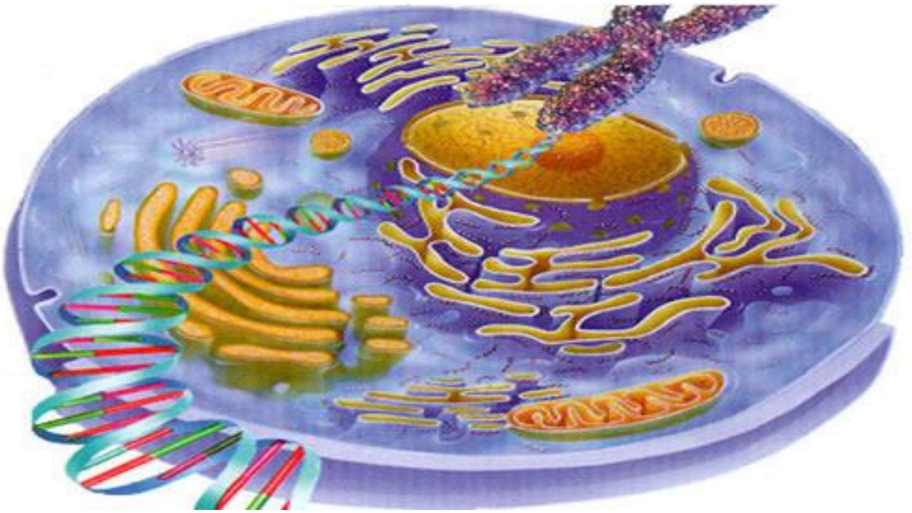
INTRODUÇÃO À CÉLULA E MECANISMOS COMUM À VIDA

Aula 1

LGN0117 – Biologia Celular



Maria Carolina Quecine
Departamento de Genética
mquecine@usp.br

REGRAS DA BOA CONVIVÊNCIA

- Não chegar atrasado;
- Evitar saidas desnecessárias da sala de aula
- Participar ativamente, perguntas - são muito bem vindas!!!
- **Proibido o uso de celular (Lei n° 12.730, de 11/10/2007).**

LGN0117 – BIOLOGIA CELULAR

Método de avaliação

- ✓1ª PROVA TEÓRICA: 11 de Maio
- ✓APRESENTAÇÃO DO TRABALHO: 29 de junho
- ✓2ª PROVA TEÓRICA6 de Julho

Média final

Provas teórica 1 + Provas teórica 2 + Nota trabalho oral/3

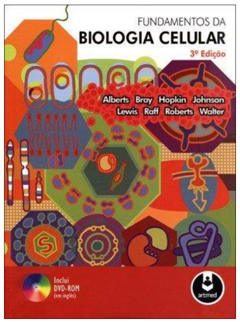
Não haverá prova substitutiva ou repositiva;

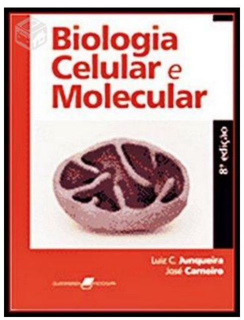
Aprovado => 5,0 e frequência => 70%

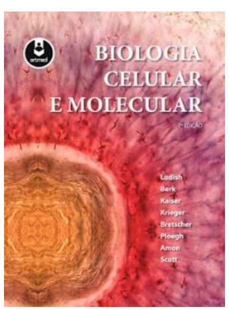
TRABALHO FINAL

Buscando um melhor aproveitamento das aulas práticas e da disciplina, você aluno utilizará a modelagem como ferramenta de aprendizagem. Essa é uma atividade obrigatória, que constituirá parte da avaliação da disciplina (0,3 da nota do conteúdo prático). **Maiores detalhes em breve!!!**

LGN0117 – BIOLOGIA CELULAR







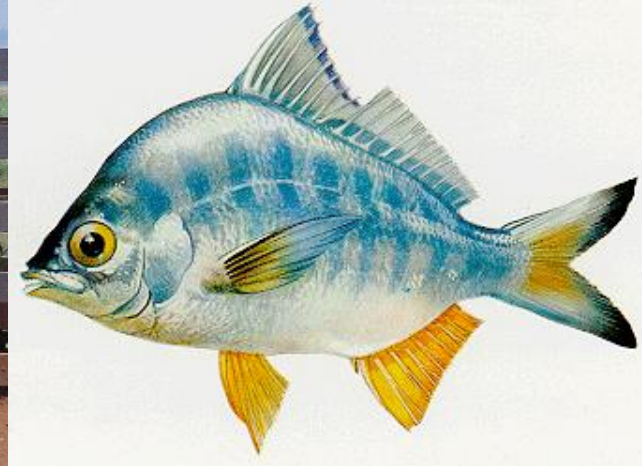
1. Alberts, B.; Bray, D.; Hopkin, K.; Johnson, A.; Lewis, J.; Raff, M.; Roberts, K.; Walter, P. 2011 3ª Edição brasileira. Artmed, Porto Alegre. . ***Fundamentos da Biologia Celular***. 843 p.

2. De Robertis, E.M.F.; Hib, J. 2015. ***Biologia Celular e Molecular*.** 16ª Edição. Editora Guanabara Koogan, Rio de Janeiro. 363 p .

3. Junqueira L.C.U. & Carneiro J. 2013. ***Biologia Celular e Molecular***. 9a Edição. Editora Guanabara Koogan, Rio de Janeiro. 3644 p.

4. Lodish, H.; Berk, A.; Matsudaira, P.; Kaiser, C.A.; Krieger, M.; Scott, M.P.; Zipursky, L.; Darnell, J. 2011. ***Biologia Celular e Molecular***. ª Edição. Artmed, Porto Alegre. 1244 p.

Capítulos no Xerox do Calq e Material disponível no STOA

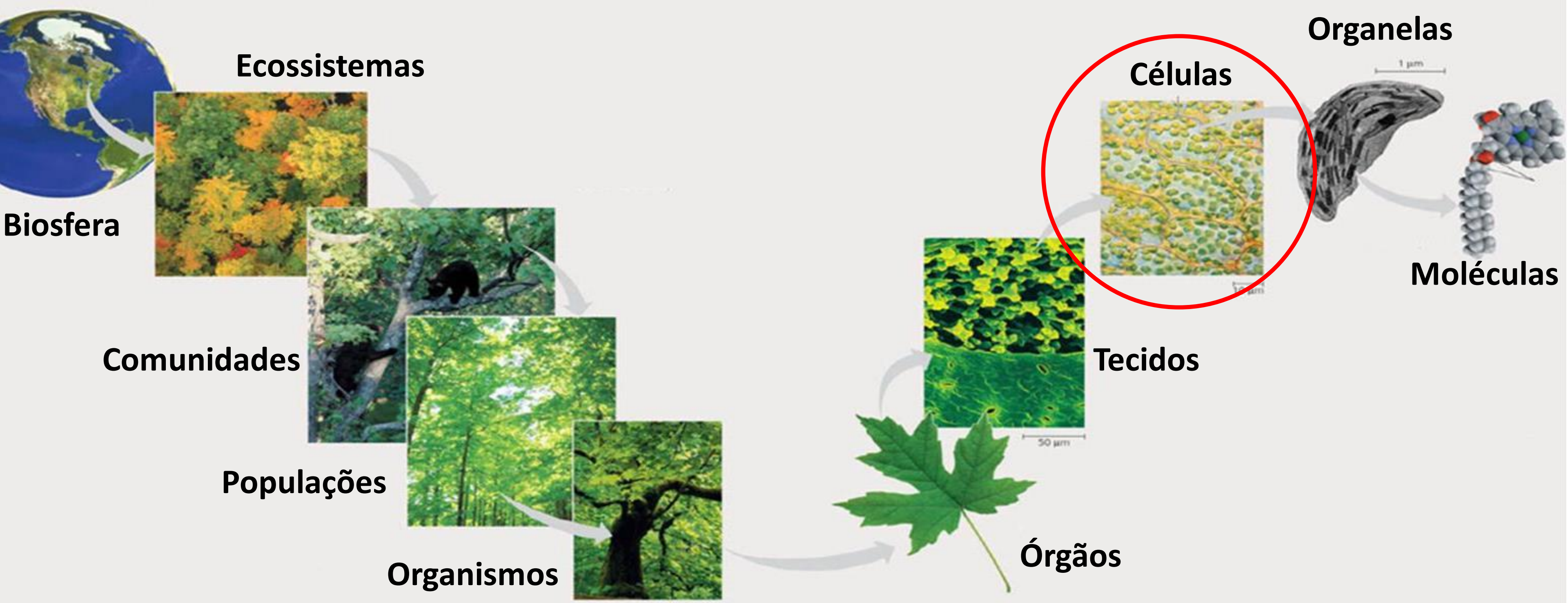




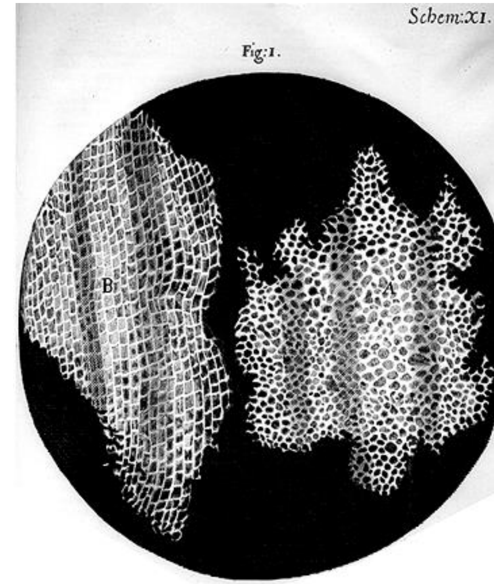

O QUE EXISTE EM COMUM ENTRE OS ORGANISMOS?

1. TEORIA CELULAR

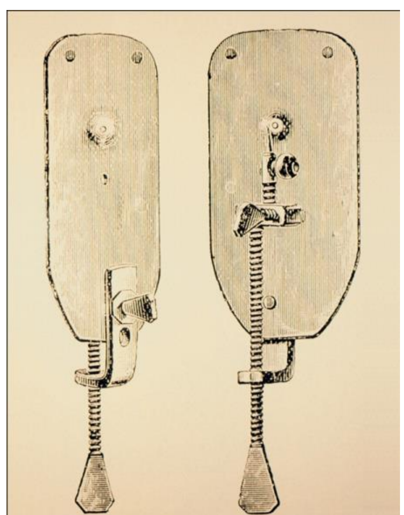
- ✓ a menor unidade de um organismo vivo (vida autônoma) é a célula;
- ✓ as propriedades (morfologia e fisiologia) de um organismo dependem das propriedades de suas células;
- ✓ as células se originam **unicamente** a partir de outras células e sua continuidade se mantém devido à transmissão de seu material genético ao longo das gerações (hereditariedade).

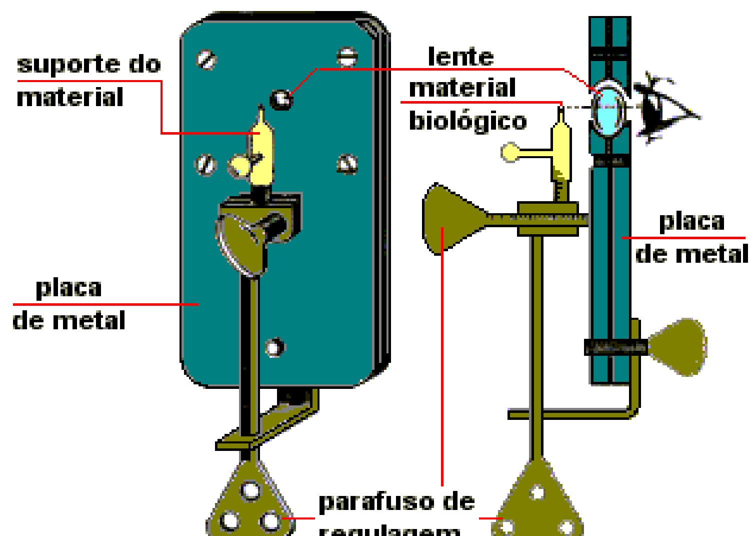


Robert Hooke – (1665)

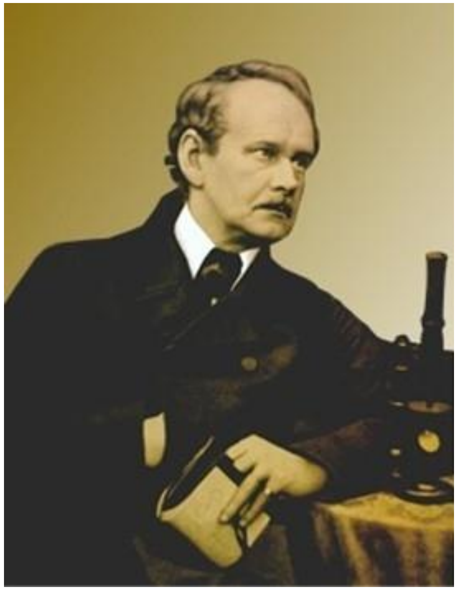


Antonie van Leeuwenhoek – (1670)

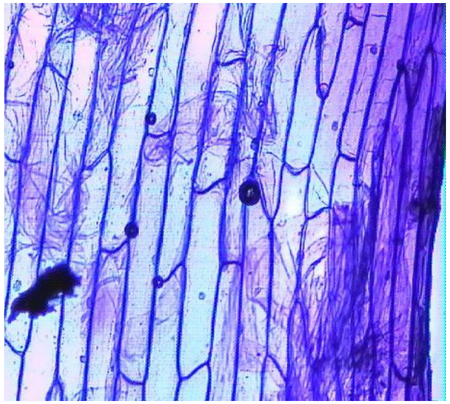




Mathias Schleiden (1838) - botânico

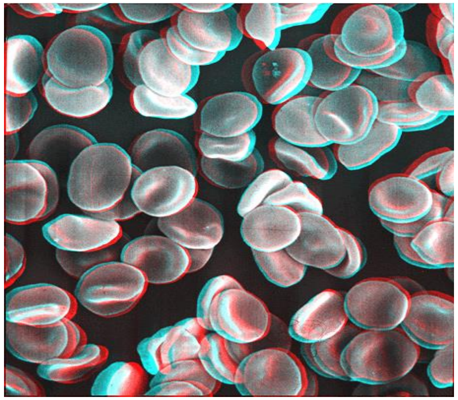


Células de cebola



Theodor Schwann (1839) - zoólogo

Células vermelhas dos sangue humano



Todas as plantas são constituídas por células.

↓

A célula é a unidade fundamental dos seres vivos

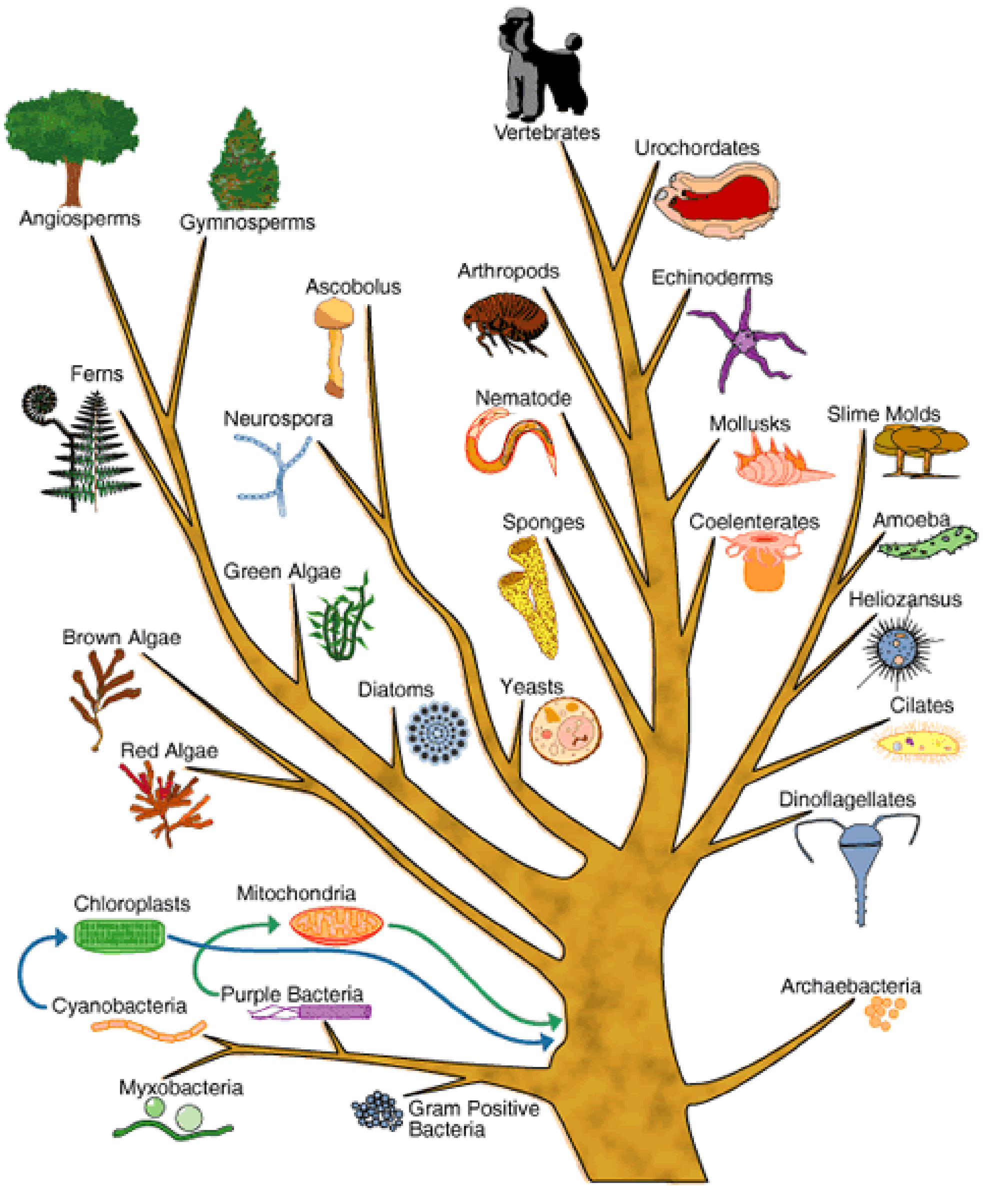
↑

Todos os animais são constituídos por células.

Rudolf Virchow – (1850) patologista

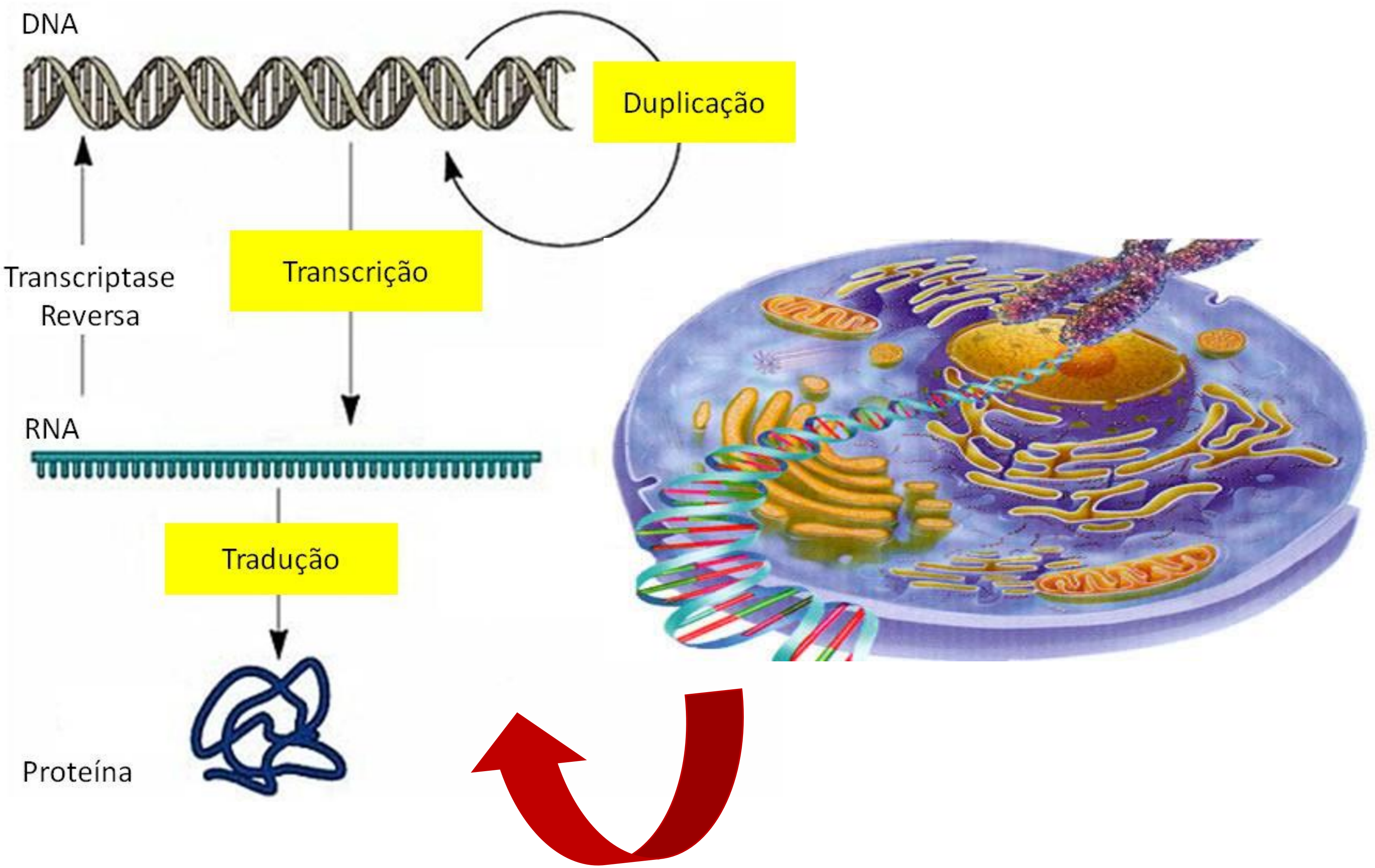
Todas as células se originam de outras células

2. ORIGEM



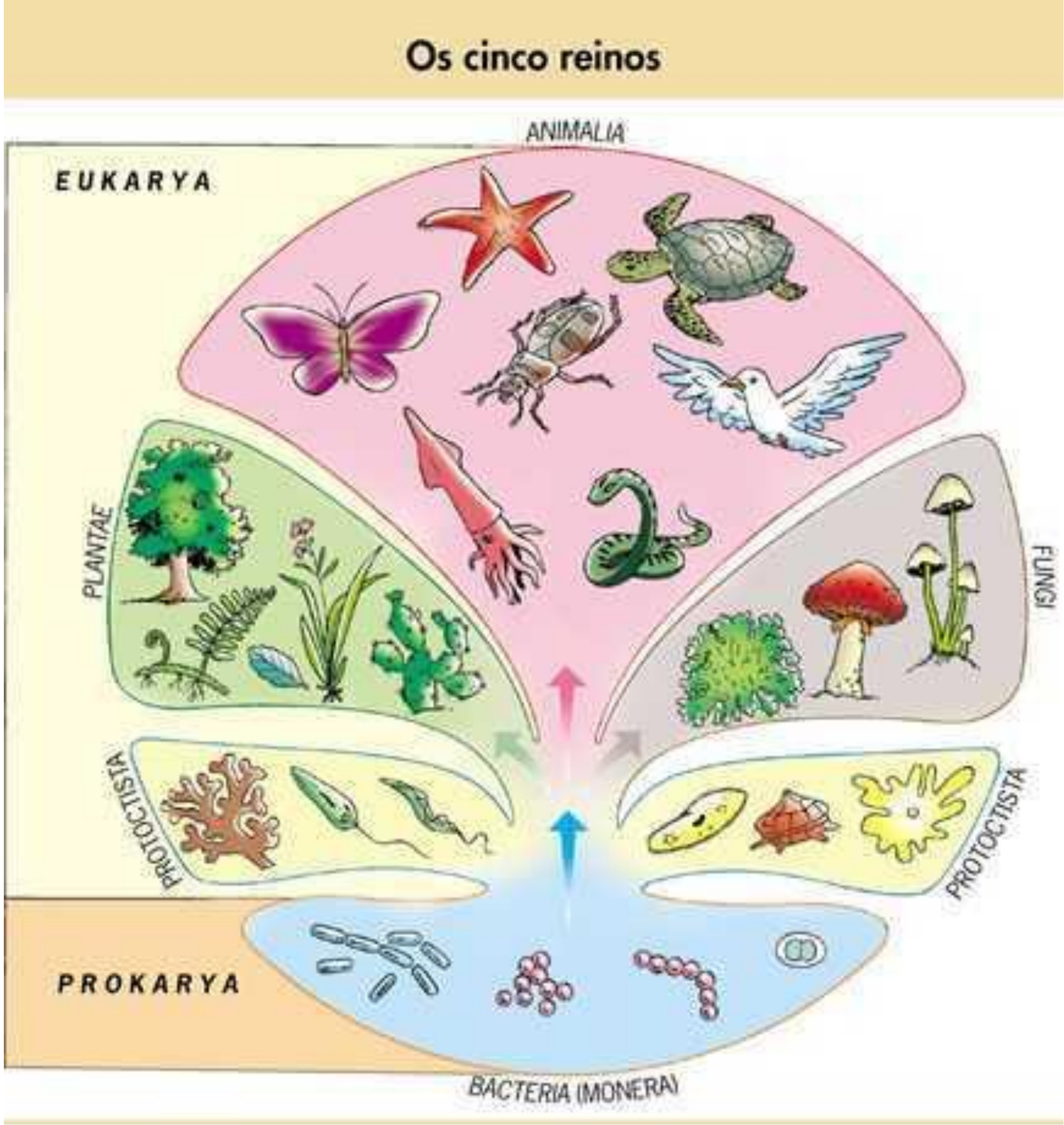
Vertebrates
Urochordates
Angiosperms
Gymnosperms
Ascobolus
Arthropods
Echinoderms
Ferns
Neurospora
Nematode
Mollusks
Slime Molds
Sponges
Coelenterates
Amoeba
Green Algae
Heliozansus
Brown Algae
Diatoms
Yeasts
Cilates
Red Algae
Dinoflagellates
Chloroplasts
Mitochondria
Purple Bacteria
Cyanobacteria
Archaebacteria
Myxobacteria
Gram Positive Bacteria

3. PROCESSOS CELULARES

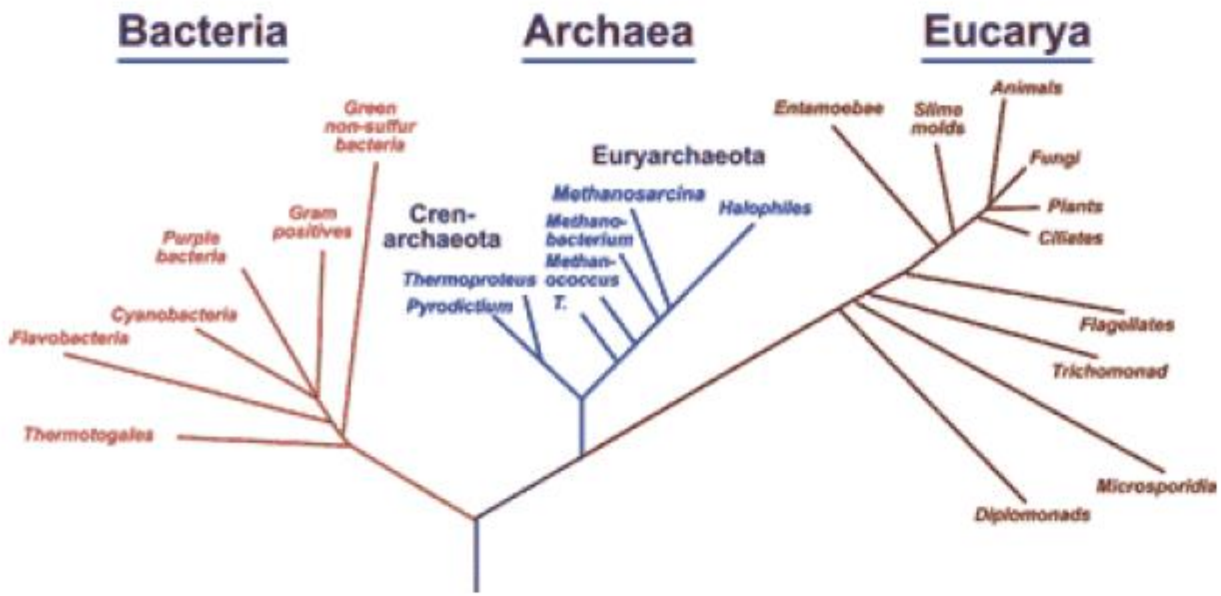


O QUE FAZ UM ORGANIMOS DIFERENTE DE OUTRO??

EXISTEM DOIS TIPOS CELULARES...



Autor	Reino e Domínios	Grupos de organismos
Linneaeus	Animalia Plantae	Animais e protozoários Plantas, algas, bactérias e fungos
Haeckel	Animalia Plantae Protista	Animais Plantas e algas multicelulares Algas unicelulares, bactérias, protozoários e fungos
Whittaker	Animalia Plantae Protista Fungi Monera	Animais Plantas Algas, Protozoários Fungos Procariotos
Woese	Archaea Bacteria Eukarya	Procariotos Procariotos Eucariotos: fungos, oomicetos, algas, protozoários, plantas e animais



Estudos filogenéticos moleculares, baseados principalmente na sequênciado gene que codifica a subunidade menor do ribossomo, separam os seres vivos em apenas três grandes grupos ou domínios: Bacteria, Archeae, Eukarya. Os dois primeiros são constituídos por células procariontes, e só o domínio Eukaryaapresenta células eucariontes (WOESE, 1977).

COMO É POSSÍVEL DIFERENCIÁ-LOS?

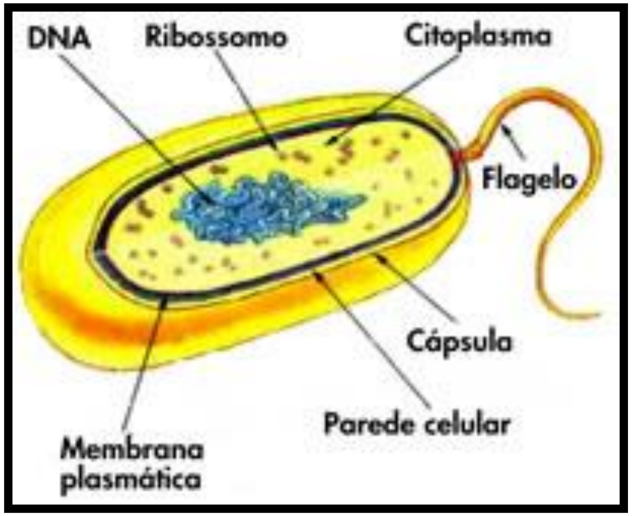
Procarioto X Eucarioto

1. Presença de envoltório nuclear;
2. Tamanho das células e suas moléculas;
3. Tamanho e organização dos genomas;
4. Organização celular.

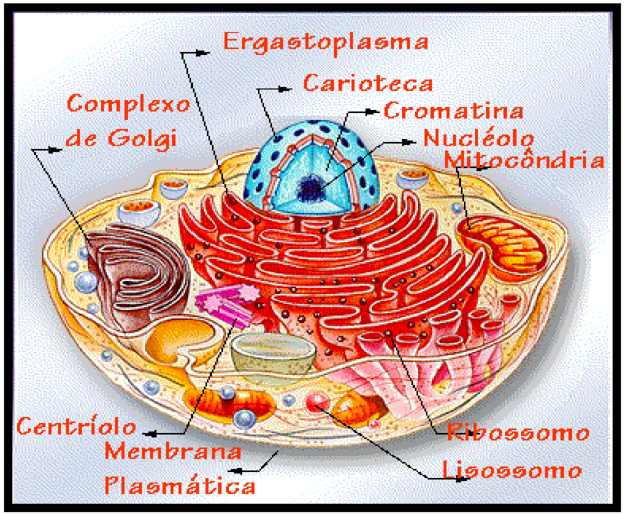
1. QUANTO A PRESENÇA DE ENVOLTÓRIO NUCLEAR

Procarioto: organismo (geralmente unicelular) cujas células não apresentam um núcleo verdadeiro, delimitado por membranas.

Eucarioto: organismo (unicelular ou multicelular) cujas células apresentam núcleo verdadeiro.

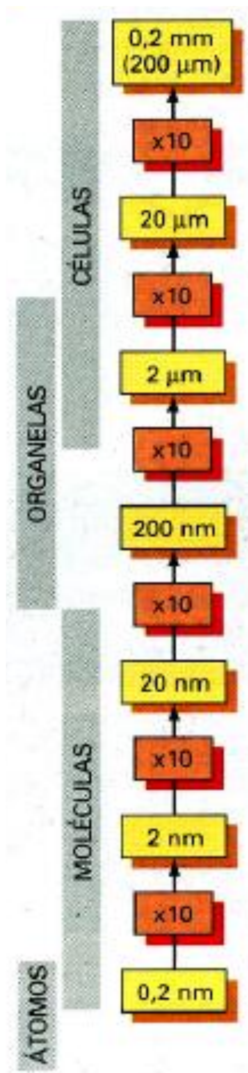


Célula Procariótica



Célula Eucariótica Animal

2. TAMANHO DAS CÉLULAS E SUAS MOLÉCULAS



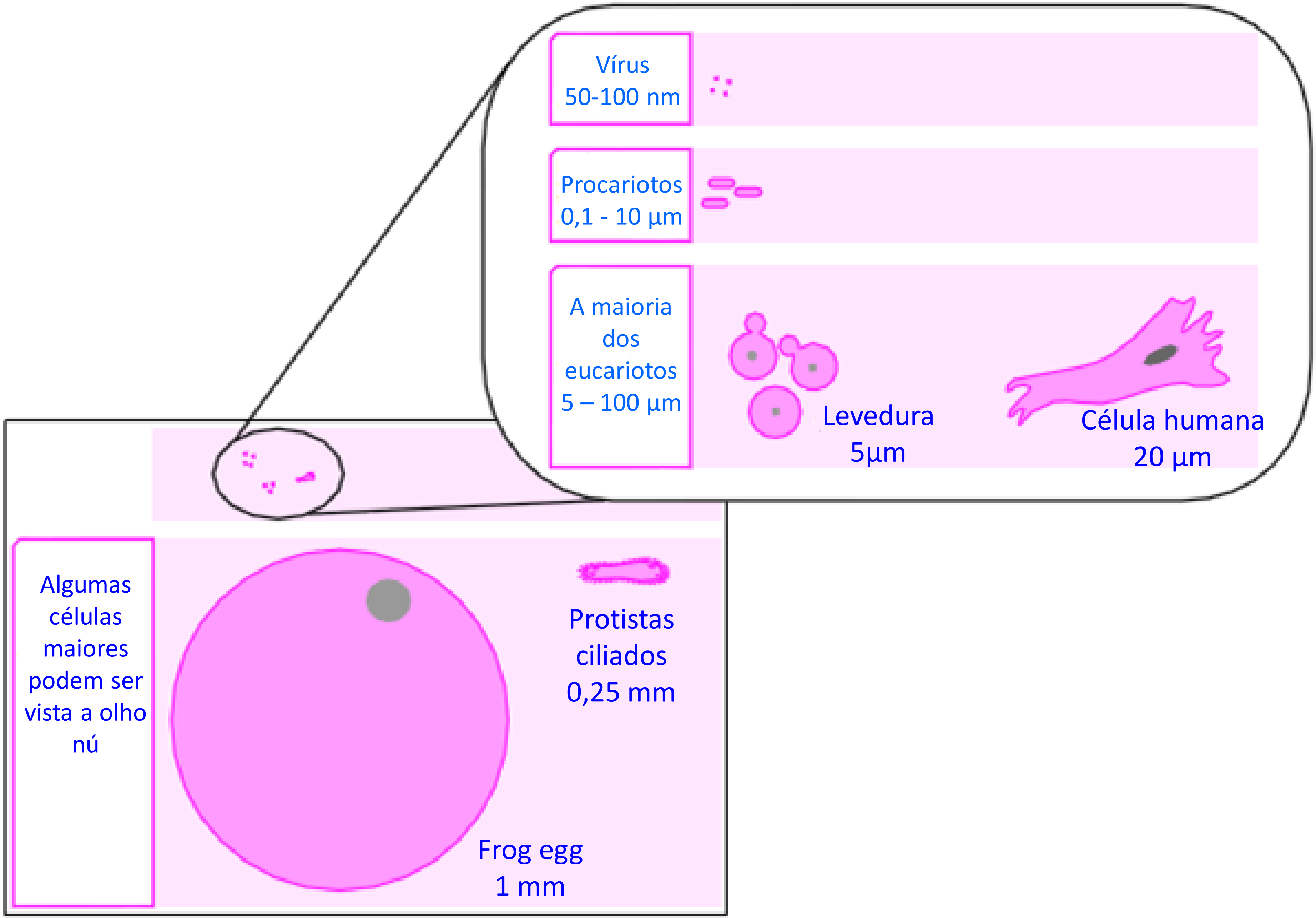
Mínimo resolvível à vista desarmada

Mínimo resolvível pelo microscópio óptico

1cm= 10mm
1mm= 1000µm
1µm= 1000nm

Mínimo resolvível pelo microscópio eletrônico

2. TAMANHO DAS CÉLULAS E SUAS MOLÉCULAS



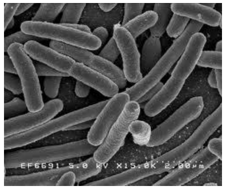
3. TAMANHO E ORGANIZAÇÃO DO GENOMA

O que faz um organismo diferente do outro?

HIV tipo I -19.750 b

Milho
2.5 Gb

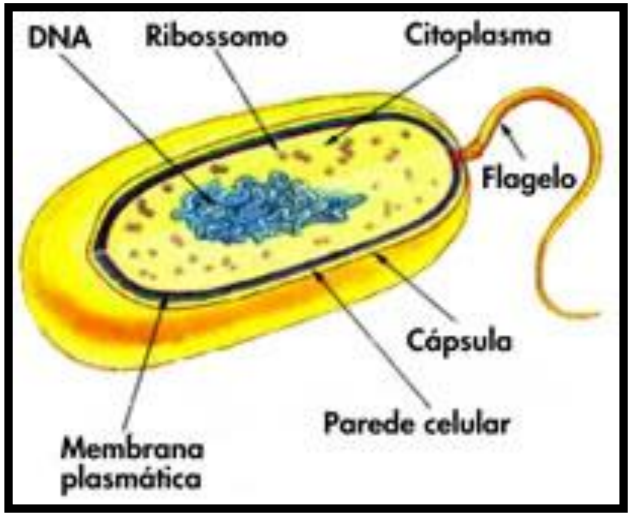
Mamute
4.17 Gb



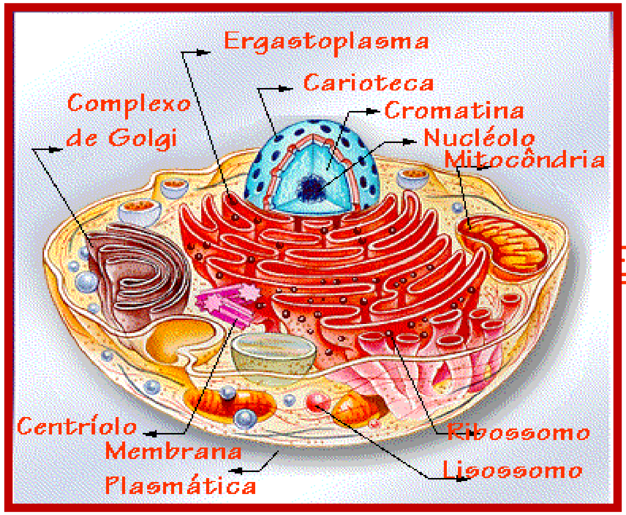
Escherichia coli
5 Mb

Humano
3 Gb

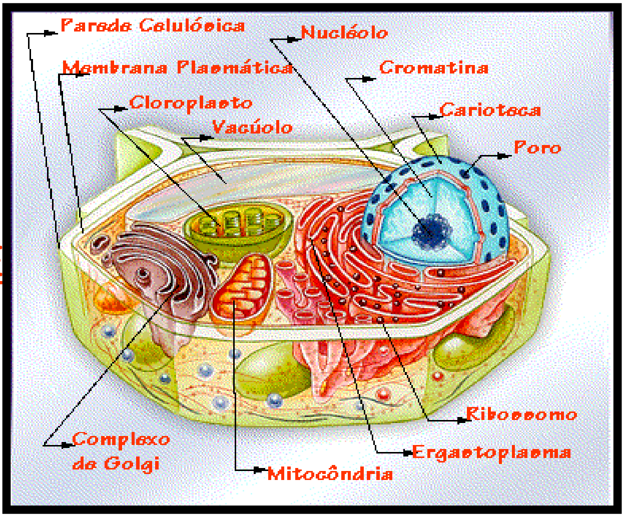
4. ORGANIZAÇÃO CELULAR



Célula Procariótica



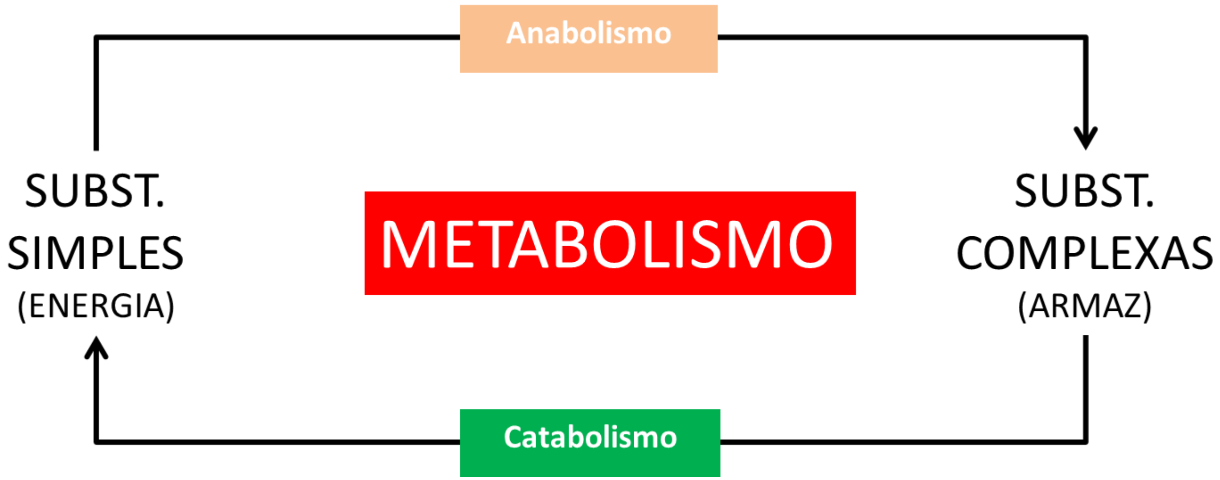
Célula Eucariótica Animal



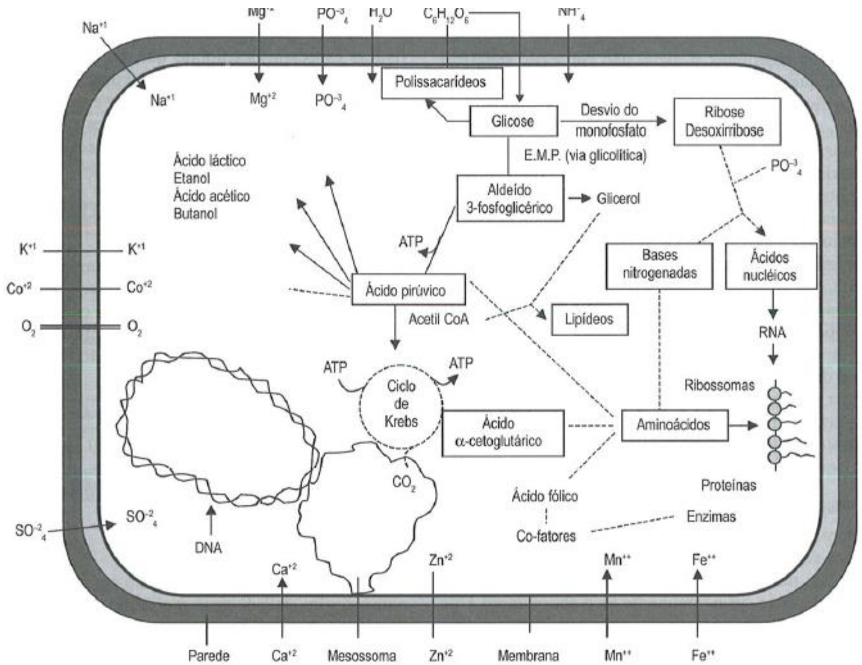
Célula Eucariótica Vegetal

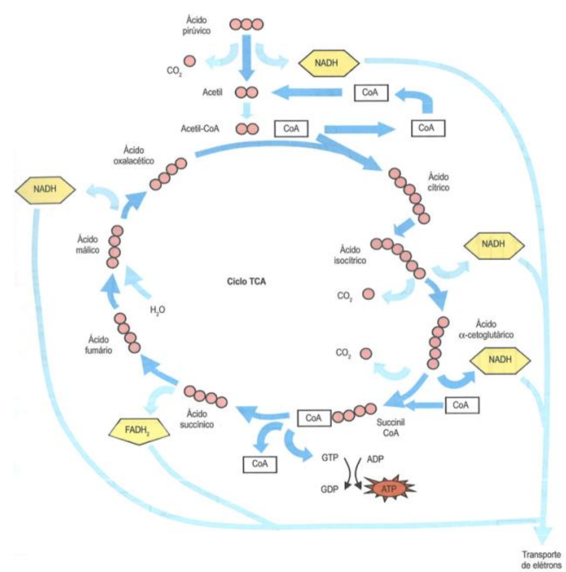
MAS O QUE TODAS AS CÉLULAS TEM EM COMUM?

AS CÉLULAS CONSTROEM E DEGRADAM MOLÉCULAS



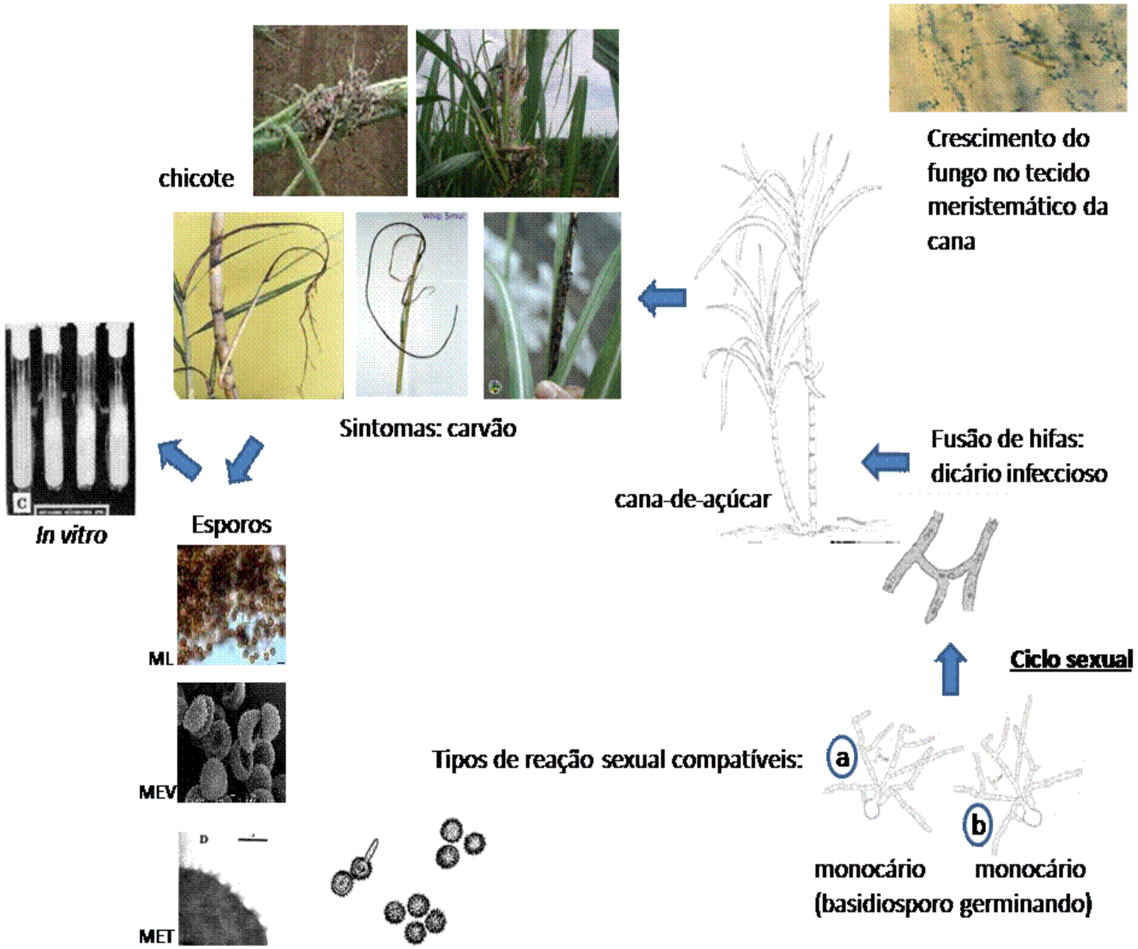
ATP é a fonte de energia!!

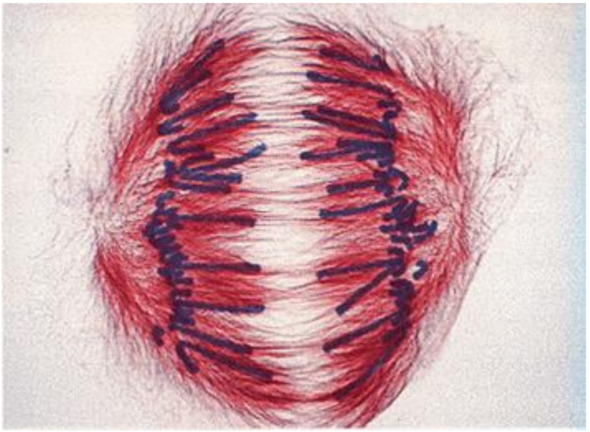


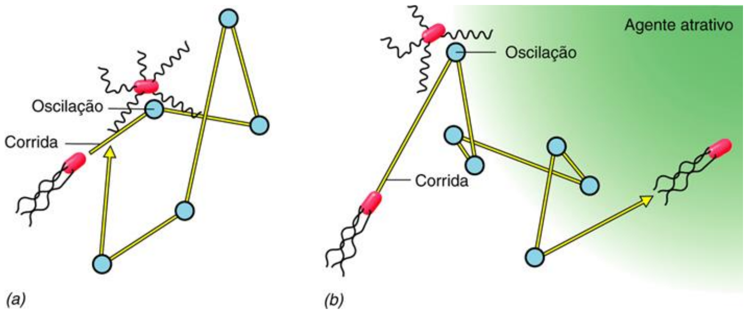


Trabulsi, 2008

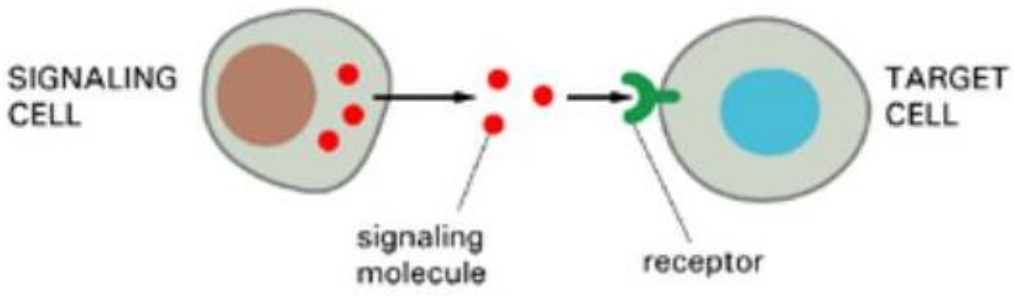
AS CÉLULAS ALTERAM SUAS FORMAS E SE MOVIMENTAM





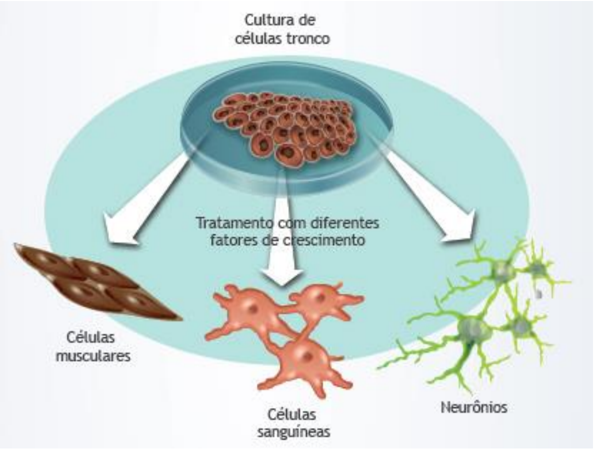


AS CÉLULAS RECEBEM E EMITEM INFORMAÇÃO

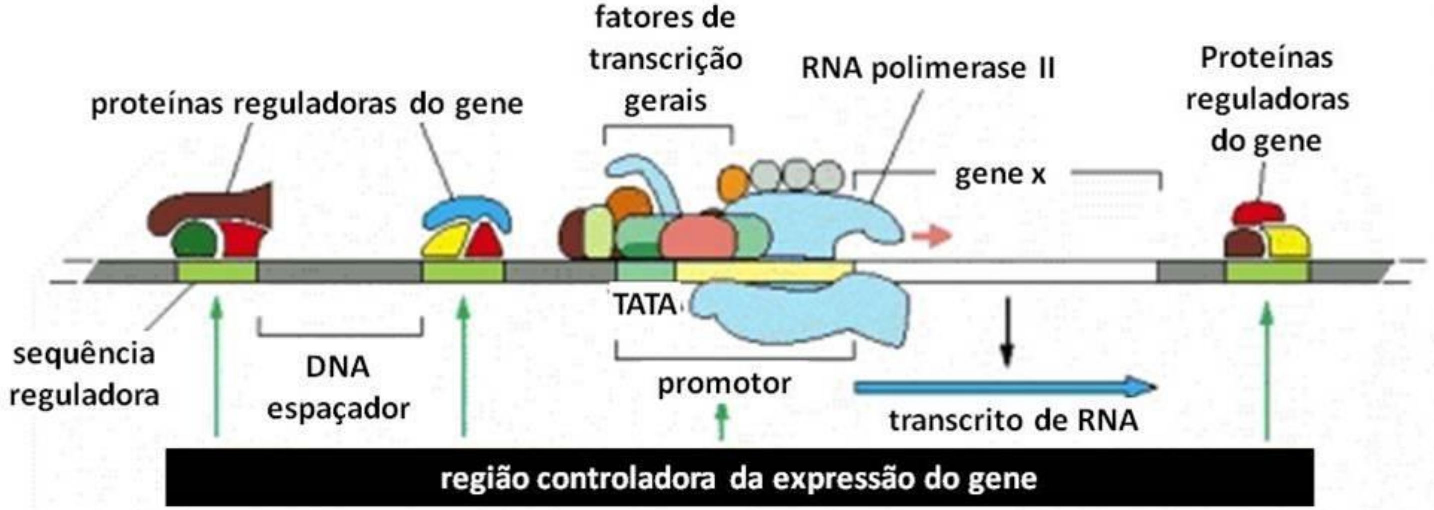


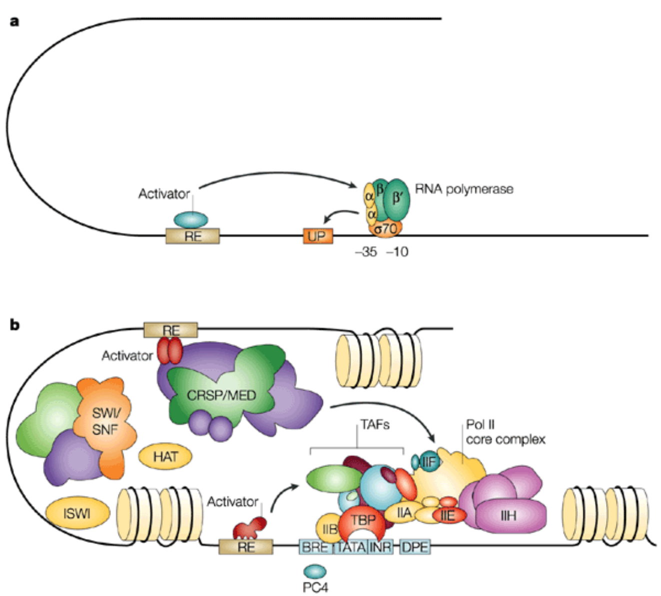
- Movimento, apoptose, defesa!
- Proliferação
- Sobrevivência
- Diferenciação

Figura 1. Sintomas observados em folhas de couve chinesa inoculadas com *Pseudomonas viridiflava*

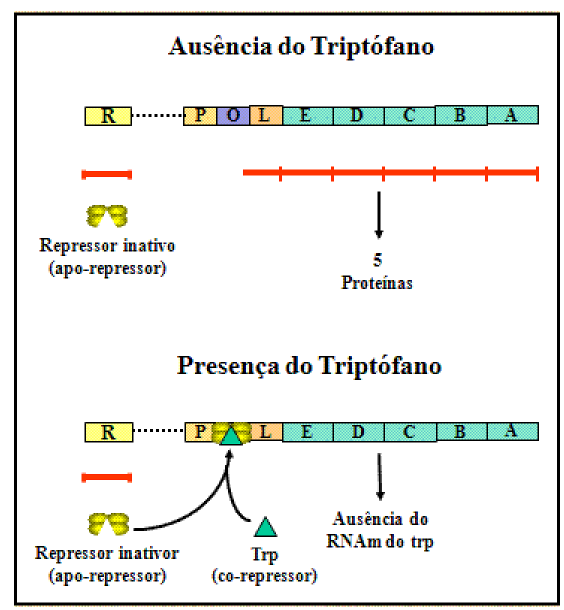


AS CÉLULAS REGULAM SUA EXPRESSÃO GÊNICA

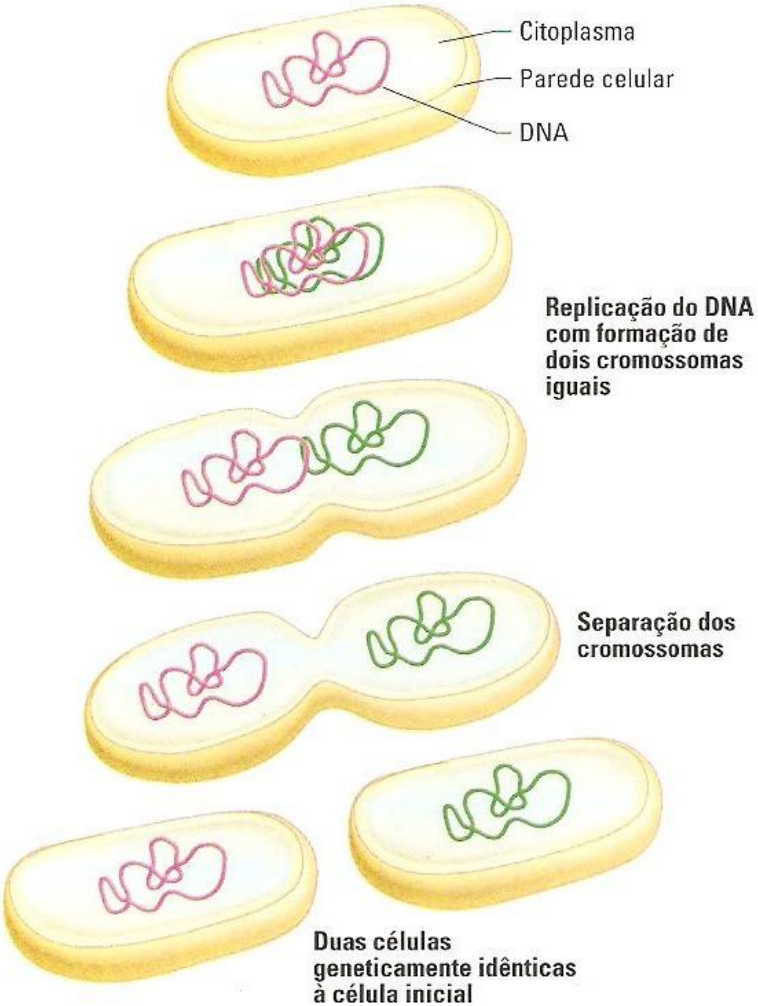


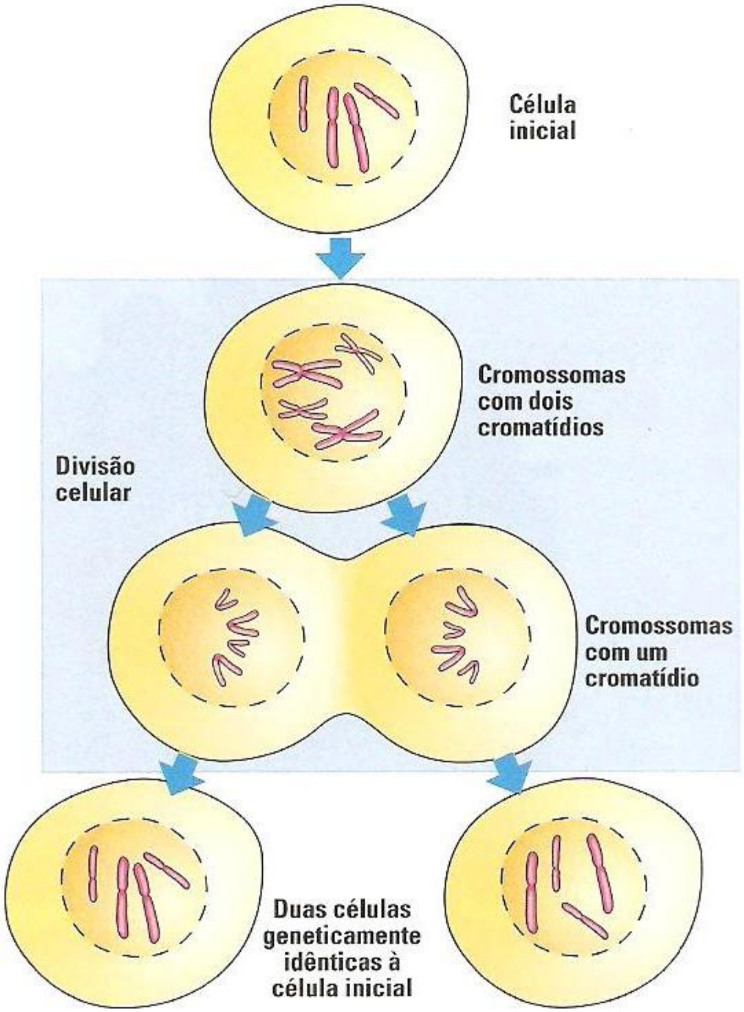


Nature Reviews | Molecular Cell Biology

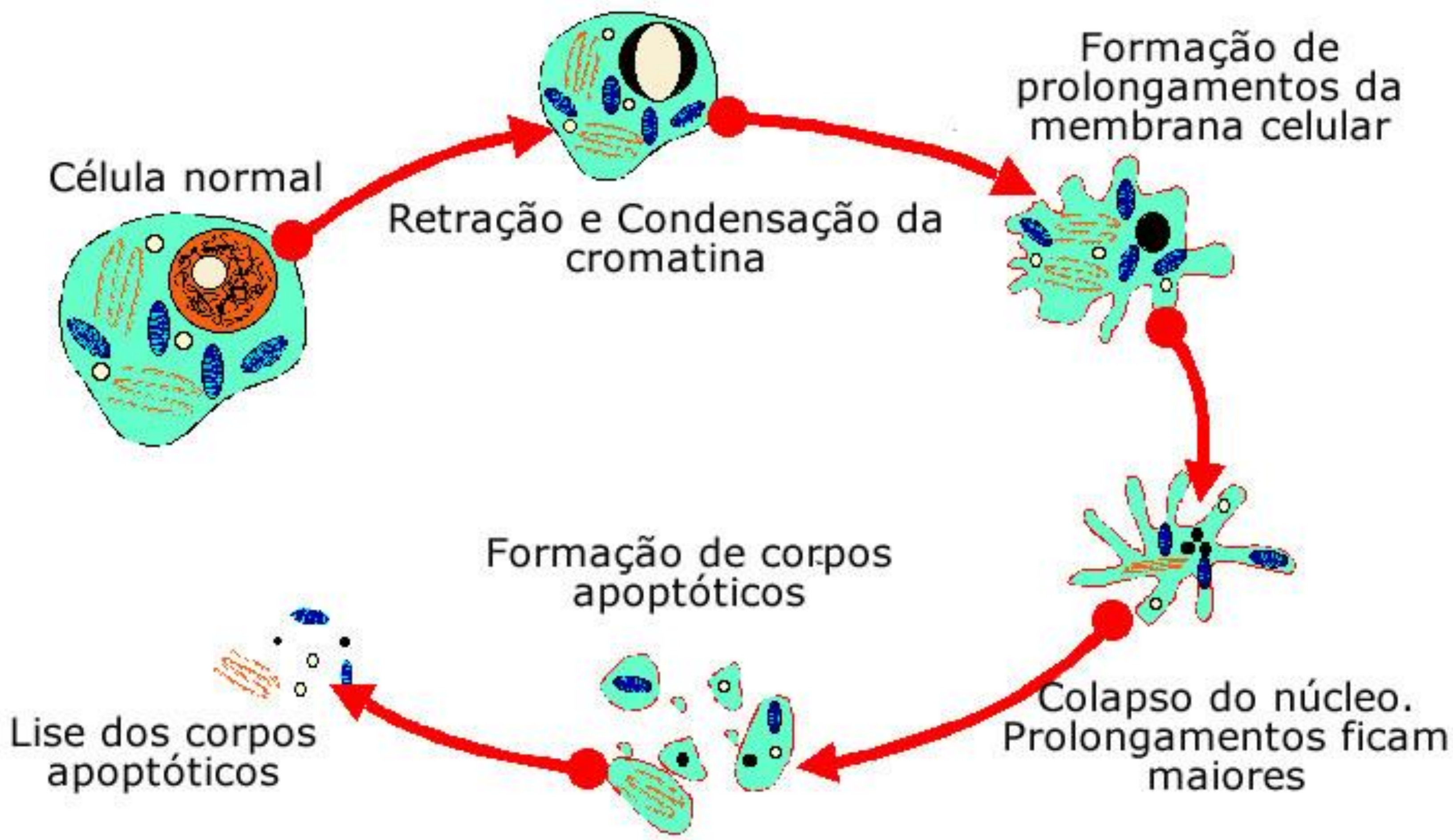


AS CÉLULAS CRESCEM E SE DIVIDEM





AS CÉLULAS MORREM

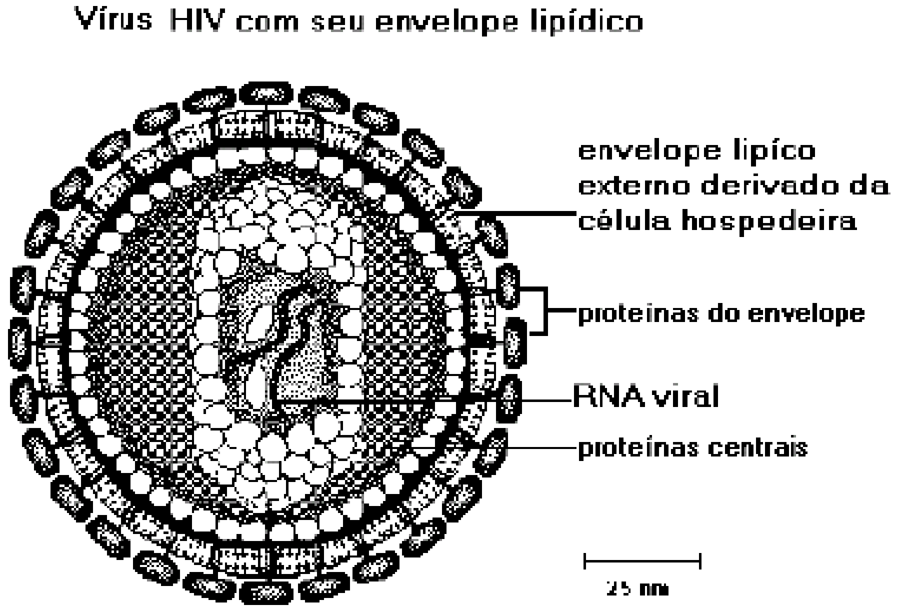


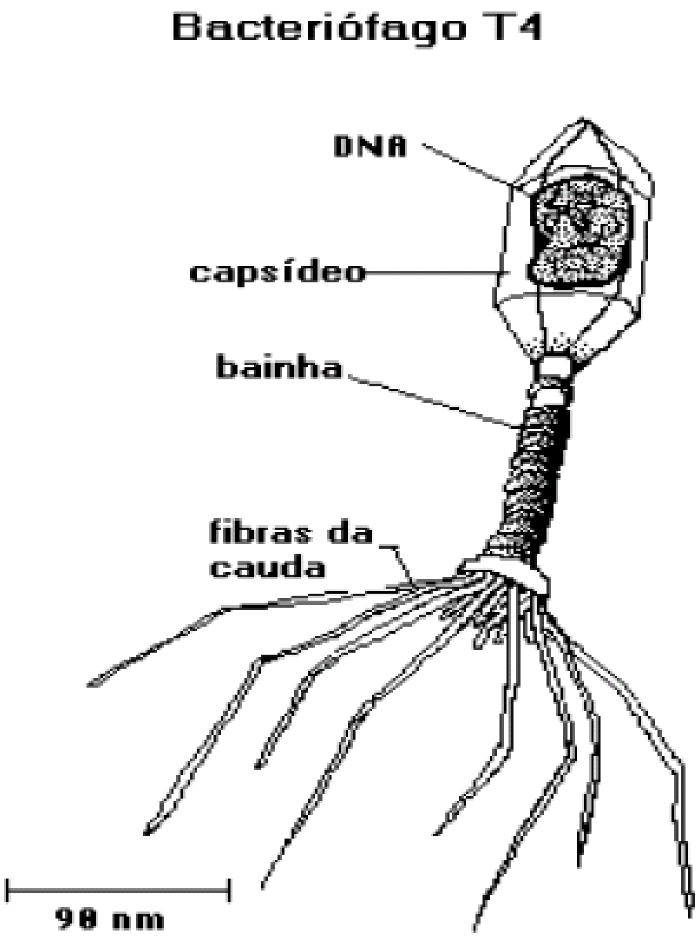
“In contrast to the laws of physics, those of biology are full of exceptions: as soon as a rule is discovered, a further discovery shows an exception.”
Antoine DanchinGenetics of Bacterial Genomes, Institute Pasteur, Paris , France

Rickettsiae Chlamydia: são parasitas intracelulares**In**

- são parasitas intracelulares obrigatórios;
- células muito pequenas;
- procariotos incompletos;
- sem a capacidade de se autoduplicar independente da célula hospedeira;
- faltam genes de metabolismo como por exemplo, vias de biosíntese de aminoácidos

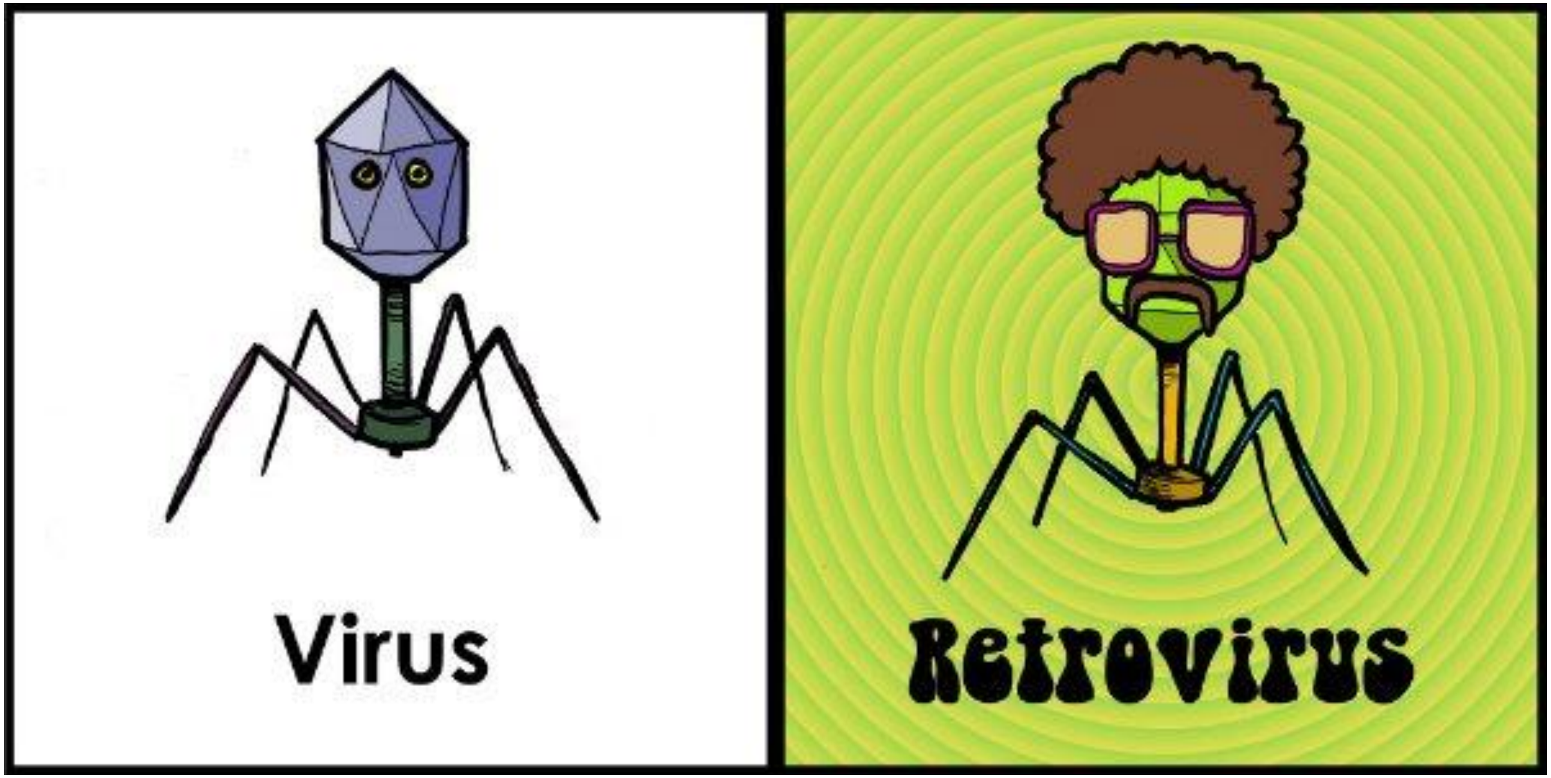
E OS VÍRUS?





Seres vivos?

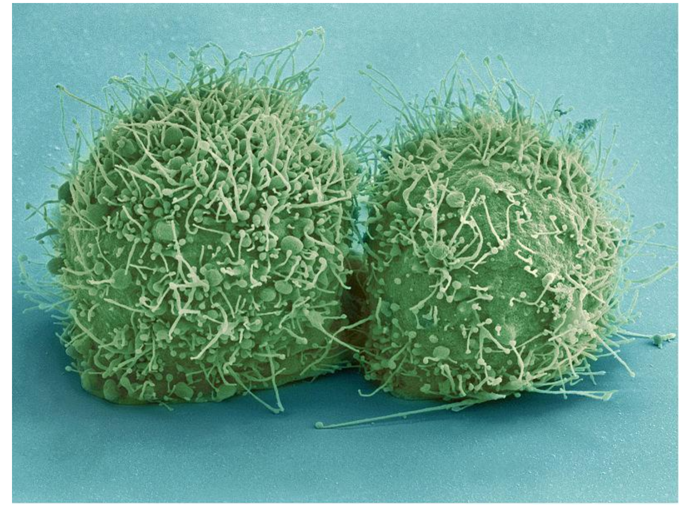
DIVERSIDADE NO MATERIAL GENÉTICO



Onde aplico todo esse estudo?

Célula "Highlander"

Atualmente já foi produzido mais de 20 tons "HeLa cells"



How One Woman's Cells Changed Medicine

By RON CLAIBORNE and SIDNEY WRIGHT IV Jan. 31, 2010

Share Tweet

Henrietta Lacks, circa 1950.

The Genomic and Transcriptomic Landscape of a HeLa Cell Line

Jonathan J. M. Landry,[*,1] Paul Theodor Pyl,[*,1] Tobias Rausch,[*] Thomas Zichner,[*] Manu M. Tekkedil,[*] Adrian M. Stütz,[*] Anna Jauch,[†] Raeka S. Aiyar,[*] Gregoire Pau,[*,2] Nicolas Delhomme,[*,3] Julien Gagneur,[*,4] Jan O. Korbel,[*] Wolfgang Huber,[*,5] and Lars M. Steinmetz[*,5]

[*]European Molecular Biology Laboratory, Genome Biology Unit, 69117 Heidelberg, Germany, and [†]University Hospital Heidelberg, Institute of Human Genetics, 69120 Heidelberg, Germany

ABSTRACT HeLa is the most widely used model cell line for studying human cellular and molecular biology. To date, no genomic reference for this cell line has been released, and experiments have relied on the human reference genome. Effective design and interpretation of molecular genetic studies performed using HeLa cells require accurate genomic information. Here we present a detailed genomic and transcriptomic characterization of a HeLa cell line. We performed DNA and RNA sequencing of a HeLa Kyoto cell line and analyzed its mutational portfolio and gene expression profile. Segmentation of the genome according to copy number revealed a remarkably high level of aneuploidy and numerous large structural variants at unprecedented resolution. Some of the extensive genomic rearrangements are indicative of catastrophic chromosome shattering, known as chromothripsis. Our analysis of the HeLa gene expression profile revealed that several pathways, including cell cycle and DNA repair, exhibit significantly different expression patterns from those in normal human tissues. Our results provide the first detailed account of genomic variants in the

KEYWORDS
genomics
transcriptomics
HeLa cell line
resource
variation

STUDIES ON THE PROPAGATION IN VITRO OF POLIOMYELITIS VIRUSES

IV. Viral Multiplication in a Stable Strain of Human Malignant Epithelial Cells (Strain HeLa) Derived from an Epidermoid Carcinoma of the Cervix*

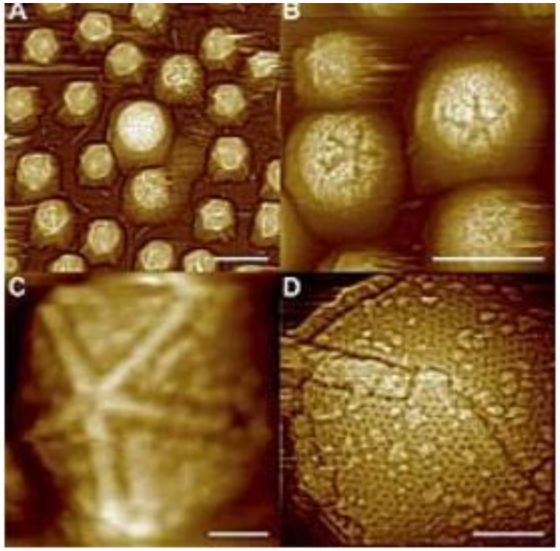
By WILLIAM F. SCHERER, M.D., JEROME T. SYVERTON, M.D., and GEORGE O. GEY, M.D.

(From the Department of Bacteriology and Immunology, University of Minnesota, Minneapolis, and the Department of Surgery, Johns Hopkins Hospital and University, Baltimore)

Plates 39 to 41

(Received for publication, January 20, 1953)

The propagation of poliomyelitis virus in tissue cultures prepared from primary explants derived from a variety of extraneural tissues from man (1–9) and monkeys (5, 7–17) has given new impetus to the development of methods for the production of poliomyelitis virus without resort (beyond the original explant) to man or to an experimental animal. A wide variety of tissues, normal and malignant, have been employed (16, 18) over several years in attempts to obtain strains of cells adaptable to cultivation in tissue culture beyond the first several generations. These attempts at the University of Minnesota met with failure until recently when success was achieved by the propagation of poliomyelitis virus in cultures of monkey testicular "fibroblasts" maintained in series (16). Contrariwise, stable strains of animal cells were developed by Gey and coworkers (19–22). Some of these strains have since been tested for susceptibility to a variety of viruses (23–26). The obvious need for a highly susceptible strain of human cells capable of yielding poliomyelitis virus in quantity in from one to several days led to the employment of a strain of malignant epithelial cells adapted to cellular cultivation *in vitro* (21, 22). It is the purpose of this paper to present the observations and data that relate to the employment of a stable strain for the successful propagation of poliomyelitis virus, Types 1, 2, and 3. This cellular strain, designated as strain HeLa by one of the authors (G. G.) when he obtained it from an epidermoid carcinoma of the cervix



Vírus gigante que se esconde dentro de amebas e tem material genético incomum

NATURE | NEWS

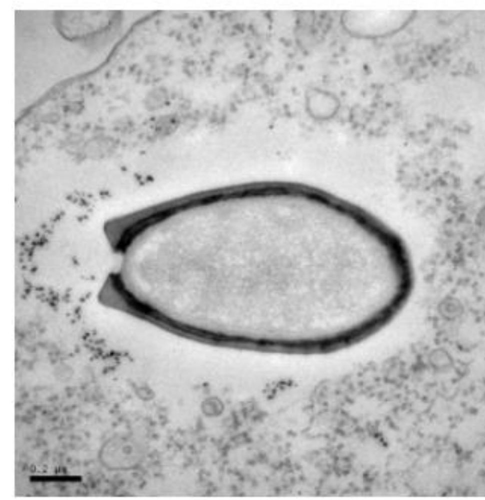
Giant viruses open Pandora's box

Genome of largest viruses yet discovered hints at 'fourth domain' of life.

Ed Yong

18 July 2013

The organism was initially called NLF, for "new life form". Jean-Michel Claverie and Chantal Abergel, evolutionary biologists at Aix-Marseille University in France, found it in a water sample collected off the coast of Chile, where it seemed to be infecting and killing amoebae. Under a microscope, it appeared as a large, dark spot, about the size of a small bacterial cell.



Pandoraviruses infect amoebae and are larger than some bacteria

Later, after the researchers discovered a similar organism in a pond in Australia, they realized that both are viruses — the largest yet found. Each is around 1 micrometre long and 0.5 micrometres across, and their respective genomes top out at 1.9 million and 2.5 million bases — making the viruses larger than many bacteria and even some eukaryotic cells.

But these viruses, described today in *Science*[1], are more than

PNAS PNAS PNAS
PNAS PLUS
MICROBIOLOGY

In-depth study of *Mollivirus sibericum*, a new 30,000-y-old giant virus infecting *Acanthamoeba*

Matthieu Legendre[a,1], Audrey Lartigue[a,1], Lionel Bertaux[a], Sandra Jeudy[a], Julia Bartoli[a,2], Magali Lescot[a], Jean-Marie Alempic[a], Claire Ramus[b,c,d], Christophe Bruley[b,c,d], Karine Labadie[e], Lyubov Shmakova[f], Elizaveta Rivkina[f], Yohann Couté[b,c,d], Chantal Abergel[a,3], and Jean-Michel Claverie[a,g,3]

[a]Information Génomique and Structurale, Unité Mixte de Recherche 7256 (Institut de Microbiologie de la Méditerranée, FR3479) Centre National de la Recherche Scientifique, Aix-Marseille Université, 13288 Marseille Cedex 9, France; [b]Université Grenoble Alpes, Institut de Recherches en Technologies et Sciences pour le Vivant–Laboratoire Biologie à Grande Echelle, F-38000 Grenoble, France; [c]Commissariat à l'Energie Atomique, Centre National de la Recherche Scientifique, Institut de Recherches en Technologies et Sciences pour le Vivant–Laboratoire Biologie à Grande Echelle, F-38000 Grenoble, France; [d]INSERM, Laboratoire Biologie à Grande Echelle, F-38000 Grenoble, France; [e]Commissariat à l'Energie Atomique, Institut de Génomique, Centre National de Séquençage, 91057 Evry Cedex, France; [f]Institute of Physicochemical and Biological Problems in Soil Science, Russian Academy of Sciences, Pushchino 142290, Russia; and [g]Assistance Publique–Hopitaux de Marseille, 13385 Marseille, France

Edited by James L. Van Etten, University of Nebraska, Lincoln, NE, and approved August 12, 2015 (received for review June 2, 2015)

Acanthamoeba **species are infected by the largest known DNA viruses. These include icosahedral Mimiviruses, amphora-shaped Pandoraviruses, and *Pithovirus sibericum*, the latter one isolated from 30,000-y-old permafrost. *Mollivirus sibericum*, a fourth type of giant virus, was isolated from the same permafrost sample. Its approximately spherical virion (0.6-µm diameter) encloses a 651-kb GC-rich genome encoding 523 proteins of which 64% are ORFans; 16% have their closest homolog in Pandoraviruses and 10% in *Acanthamoeba castellanii* probably through horizontal gene transfer. The Mollivirus nucleocytoplasmic replication cycle was analyzed using a combination of "omic" approaches that revealed how the virus highjacks its host machinery to actively replicate. Surprisingly, the host's ribosomal proteins are packaged in the virion. Metagenomic analysis of the permafrost sample uncovered the presence of both viruses, yet in very low amount. The fact that two different viruses retain their infectivity in prehistorical permafrost layers should be of concern in a context of global warming. Giant viruses' diversity remains to be fully explored.**

genome was recently made available [*Pandoravirus inopinatum* (15)]. These genomes encode a number of predicted proteins comparable to that of the most reduced parasitic unicellular eukaryotes, such as encephalitozoon species (14). In contrast with *Mimiviridae*, Pandoraviruses' replication cycle involves (and disrupts) the host nucleus.

Searching for *Acanthamoeba*-infecting virus in increasingly exotic environments allowed the discovery of *Pithovirus sibericum* infectious particles, which were recovered from a sample of Late Pleistocene Siberian permafrost (16). Although Pithovirus's virions looked similar to those of Pandoraviruses both in terms of size and overall shape, further analyses indicated that the two

Significance

The saga of giant viruses (i.e. visible by light microscopy) started in 2003 with the discovery of Mimivirus. Two additional types of giant viruses infecting *Acanthamoeba* have been discovered since: the Pandoraviruses (2013) and *Pithovirus sibe-*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ÚLTIMAS | BLOGS | COLUNAS

Herton Escobar

Imagine só!

Pesquisar

As informações e opiniões expressas neste blog são de responsabilidade única do autor.

Atenção: Este alimento contém DNA!

HERTONESCOBAR

04 Fevereiro 2015 | 08:00

0 COMENTÁRIO(S)

DÊ A SUA OPINIÃO

SEM COMENTÁRIOS.

DÊ A SUA OPINIÃO

POSTS MAIS LIDOS

29 de abril de 2013
Ciência brasileira adere ao 'padrão salame' de

6 de junho de 2014
CNPq lança o maior edital de sua história: R$ 642 milhões

http://ciencia.estadao.com.br/blogs/herton-escobar/atencao-este-alimento-contem-dna/

MELHORAMENTO GENÉTICO

Teosinto Milho primitivo Milho atual

tomate selvagem
(*Lycopersicon pimpinellifolium*)
ϕ = 1 cm

Nature Genetics, 40(6):800-804, 2008.

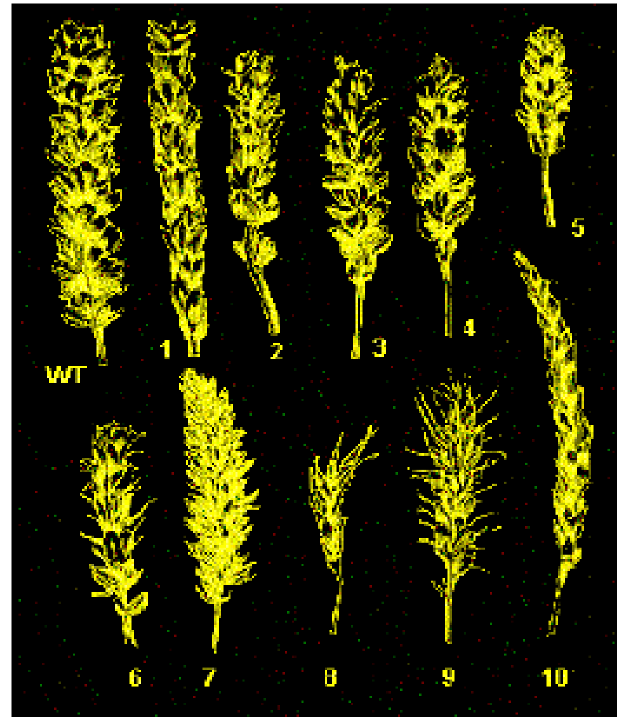
CITOGENÉTICA

* Esclarecendo a origem de espécies vegetais

Triticum dicoccum (n=14)

T. monococcum (n=7)

T. aestivum (n=21)



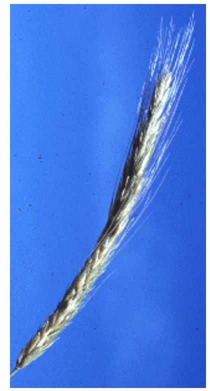
Mutantes de trigo com variação no número de cromossomos

CRUZAMENTOS INTERESPECÍFICOS

Trigo (*Triticum aestivum*)

X

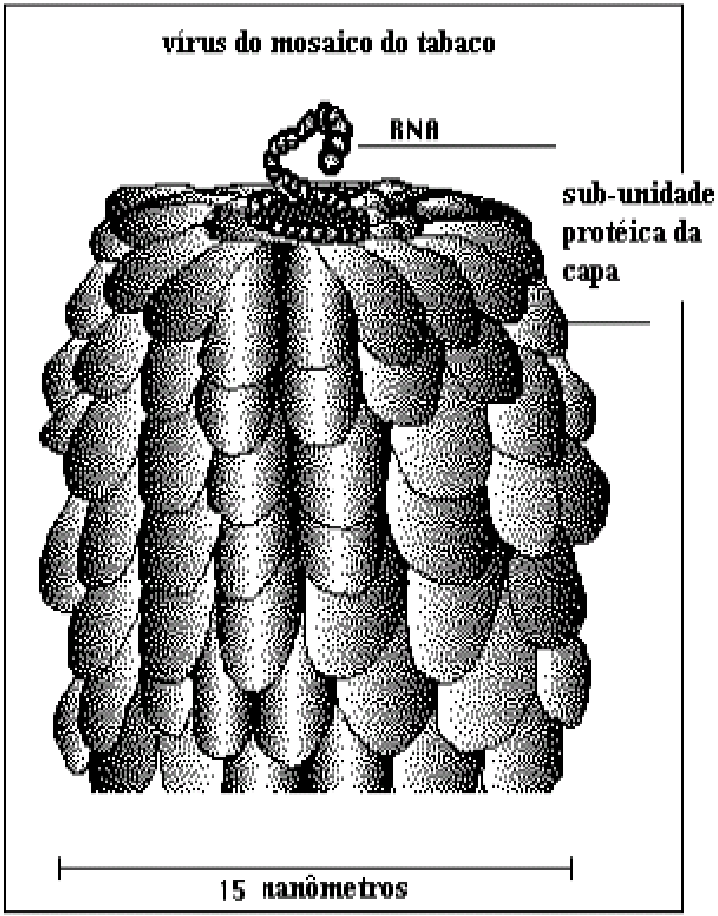
Centeio (*Secale cereale)*



Triticale (Triticosecale)

Nova espécie, mas não produzida por Biotecnologia.

CONTROLE DE PRAGAS AGRÍCOLAS



Planta sadia

Planta infectada com vírus

DIAGNÓSTICO AMBIENTAL

Cianobactérias x Toxinas

Praia dos Namorados, Americana-SP

ENGENHARIA GENÉTICA

Engenharia Genética envolve:

- ✓ Isolamento de genes;
- ✓ Modificação de genes para que "funcionem melhor"
- ✓ Preparar os genes para serem inseridos na nova espécie;
- ✓ Desenvolvimento dos transgênicos;

Plant Biotechnology Journal

Plant Biotechnology Journal (2015) **13**, pp. 884–892 doi: 10.1111/pbi.12309

Engineering soya bean seeds as a scalable platform to produce cyanovirin-N, a non-ARV microbicide against HIV

Barry R. O'Keefe[1,*], André M. Murad[2], Giovanni R. Vianna[2], Koreen Ramessar[1], Carrie J. Saucedo[1,3], Jennifer Wilson[1], Karen W. Buckheit[4], Nicolau B. da Cunha[2], Ana Claudia G. Araújo[2], Cristiano C. Lacorte[2], Luisa Madeira[2,5], James B. McMahon[1] and Elibio L. Rech[2,*]

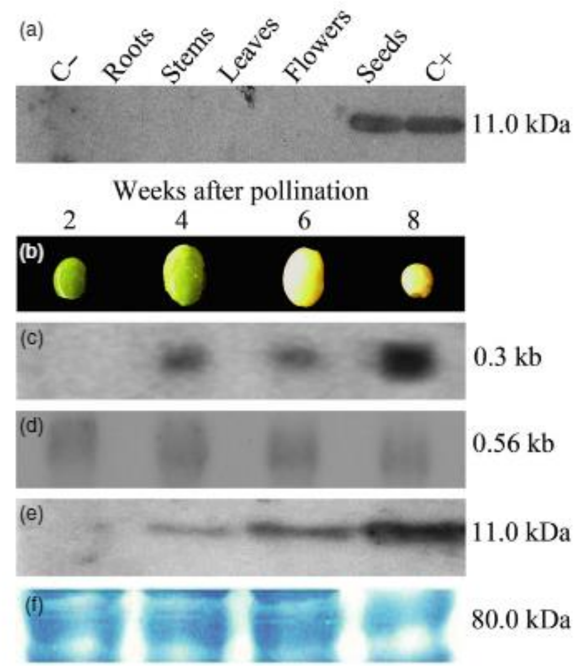
[1]*Molecular Targets Laboratory, Center for Cancer Research, National Cancer Institute, NIH, Frederick, MD, USA*

[2]*EMBRAPA Genetic Resources and Biotechnology, Laboratory of Synthetic Biology, Brasília, DF, Brazil*

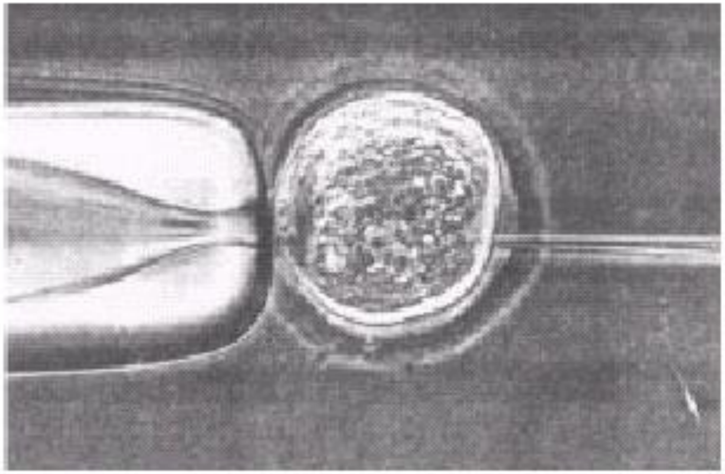
[3]*Leidos, Frederick National Laboratory for Cancer Research, Frederick, MD, USA*

[4]*ImQuest BioSciences LLC., Frederick, MD, USA*

[5]*Division of Clinical Sciences, St. George's, University of London, London, UK*



Animais transgênicos



ESTUDO DIRIGIDO

1. Definição de um organismo vivo;
2. Classificação dos seres vivos (Domínios e Reinos);
3. Diferenças entre Eucariotos e Procariotos;
4. Funções celulares;
5. Importância da Biologia Celular. Exemplos.

LEITURA DA SEMANA

Livro:

Alberts, B.; Bray, D.; Hopkin, K.; Johnson, A.; Lewis, J.; Raff, M.; Roberts, K.; Walter, P. 2011. ***Fundamentos da Biologia Celular***. 3ª Edição brasileira. Artmed, Porto Alegre

CAPÍTULO 1 – INTRODUÇÃO À CÉLULA