SINCOTRÓN

Aplicaciones en las investigaciones biomédicas.

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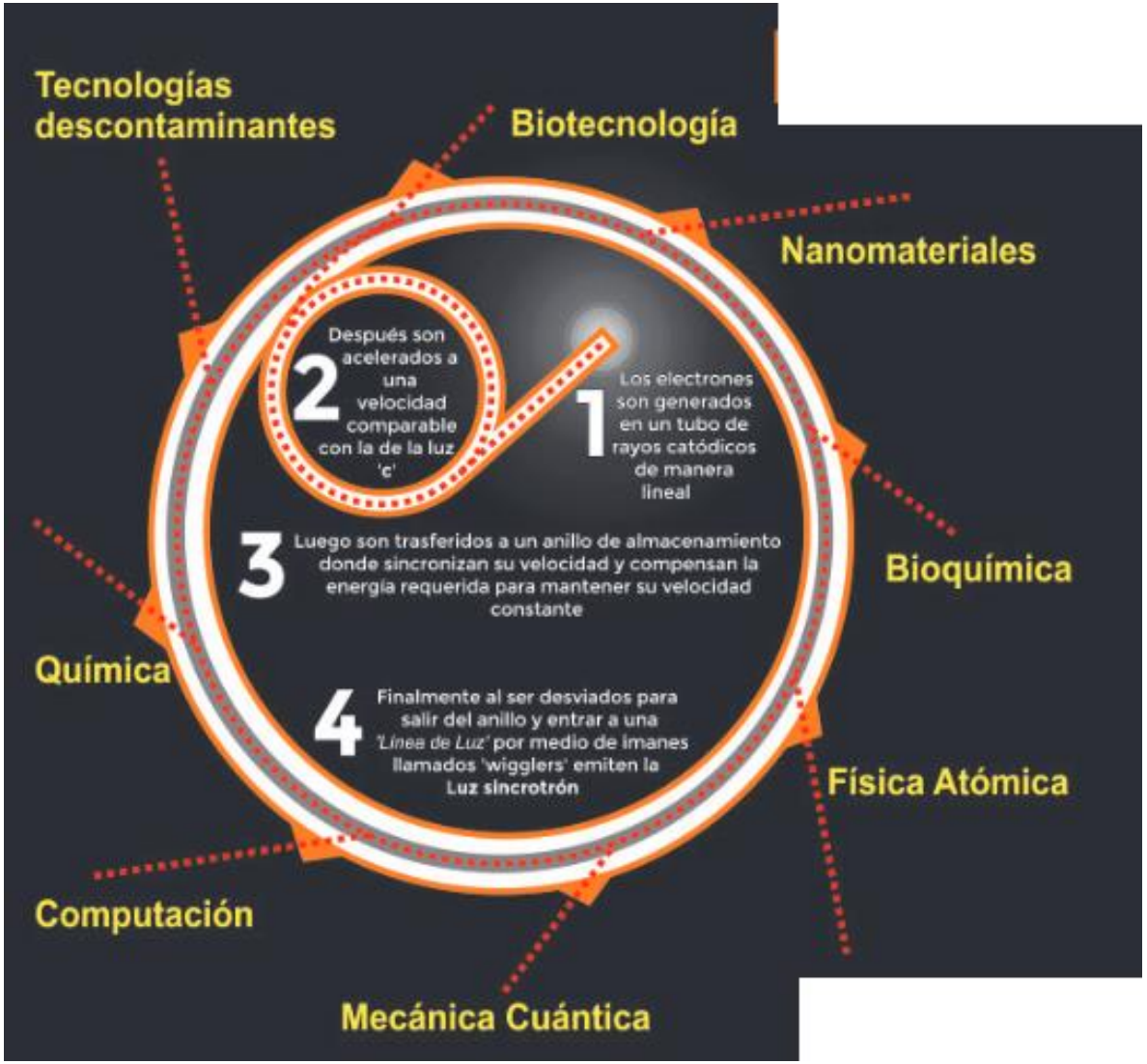
SINCOTRÓN

- ✓ Es un tipo de acelerador de partículas.
- ✓ Generan energía extremadamente altas, creando un haz de electrones que viaja casi a la velocidad de la luz
- ✓ Estas instalaciones aceleran partículas a gran velocidad y las guían dentro de una trayectoria utilizando campos electromagnéticos.
- ✓ Permiten estudiar la materia (viva o inerte) y sus propiedades del orden del radio atómico.

PARTES DEL SINCOTRÓN



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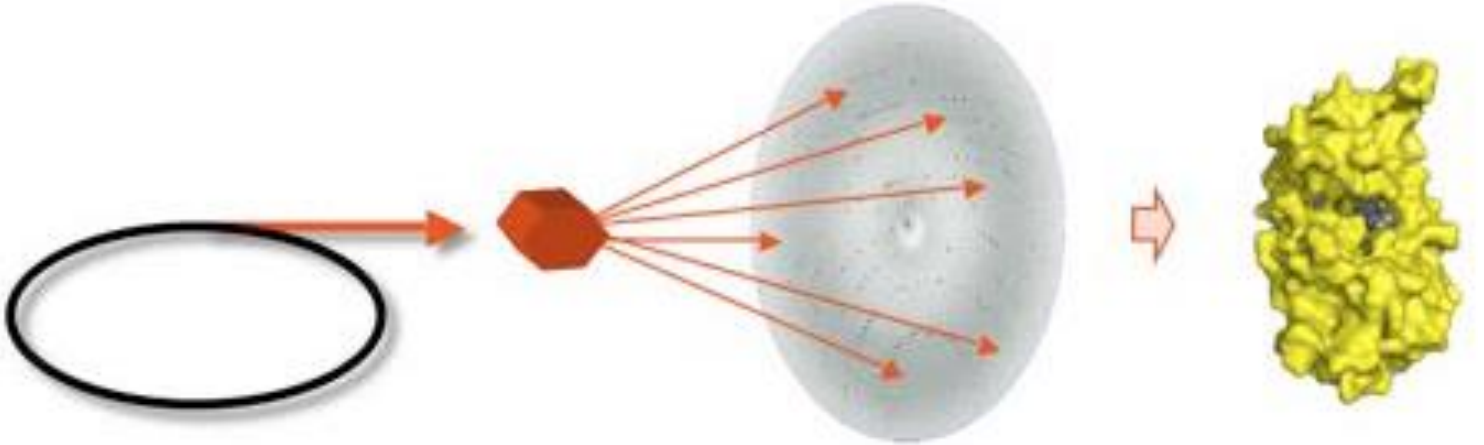
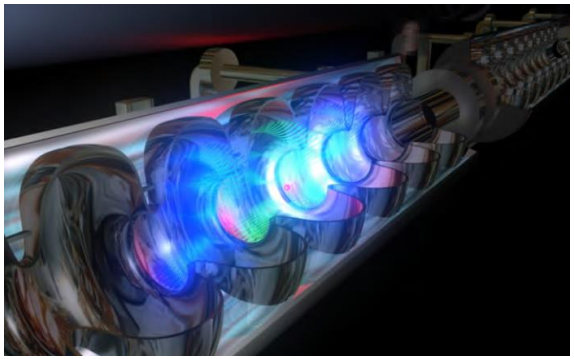
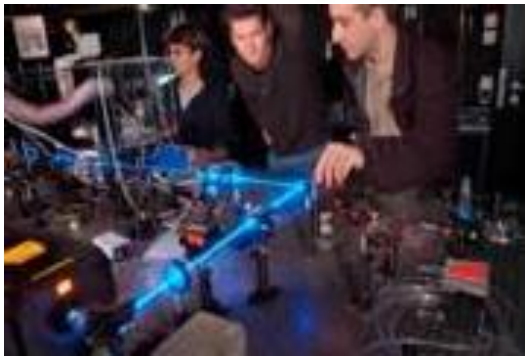
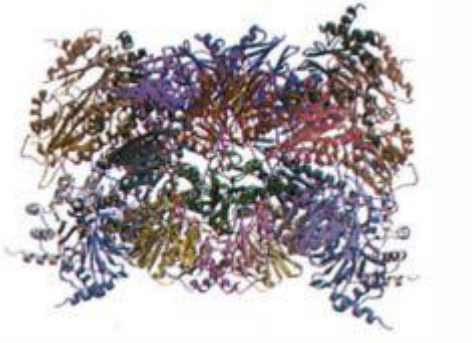
FUNCIONAMIENTO DEL SINCOTRON









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APLICACIONES DEL SINCOTRÓN

La luz de sincrotrón se utiliza en múltiples industrias. Destacan los siguientes:

Investigación médica: microbiología, estudio de enfermedades, generación de imágenes de alta resolución y radioterapia contra el cáncer.

Contaminación: detección de partículas contaminantes de agua y polvos cósmicos.

Exploración de minerales/fósiles: análisis rápido de minerales para facilitar el procesamiento de minerales.

Ingeniería: imágenes de procesos industriales en tiempo real y imágenes de alta resolución de grietas y defectos en estructuras.

APLICACIONES DEL SINCOTRÓN

Estudia cristales a nivel macromolecular

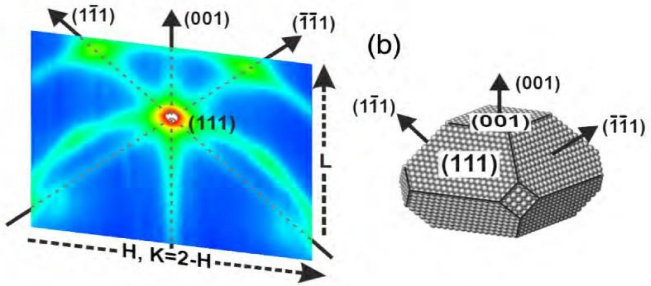
MATERIALES

- ✓ **Preciosos.**
- ✓ **Que no pueden ser reproducidos.**
- ✓ **Contiene diferentes estructuras mezcladas.**
- ✓ **Frágiles.**

APLICACIONES DEL SINCOTRÓN

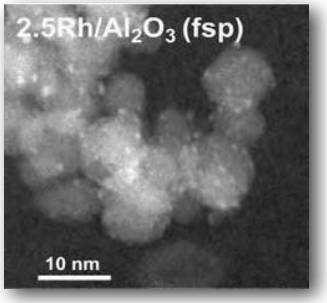
Física

- ✓ Disposición de electrones
- ✓ Películas magnéticas
- ✓ Fotones



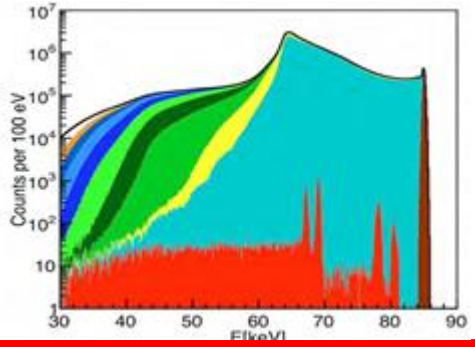
Química

- ✓ Catálisis
- ✓ Reacciones superficiales



Materia blanda

- ✓ Coloides
- ✓ Fase de transición



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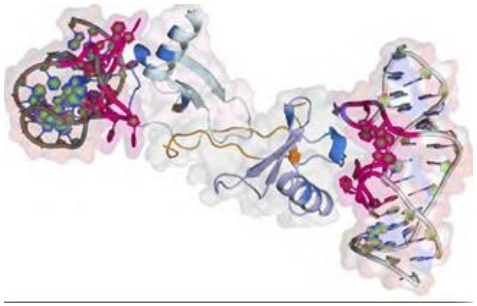
APLICACIONES DEL SINCOTRÓN

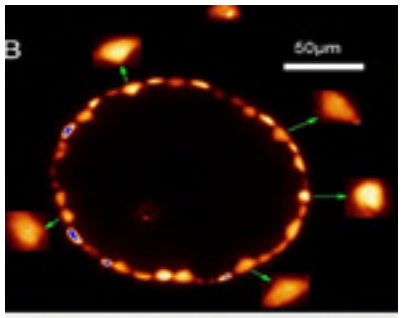
Ciencias de la Vida

- ✓ Estructura de proteínas
- ✓ Fisiología celular
- ✓ Diseño de fármacos



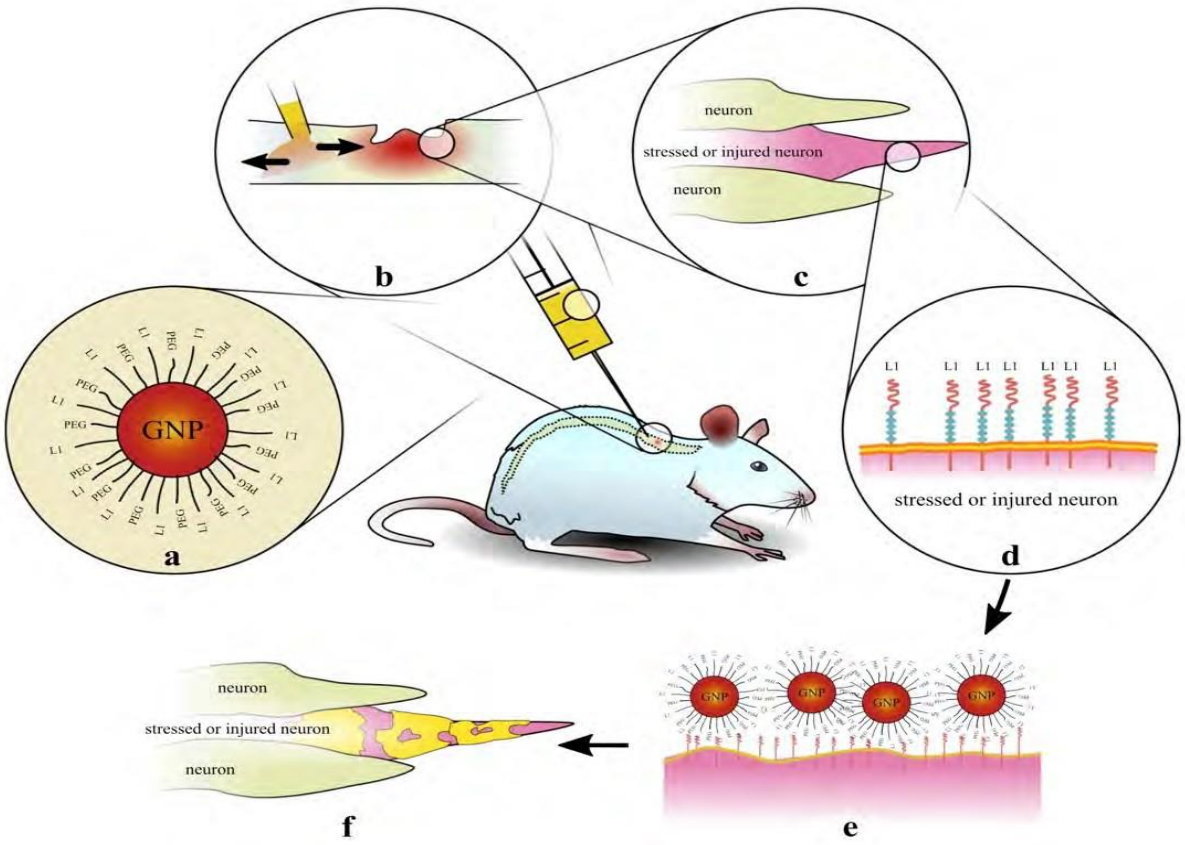
Ciencias medioambientales

- ✓ Contaminación
- ✓ Reacciones



APLICACIONES DEL SINCOTRÓN

DIAGNÓSTICO TEMPRANO DE TUMOR

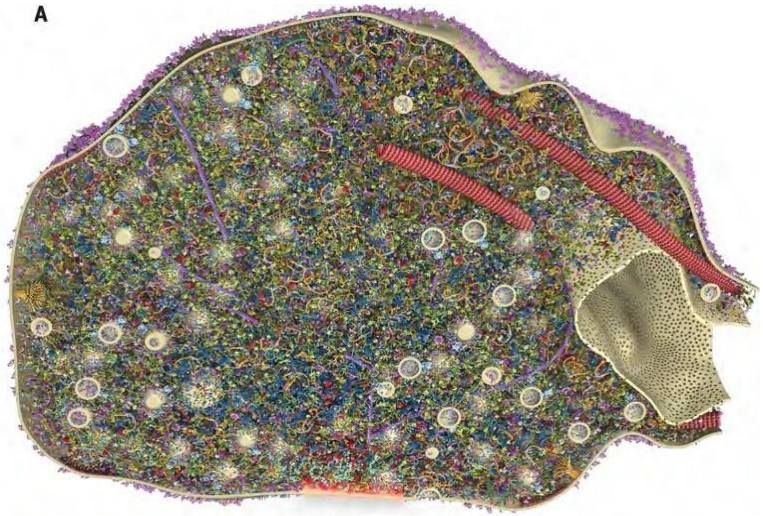


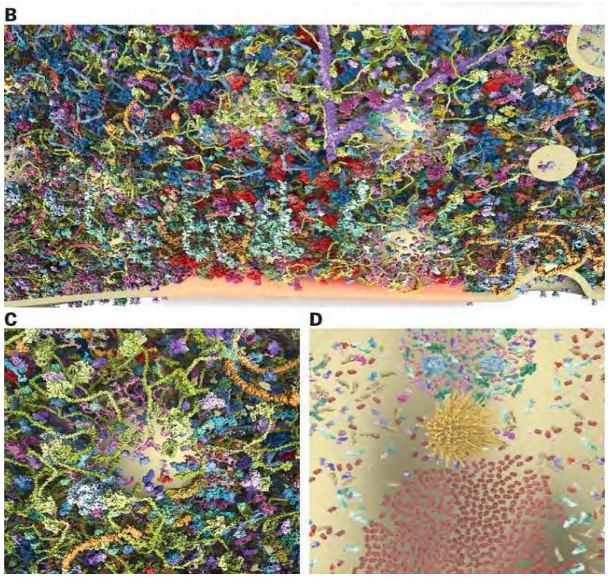
APLICACIONES DEL SINCOTRÓN

ENFERMEDADES INFECCIOSAS

Unión de virus a la superficie de una célula

- ✓ Puede resultar segundos
- ✓ Reacción química que ocurre a nivel cuántico





SINCOTRONES EN EL MUNDO

HAY MÁS DE 60 SINCROTRONES

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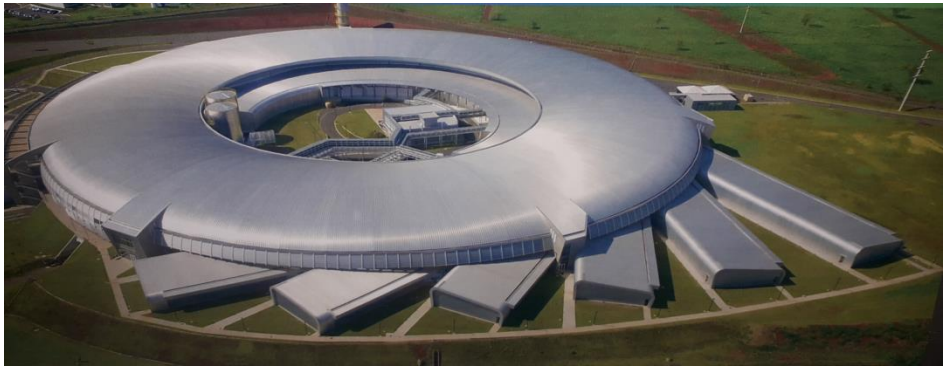
SINCOTRÓN EN BRASIL

SIRIUS
Ciudad de Campinas

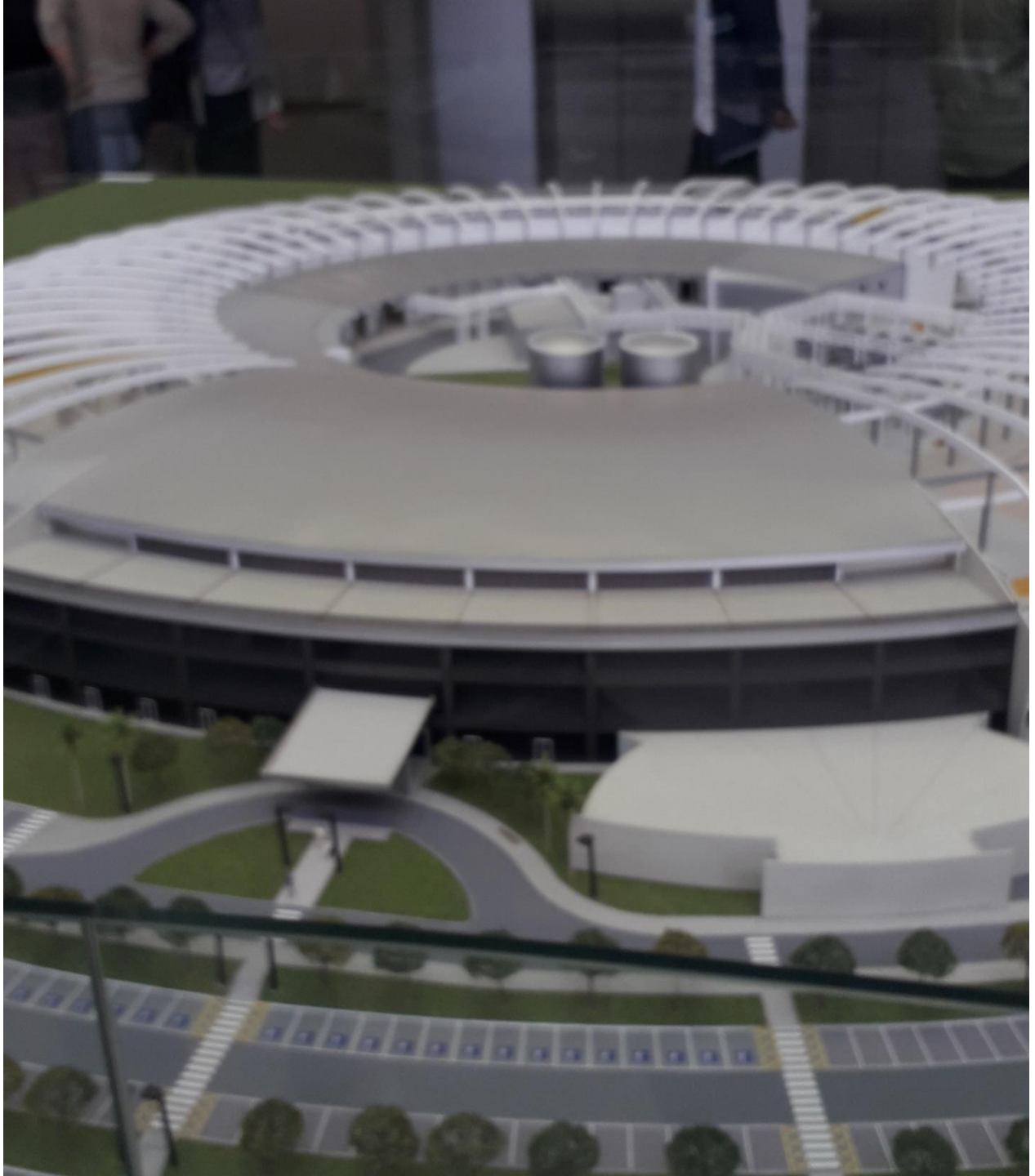
DrC. Lianet Monzote Fidalgo

SINCOTRÓN EN BRASIL

SIRIUS
Ciudad de Campinas



- ✓ Empezó a contruirse en 2015.
- ✓ Se terminó 2020.
- ✓ Circunferencia de 518 metros y emitancia de 0,27 nm-radianes.
- ✓ Está blindado por 1 kilómetro de muros de hormigón de 1,5 metros de espesor y 3 metros de altura.
- ✓ La inversión fue de 1.800 millones de reales.
- ✓ El proyecto científico más ambicioso jamás realizado en Brasil.
- ✓ Todo es tecnología brasileña.
- ✓ Primeros estudios dirigidos al Sar-CoV-2.

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SINCOTRÓN EN BRASIL

SIRIUS
Ciudad de Campinas

- ✓ Estudiar estructuras tridimensionales.
- ✓ Posición de los átomos en el espacio y soluciones.
- ✓ Interacciones entre moléculas
- ✓ Creación de materiales superconductores.

Aprueban proyectos 2 veces al año libre de costo

SINCOTRÓN

viruses

Review

Imagining of Virus-Infected Cells with Soft

Damià Garriga [1], Francisco Javier Chichón [2], Bárbara M. Calisto [1], Diego Eva Pereiro [3] and Ana Joaquina Pérez-Berna [1,*]

Abstract: Viruses are obligate parasites that de
Consequently, to fully understand the viral pr
fundamental to study them in the cellular conte
in the subcellular organization of the host cell
cell cytoskeleton and/or budding of newly fo
reorganization in infected cells can thus provid
and antiviral drug development. Among the
X-ray tomography stands out for its large dep
ples to be imaged without further thinning),
cient to detect viral particles), the minimal ra
frozen, unfixed and unstained whole cells) a
(i.e., correlative fluorescence microscopy). In
X-ray tomography, its sample requirements
potential of this technique, examples of vir
ALBA synchrotron are also presented.

Keywords: cryo-soft X-ray tomography (cr
Zika virus (ZIKV); direct-acting antiviral (D

1. Introduction

Viruses occur universally, presum
life development on the planet [1]. Fo
dramatic losses of human life world
health and the economy, as exemplif

Despite their vast diversity, vi
one being that all viruses are obligat
to generate energy or to synthesize
cellular environment, any prolifer
smaller degree, to alterations in th
favorable environment for viral re

In eukaryotic viruses, one of t
viral factories or viral replication c
compartments or inclusions that ar
and membrane compartments and
and morphogenesis. Viral factor
concentrating the acquired cellula
defenses [4–7].

Virus 2021, 13, 2109. https://doi.org/10.3390/v13112109

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Structural Genomics and Drug Discovery for Infectious D

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Feinberg School of Medicine, Chicago, IL 60611, USA

Abstract

The application of structural genomics methods and approaches to proteins from orga
infectious diseases is making available the three dimensional structures of many pro
potential drug targets and laying the groundwork for structure aided drug discovery
are a number of structural genomics projects with a focus on pathogens that have h
worldwide. The Center for Structural Genomics of Infectious Diseases (CSGID) w
established to apply state-of-the-art high throughput structural biology technolog
characterization of proteins from the National Institute for Allergy and Infectious
category A–C pathogens and organisms causing emerging, or re-emerging infe
target selection process emphasizes potential biomedical benefits. Selected pro
drug targets and their homologs, essential enzymes, virulence factors and vacc
Center also provides a structure determination service for the infectious disease
The ultimate goal is to generate a library of structures that are available to th
and can serve as a starting point for further research and structure aided drug
diseases. To achieve this goal, the CSGID will determine protein crystal st
and protein-ligand complexes using proven, rapid, highly integrated, and c
such determination, primarily by X-ray crystallography. High throughput
determination is greatly aided by frequent, convenient access to high-perfo
generation synchrotron X-ray sources.

Keywords

CSGID; structural genomics; infectious diseases; drug discovery; str
structure

ANTI-MICROBIAL DRUG DISCOVERY AND STRUC
DISCOVERY

It is widely recognized that anti-microbial drug discov
years [1]. Coupled with the rise in drug resistance in
in a need for new targets and new approaches to anti-
screening for broad spectrum antibiotics in particula
are a number of factors that have limited recent su
spectrum antibacterials is lagging behind society's
explored is to focus on new drug targets and appr
spectrum therapeutics, may be useful for treating

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Candida species: new insights into biofilm formation

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Biofilms of Candida albicans, Candida parapsilosis, Candida glabrata and Candida tropicalis are associated with high indices of hospital morbidity and mortality. Major factors involved in the formation and growth of Candida biofilms are the chemical composition of the medical implant and the cell wall adhesins responsible for mediating Candida–Candida, Candida–human host cell and Candida–medical device adhesion. Strategies for elucidating the mechanisms that regulate the formation of Candida biofilms combine tools from biology, chemistry, nanoscience, material science and physics. This review proposes the use of new technologies, such as synchrotron radiation, to study the mechanisms of biofilm formation. In the future, this information is expected to facilitate the design of new materials and antifungal compounds that can eradicate nosocomial Candida infections due to biofilm formation on medical implants. This will reduce dissemination of candidiasis and hopefully improve the quality of life of patients.

Biofilms as a virulence factor of Candida species

Fungal infections due to Candida species are the leading cause of hospital morbidity and mortality [1,2], and Candida albicans is the organism most frequently isolated from patients with systemic candidiasis [3–5]. However, because of the indiscriminate use of broad-spectrum antibiotics and antifungals [6–11] combined with immunosuppressive therapies, the non-C. albicans Candida (NCAC) species such as Candida parapsilosis, Candida glabrata and Candida krusei, which were previously considered to be nonpathogenic, have emerged as the second or third most common species causing candidemia and systemic candidiasis in immunocompromised patients, organ transplant or hematopoietic stem cell recipients, diabetics, newborns, elderly adults and patients with neoplasms [12,14–22]. The infections caused by these species are difficult to treat, since C. glabrata and C. krusei possess an innate resistance to azole-based compounds [9,13,14]. The second most frequently isolated species of Candida in the USA and Canada is presently C. glabrata [9]. In Latin America and Asia, it is C. tropicalis [9,10,25], whereas C. parapsilosis is the second most frequent in Europe and some regions of Latin America [9,13,26,27]. Even though C. parapsilosis, C. glabrata and C. tropicalis are important nosocomial pathogens, little is known about their virulence. One virulence factor involved in the establishment of Candida infection is the adherence of the yeast to epithelial and endothelial cells, soluble factors, extracellular matrices and inert material implants in the body of the host [24]. Once Candida has adhered and evaded the immune system of the patient [29–31], it can form biofilms that colonize the internal organs and medical implants such as prostheses, contact or intraocular lenses, breast implants, vascular inserts, endotracheal tubes and pacemakers [32–34]. In the last two decades, biofilms have come to be considered as very important virulence factors for the establishment of recurring candidiasis [35], as their sessile living cells show high resistance to antifungal treatment and host defense mechanisms [34–46]. This resistance negatively impacts the patient's health, since the infected medical implant must be removed when the infection does not respond adequately to treatment. This can damage surrounding tissues, as can the prolonged antifungal treatment required by the resistance of the microorganism [44,45]. It has been reported that the strains of C. albicans, C. parapsilosis, C. glabrata and C. tropicalis that were isolated during a fungal infection, capable of forming biofilms, cause high levels of mortality (25–50%) as compared with clinical isolates unable to form biofilms [28,45]. In silico studies have shown that C. glabrata is phylogenetically closer to Saccharomyces cerevisiae than to C. albicans, as suggested by evolutionary divergence

Keywords
• adhesins • ALS • biofilm • Candida species • cell wall • EPA • GPI proteins • mannoproteins • medical device • synchrotron

Review
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755