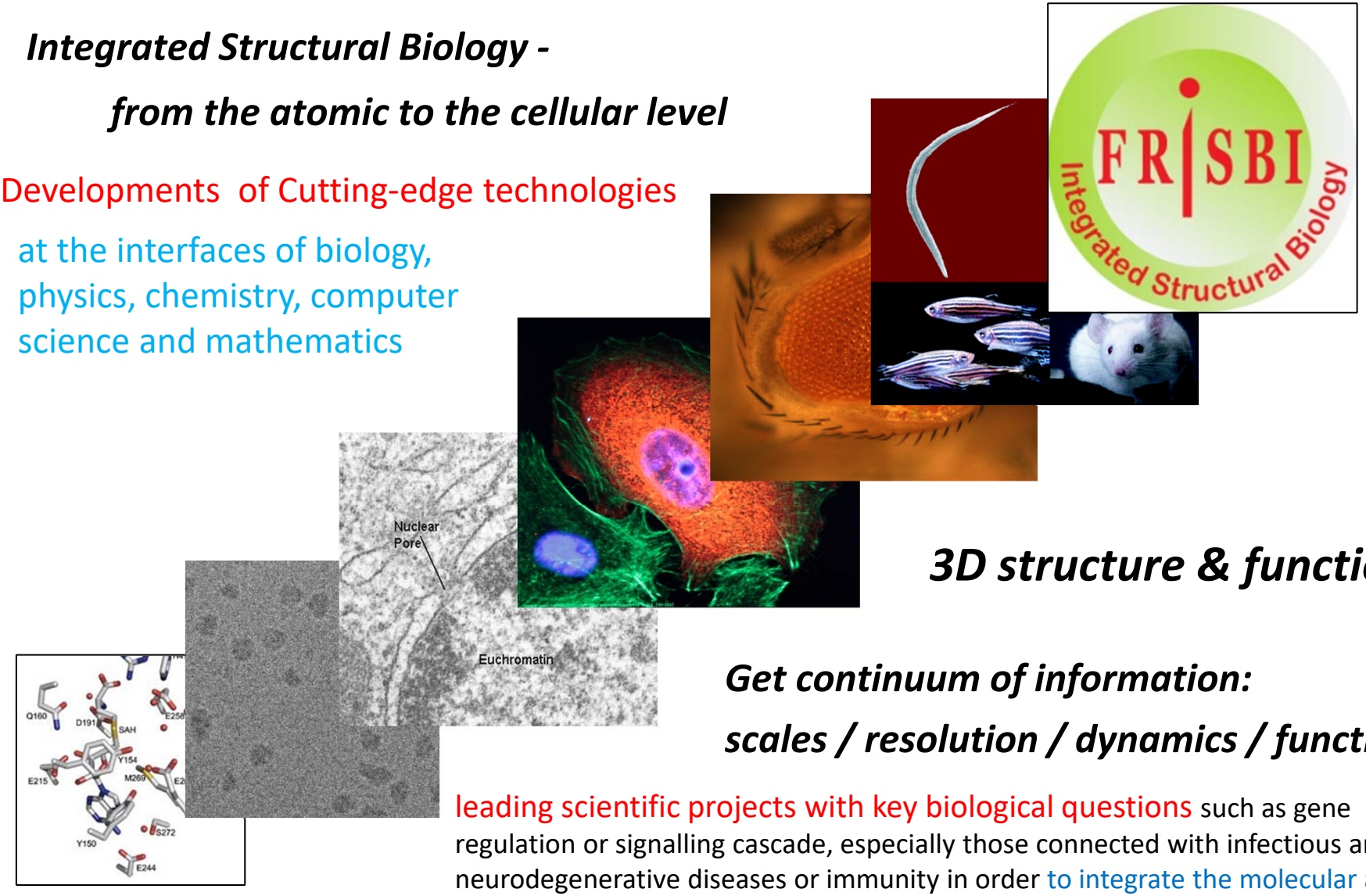
French Infrastructure for **I**ntegrated **S**tructural **BI**ology

Integrated Structural Biology -

from the atomic to the cellular level

Developments of Cutting-edge technologies

at the interfaces of biology, physics, chemistry, computer science and mathematics



3D structure & function

Get continuum of information:

scales / resolution / dynamics / function

leading scientific projects with key biological questions such as gene regulation or signalling cascade, especially those connected with infectious and neurodegenerative diseases or immunity in order to integrate the molecular and cellular complexity of functional systems in healthy and pathological cases.

Fine details in complex environments: the power of cryo-electron tomography

Joshua Hutchings and Giulia Zanetti

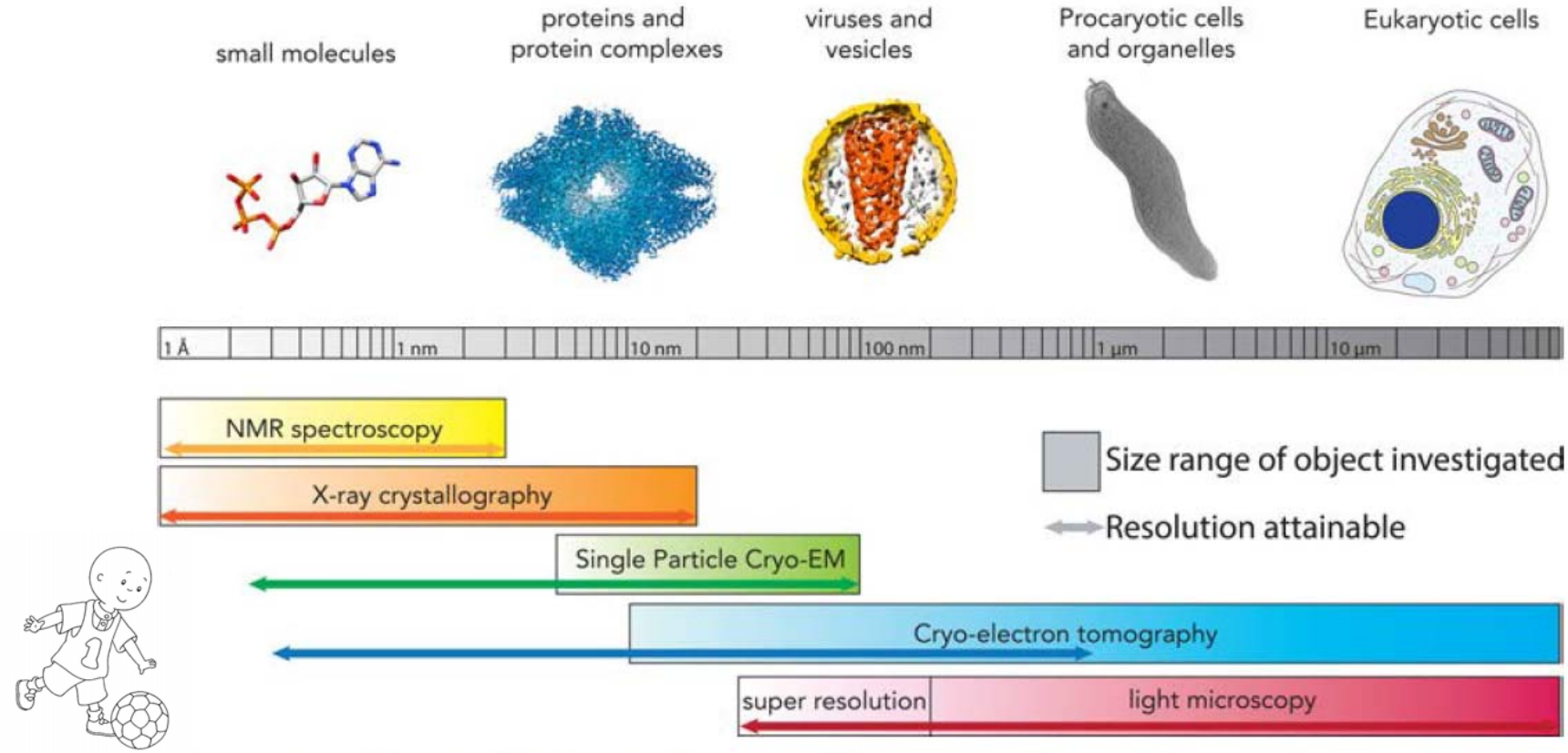


Figure 1. An overview of structural biology techniques and the biological objects they investigate.

The size range of biological objects that can be studied is represented with thick bars, while arrows of corresponding colours indicate the resolution ranges that can be targeted. CET is ideally placed to resolve biological molecules at subnanometer resolutions, while studying large and complex assemblies such as eukaryotic cells. ATP is used as an example of small molecules, EMD-2984 was used as representative protein, a segmented tomogram from Mattei et al. [6] was used as representative of virus, EMD-2754 was used to extract a *Campylobacter jejuni* cell to represent bacteria.

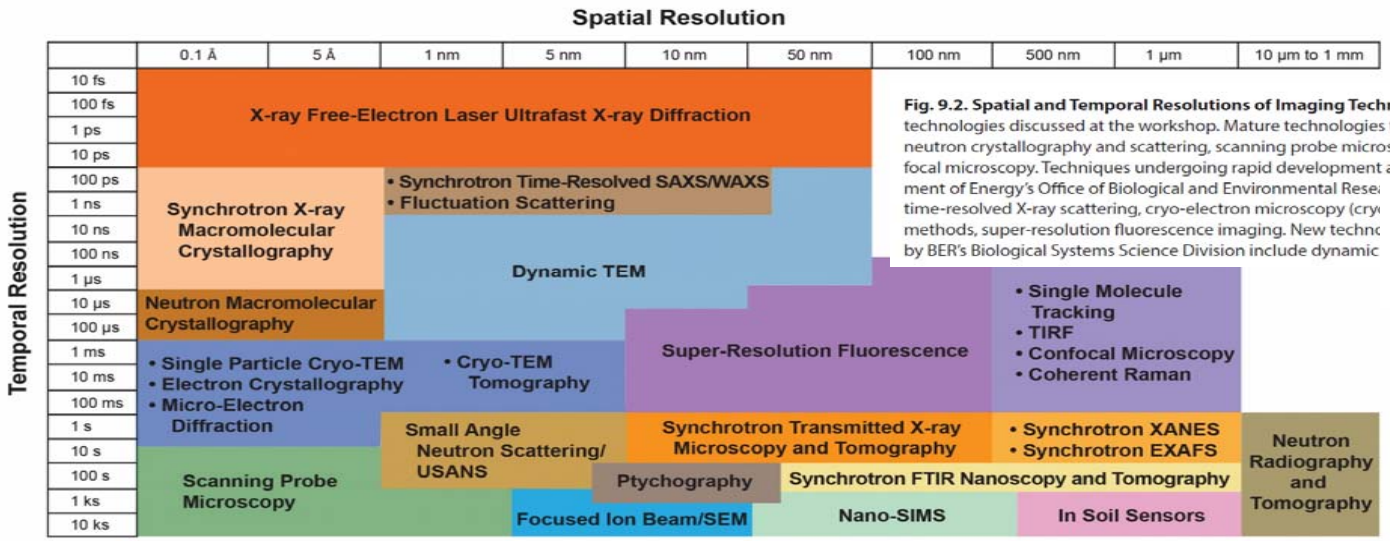
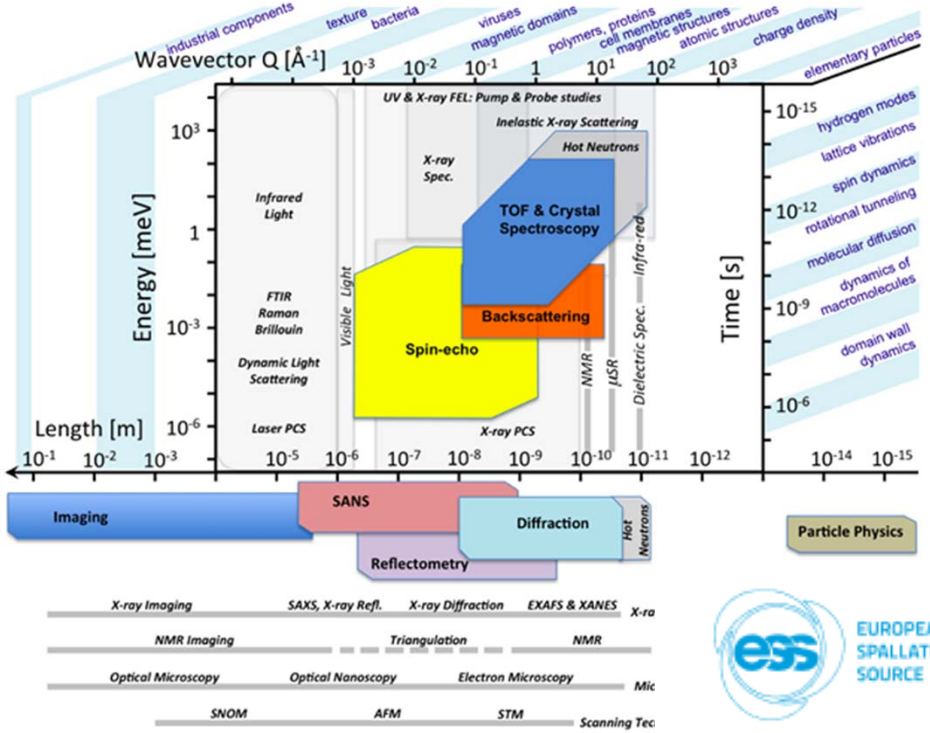


Fig. 9.2. Spatial and Temporal Resolutions of Imaging Technologies. Summary of imaging and other selected measurement technologies discussed at the workshop. Mature technologies that will benefit from further development include X-ray and neutron crystallography and scattering, scanning probe microscopies, X-ray tomography, synchrotron spectroscopy, and confocal microscopy. Techniques undergoing rapid development and with potential application to the mission of the U.S. Department of Energy's Office of Biological and Environmental Rese… fraction, time-resolved X-ray scattering, cryo-electron microscopy (cry… imaging methods, super-resolution fluorescence imaging. New techno… supported by BER's Biological Systems Science Division include dynamic… ensors.

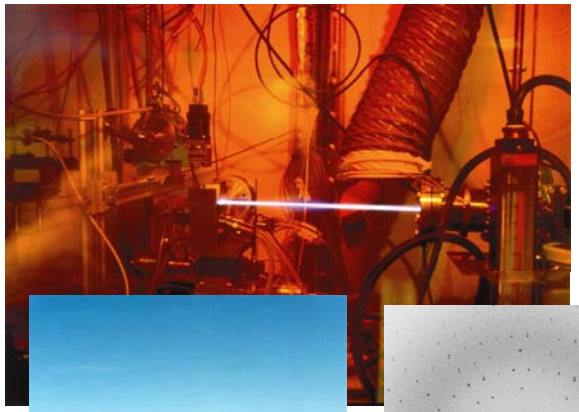
U.S. DEPARTMENT OF ENERGY | Office of Science

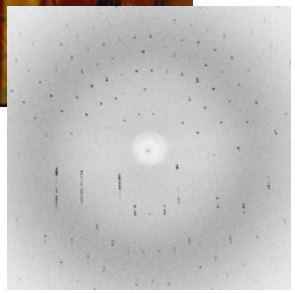
Office of Biological and Environmental Research

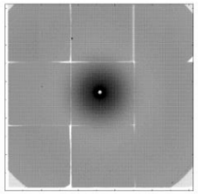
Key: **Å**, Angstrom; **EXAFS**, extended X-ray absorption fine structure; **fs**, femtosecond; **ks**, kilosecond; **µm**, micrometer; **µs**, microsecond; **mm**, millimeter; **ms**, millisecond; **nm**, nanometer; **ns**, nanosecond; **ps**, picosecond; **s**, second; **SAXS**, small-angle X-ray scattering; **SEM**, scanning electron microscopy; **TEM**, transmission electron microscopy; **TIRF**, total internal reflection fluorescence; **USANS**, ultrasmall-angle neutron scattering; **WAXS**, wide-angle X-ray scattering; **XANES**, X-ray absorption near edge structure.



EUROPEAN SPALLATION SOURCE

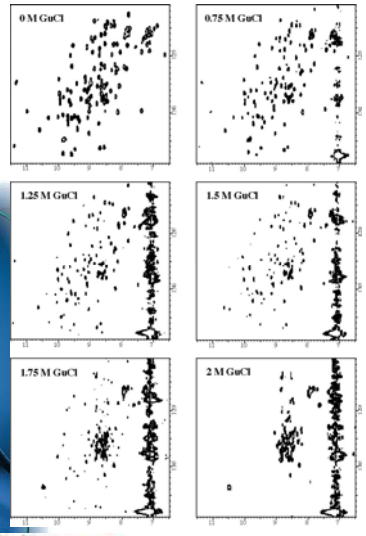


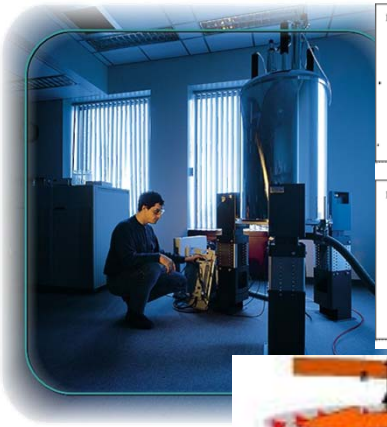


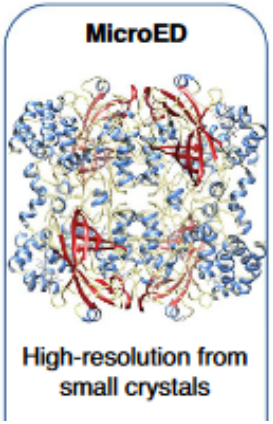


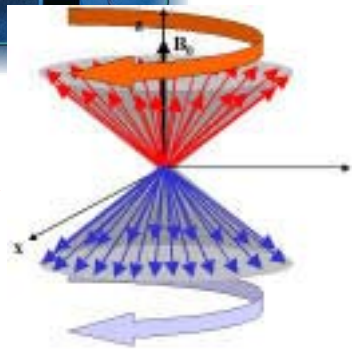
X-ray

RCSB PDB PROTEIN DATA BANK 155618 Biological Macromolecular Structures Enabling Breakthroughs in Research and Education





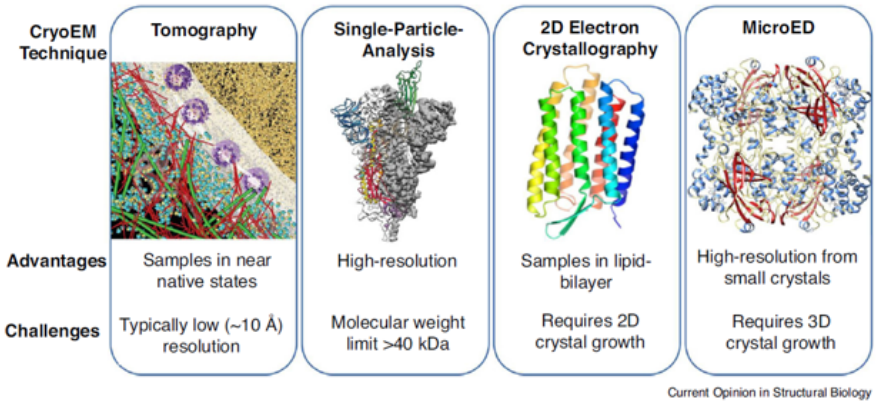


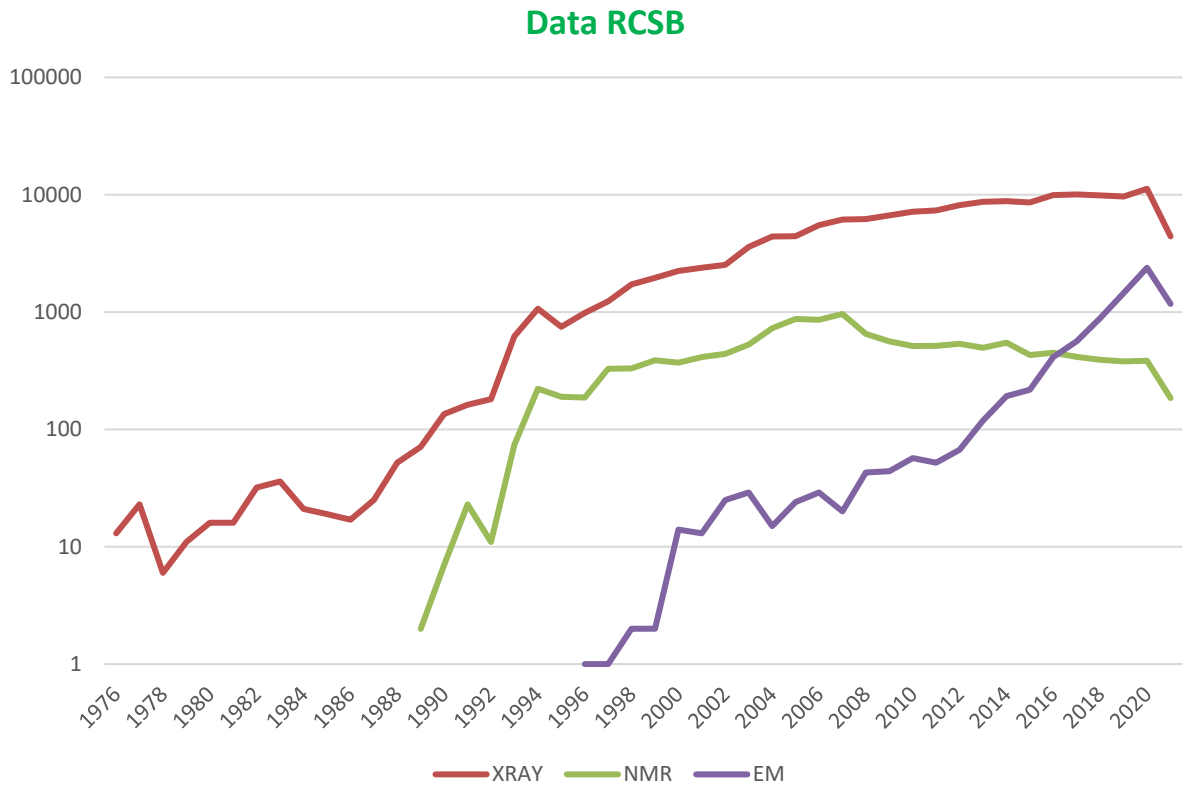


NMR

Electron microscopy

Current Opinion in Structural Biology 2020, 64:1–8

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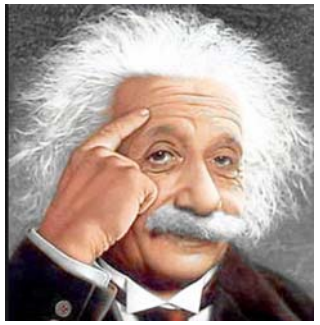


Monday
SPA Cryo-EM

Tuesday
Interactions

Sunday
MX

NMR

Saturday
BSI 101

EM and Brothers

TPs: TM - BLI

STRATÉGIE NATIONALE
DES INFRASTRUCTURES DE RECHERCHE
ÉDITION 2018 - N°2

herche.gouv.fr

MINISTÈRE DE L'ENSEIGNEMENT SUPÉRIEUR, DE LA RECHERCHE ET DE L'INNOVATION

FRISBI Integrated Structural Biology

TGIR	ESRF	Source Européenne de Rayonnement Synchrotron/ European Synchrotron Radiation Facility
TGIR	SOLEIL	Source Optimisée de Lumière d'Energie Intermédiaire du LURE
TGIR	XFEL	European X-ray Free Electron Laser

ESRF The European Synchrotron

SOLEIL SYNCHROTRON

European XFEL

IR	RMN-THC	Résonance Magnétique Nucléaire à Très Hauts Champs

IR THC RMN

ProFI PROTEOMICS

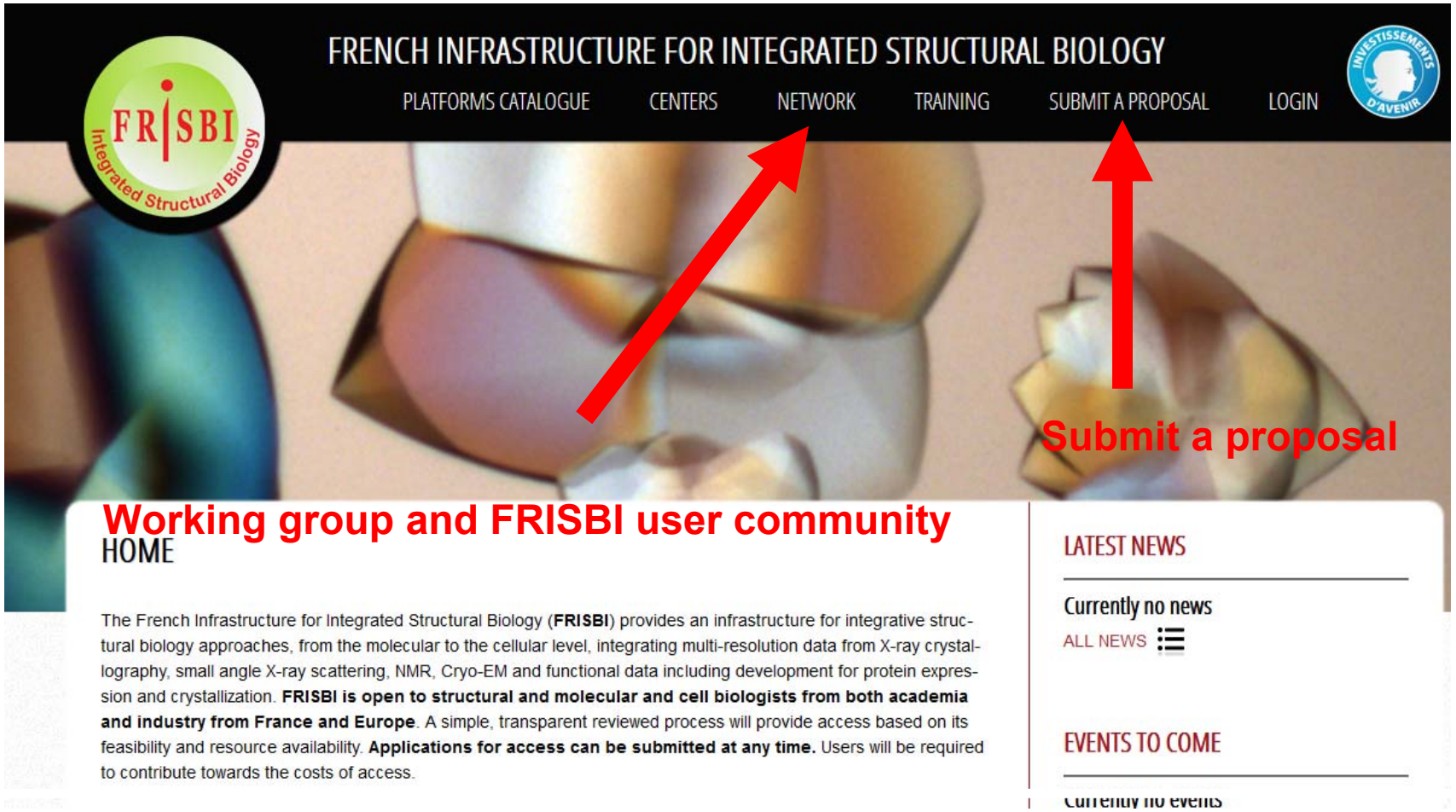
IR	PROFI	Infrastructure Française de Protéomique
IR	ChemBioFrance	Plateforme de découverte de molécules bioactives pour comprendre et soigner le vivant
IR	FBI	France-BioImaging
IR	FLI	France Life Imaging

France-BioImaging
. A National Research Infrastructure for Biological Imaging

One portal for access

Web site: accessible via the Instruct, CNRS, ReNaFoBis & ITMO websites

http://www.frisbi.eu **contact@frisbi.eu**



HOME

The French Infrastructure for Integrated Structural Biology (**FRISBI**) provides an infrastructure for integrative structural biology approaches, from the molecular to the cellular level, integrating multi-resolution data from X-ray crystallography, small angle X-ray scattering, NMR, Cryo-EM and functional data including development for protein expression and crystallization. **FRISBI is open to structural and molecular and cell biologists from both academia and industry from France and Europe**. A simple, transparent reviewed process will provide access based on its feasibility and resource availability. **Applications for access can be submitted at any time.** Users will be required to contribute towards the costs of access.

FRISBI offers priority of access for research proposals relating to covid-19

The non-infectious character of the samples needs to be confirmed by the director of th applying institute.

For application please **"submit proposals"**

Two of the FRISBI centers are part of the european Instruct-ERIC infrastructure

Sixth FRISBI call for proposals for Structural Biology Training Courses (to be held in 2021 in France).

LATEST NEWS

Currently no news

ALL NEWS

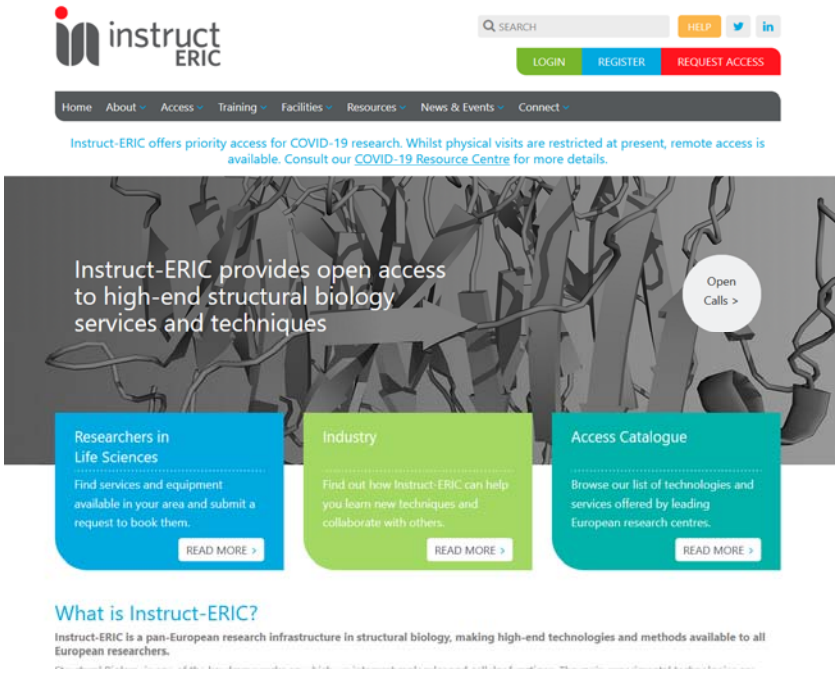
EVENTS TO COME

Currently no events

CENTERS

- INSTRUCT CENTER - FRANCE 1 - IGBMC
- INSTRUCT CENTRE - FRANCE 2 - IBS - ISBG
- CBS
- AFMB
- South Paris

https://instruct-eric.eu/




RéNaFoBiS
Réseau National de Formation en Biologie Structurale Intégrative


FRENCH INFRASTRUCTURE FOR INTEGRATED STRUCTURAL BIOLOGY
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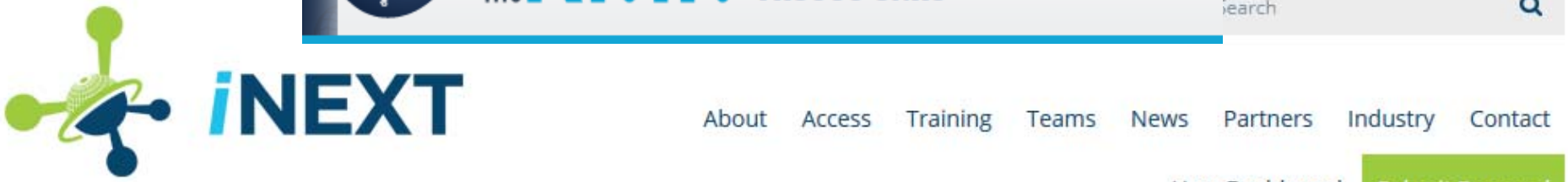
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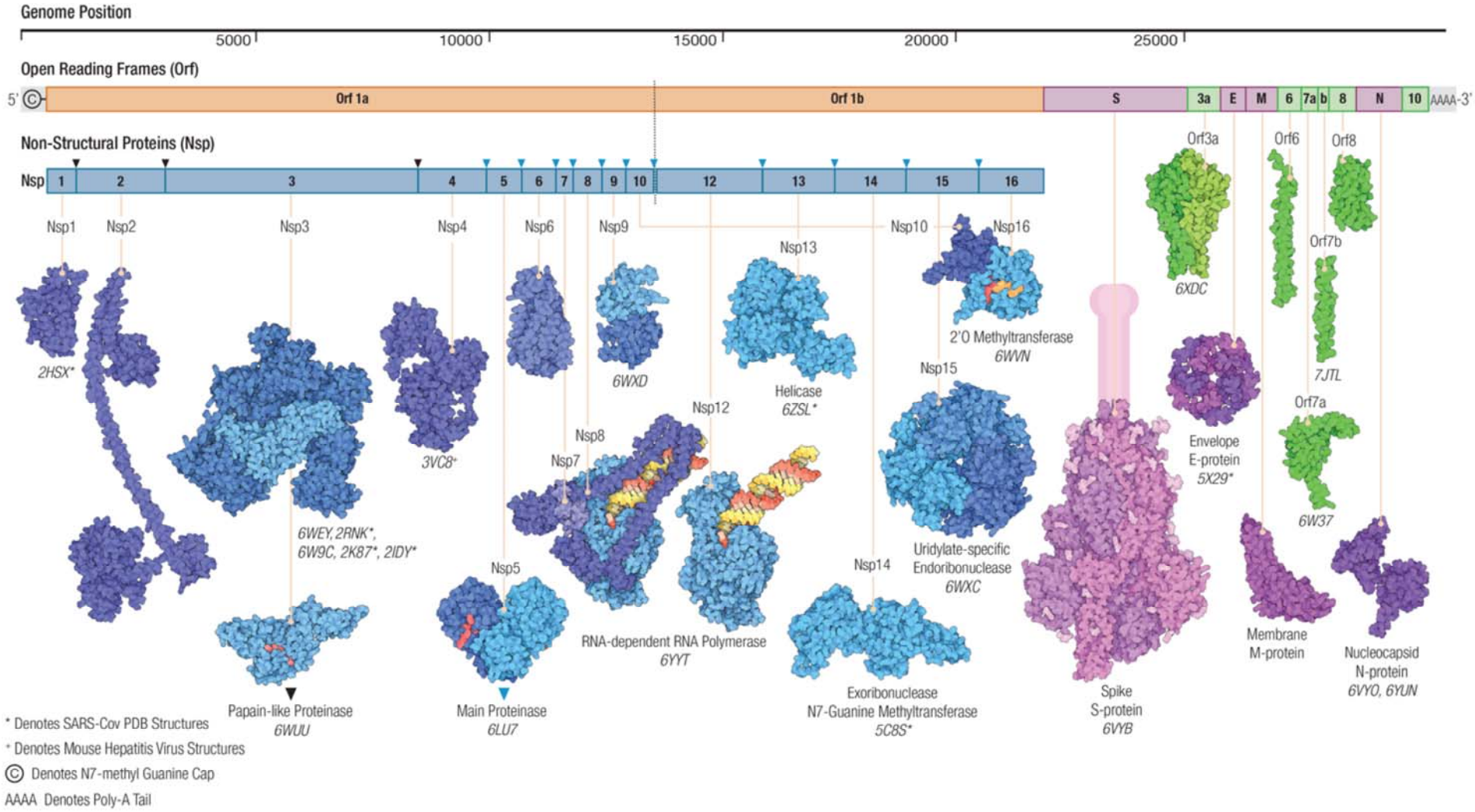
alliance nationale
pour les sciences de la vie et de la santé
FRISBI
Integrated Structural Biology

Evolution of the SARS-CoV-2 proteome in three dimensions (3D) during the first six months of the COVID-19 pandemic
bioRxiv 2020.12.01.406637; doi: 10.1101/2020.12.01.406637



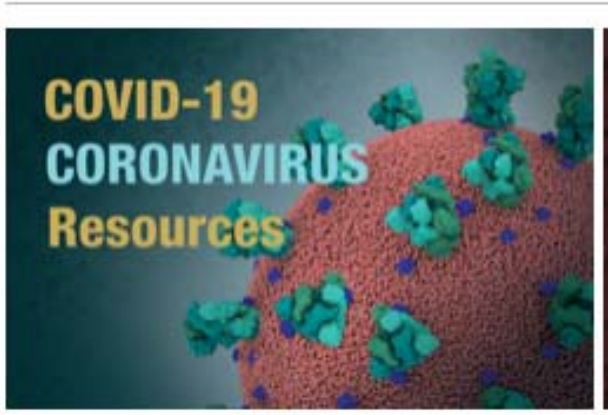
03/03/2021

With this week's update of the PDB, over one thousand (1018 to be exact!) SARS-CoV-2-related structures are now freely available in the PDB.
The first SARS-CoV-2 structure, a high-resolution crystal structure of the coronavirus main protease (PDB **6lu7**), was released early in the pandemic on February 5, 2020.

Since then, structural biologists have determined the structures of most of the proteins in the SARS-CoV-2 proteome, including the spike protein binding to its ACE2 receptor and neutralizing antibodies, and the main protease, the papain-like proteinase, and other promising drug discovery targets.

Rapid public release of SARS-CoV-2 structures has greatly increased our understanding of Covid-19, allowed direct visualization of emerging variants of the virus, and facilitated structure-guided drug discovery and reuse to combat infection. Open access to PDB structures has already enabled design of effective vaccines against SARS-CoV-2.

John Berrisford
PDBe, European Bioinformatics Institute (EMBL-EBI)
Wellcome Trust Genome Campus, Hinxton, Cambridge



GISAID

In Focus

One year since first genomes of S
to the world 10 January 2020 00:

One year ago, critical public health respons
kicked off, when China CDC shared via GIS
whole-genomes and associated data.

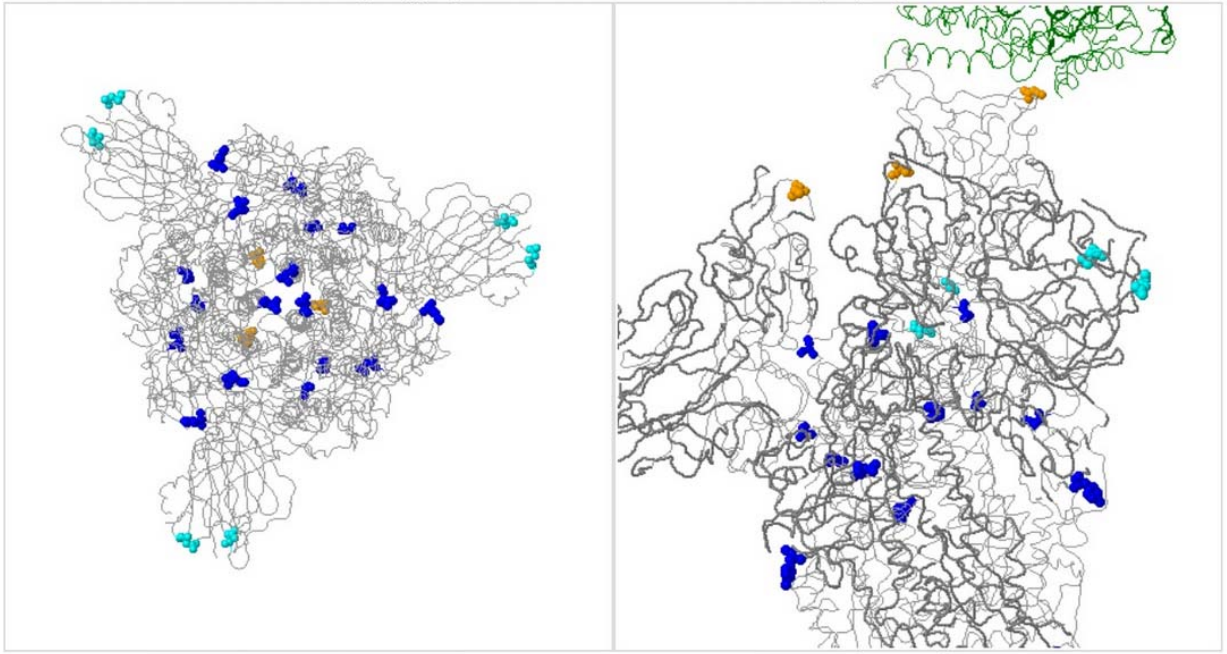
This curated, high-quality data made availa
the initiation of the development of the first
and other responses at unprecedented spe
to be approved and made available (Polack
and development of the first NAAT and RT-
detect the pandemic coronavirus (Bohn et a

UK reports new variant, termed VUI 202012/01

The United Kingdom reported a new variant, termed VUI 202012/01 (Variant Under Investigation, year 2020, month 12, variant 01). It was defined by multiple spike protein changes (deletion 69-70, deletion 145, N501Y, A570D, D614G, P681H, T716I, S982A, D1118H). An increasing fraction in Southern England (all from clade GR) share several of these changes and a handful have been seen through imports in other countries. Based on evaluation of effect on virus structure and function, the most relevant might be N501Y (orange in Figure; host receptor and antibody binding, also reported at gisaid.org/spike) and the deletions (cyan in Figure) in positions contributing to potential spike surface variation (Y145del is where some antibodies like neutralizing 4A8 bind).

At the end of the day, biology is just chemistry

3D structural visualization of the spike glycoprotein with mutations identified in the query sequences shown as colored balls



Spin ON | Spin OFF | Save IMAGE

Spike glycoprotein (PDB: 6acc, EM 3.6 Angstrom) with RBD in down conformation.

Spin ON | Spin OFF | Save IMAGE

Spike glycoprotein (PDB: 6acj, EM 4.2 Angstrom) in complex with host cell receptor ACE2 (green ribbon).

List of variations displayed in structure (nearest residue if in loop/termini region)

H69del V70del(69) Y145del(143) N501Y A570D D614G P681H(674) T716I S982A D1118H

French Infrastructure for Integrated Structural BIology

Education and Training

Workshops/Symposia

PhD

Exp Researcher

Master

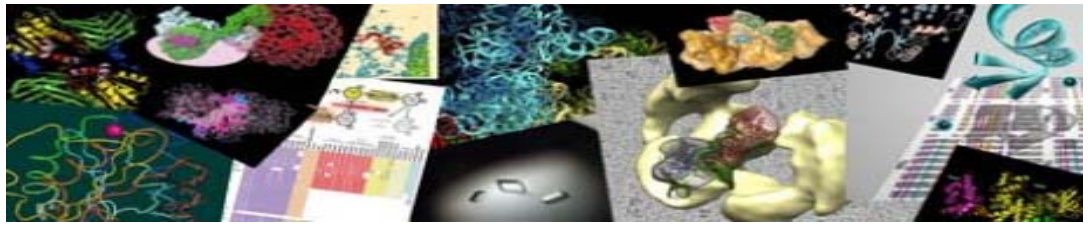
RéNaFoBiS

Developments of Methods and Techniques to shape and build the future of Integrate Structural Biology

helping "people" to understand the core principles of Integrated Structural Biology

FRISBI platforms

Provide access to cutting-edge instruments and expertise in structural biology



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RÉPUBLIQUE FRANÇAISE

instruct Integrating Biology

cnrs

cea

Inserm

Sfμ

AFC

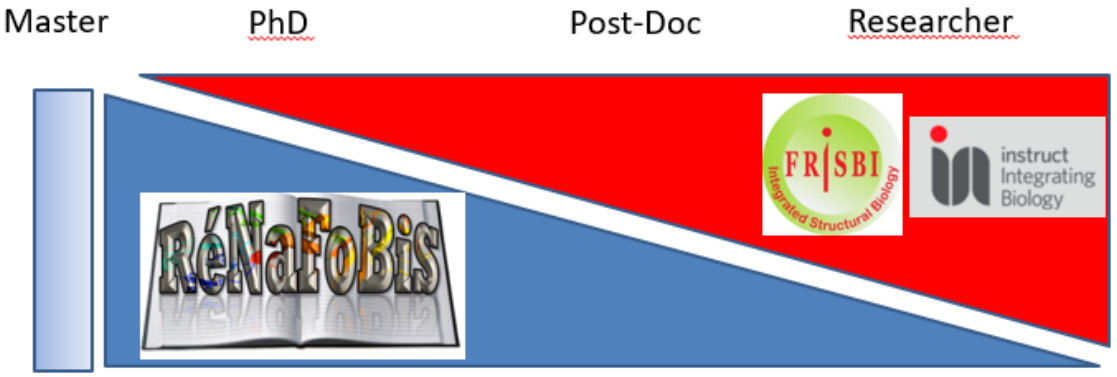
RéNaFoBiS

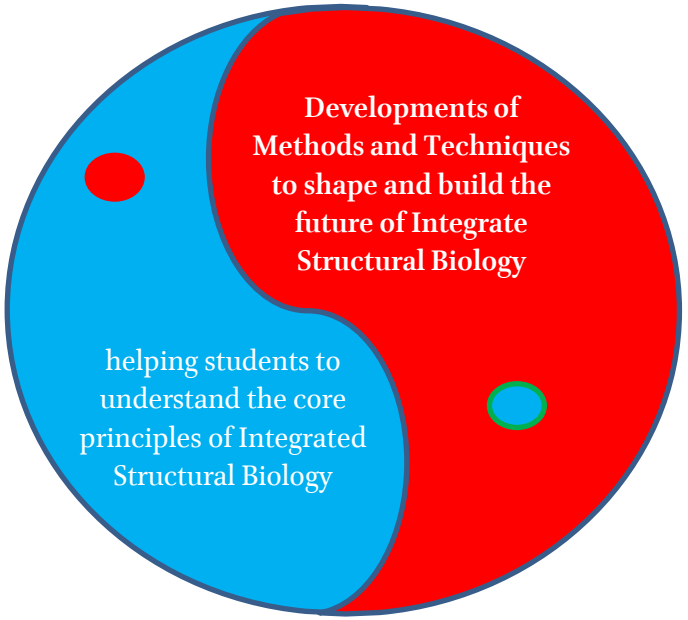
Réseau National de Formation en Biologie Structurale Intégrative

2013  initially driven by the FRISBI centers

A “national” high-level training program in integrated structural biology

A dream of a national graduate School in Structural biology





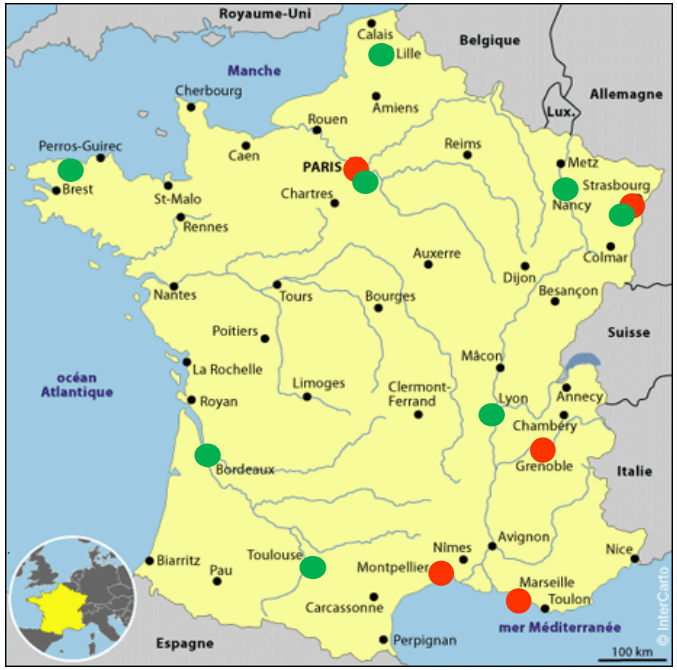
ReNaFoBiS is an open initiative, Open Network

" **National Training Network in Integrated Structural Biology** "

«Reseau National de Formation en Biologie Structurale Intégrative»

A dream of a national graduate School in Structural biology

Structural biology Institutes in 12 cities



https://www.renafobis.fr/

https://listes.services.cnrs.fr/wws/info/renafobis.bb

Ecole RéNaFoBiS Oléron Juin 2014

Programme et supports de cours

Ecole RéNaFoBiS Oléron 2015

Bienvenue sur la section de l'école RéNaFoBiS 2015 à Oléron!

Oléron 2016: Troisième Ecole Nationale RéNaFoBIS

Oléron 2017: Quatrième Ecole Nationale RéNaFoBiS

5e École de Biologie Structurale Intégrative

6ème Ecole RéNaFoBiS - Oléron 2019

7ème Ecole RéNaFoBiS - Oléron 2020

Accueil

8 e École de Biologie Structurale Intégrative
Oléron - du 18 au 25 Juin 2021

Cette **école** propose une formation théorique et appliquée aux différentes approches utilisées en biologie structurale (diffraction et diffusion des rayons X, RMN, cryo-microscopie, préparations des échantillons en vue des études structurales, interactions macromoléculaires).
Elle mettra l'accent sur l'intégration de plusieurs de ces méthodes pour répondre aux grandes questions de la biologie fonctionnelle à l'échelle atomique.

Ciblée pour un public de **doctorants** ou de **jeunes chercheurs**, cette formation montrera les apports et les limites de chaque méthode et leur complémentarité. Elle indura des sessions théoriques le matin et des travaux pratiques en groupes l'après-midi.
Cette école est ouverte aux techniciens et ingénieurs (domaine académique et industriel) dans la cadre de la **formation continue**.

Les conférences seront données principalement en Français. Les supports des présentations seront **en Anglais**, afin de permettre aux participants non-francophones de suivre plus facilement. Lors des sessions pratiques (TP), des groupes anglophones pourront être proposés si besoin.

Le nombre de places étant limité (28), les participants seront sélectionnés sur la base d'une lettre de motivation. Les dossiers seront examinés et validés au fur et à mesure de leur arrivée. **Les inscriptions seront closes lorsque le nombre de candidatures acceptées atteindra le nombre de places possibles.**

En préparation et en complément de l'école, le MOOC "Voyage au coeur du Vivant avec les rayons X", accessible sur FUN-MOOC sera ouvert en SPOC aux étudiants retenus.

Ce SPOC, adapté spécifiquement pour les participants à Oleron2021, comportera des compléments nécessaires à l'école (initiation à LINUX, utilisation de programmes de construction/visualisation 3D, vision unifiée de la diffraction/diffusion des rayonnements). Les informations détaillées seront communiquées aux étudiants sélectionnés.

Formateurs et conférenciers

Guillaume Bouvignies (ENS, Paris), Jean Cavarelli (IGBMC, Strasbourg-Illkirch), Marc-André Delsuc (IGBMC, Strasbourg-Illkirch), Samuel Holweg (IGBMC, Strasbourg), Bruno Klaholz (IGBMC, Strasbourg-Illkirch), Olivier Lambert (CBMN, Bordeaux), Marie-Helene Le Du (CEA Saclay), Amélie Leforestier (LPS, Orsay), Gordon Leonard (ESRF, Grenoble), Arnaud Poterszman (IGBMC, Strasbourg-Illkirch), Alain Roussel (AFMB, Marseille), Robert Schneider (Biologie Structurale Intégrative, Lille), William Shepard (SOLEIL, Gif/Yvette), Christina Sizun (ICSN, Glf/Yvette), Jean-Christophe Taveau (CBMN, Bordeaux).

Contacts administratifs

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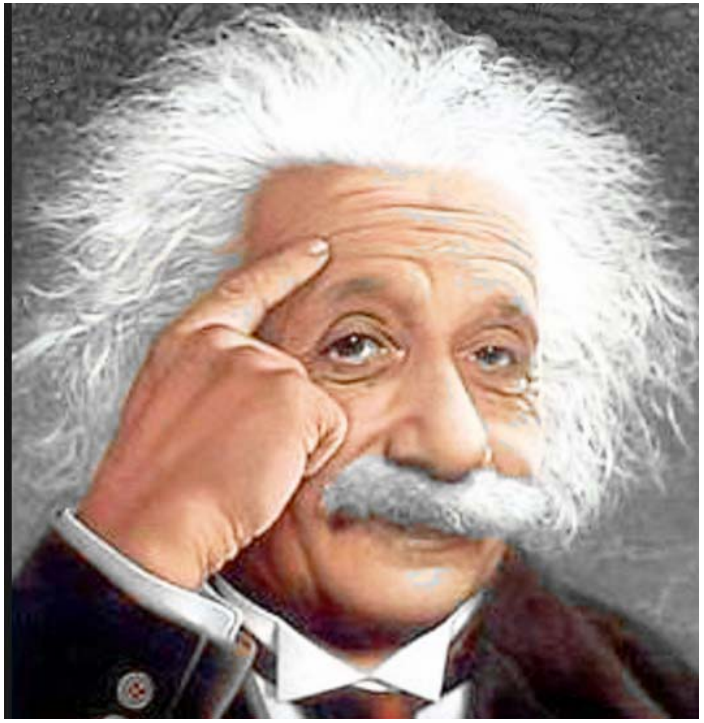
Informations

Inscriptions

Effectif Complet pour 2021



What we hope to do in *ReNaFoBiS/Oleron* is to give you a feel for the fundamental ideas that come into play in a variety of structural biology approaches and applications, and to do so with enough detail
to allow you to go off and invent new approaches of your own.

We look forward to seeing your contributions to Structural biology !

Modify without permission from Jacobsen 2020 "X-ray microscopy"

Aimeur Sana-Zineb

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Bretagne Damien

Cargemel Claire

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Coudray Léna

Degaugue Augustin

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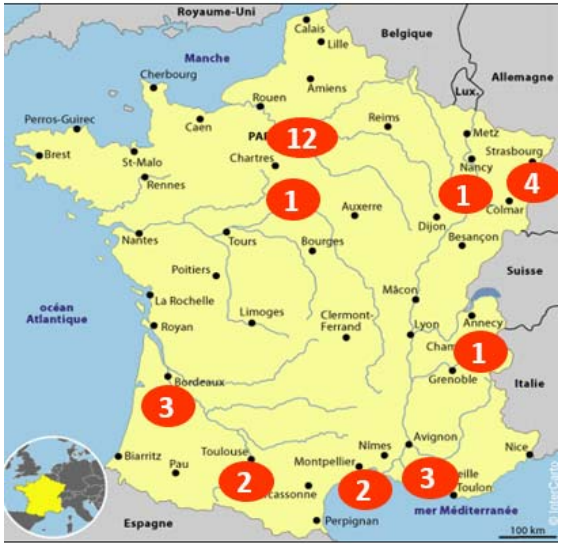


Gauffre Pierre

Gervason SYLVAIN

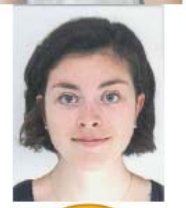
Hepp Benjamin

Kra Kalouna

Lahfa Mounia

Lo Bello Lea

Lopez-Lozano Nina



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Schmitt Alain

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Sobron Lua

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