



BB101 Biology

- A course designed to give you a broad flavor of biology
- For those of you who are much interested in Biology
 - Department Minor to get the depth + breadth

Today's topics

- Perception versus reality
- What is Biology?
 - Why study Biology?
- Bottom-up and top-down approaches
- Applications of Biology
- Course related non-technical information

Perception and reality

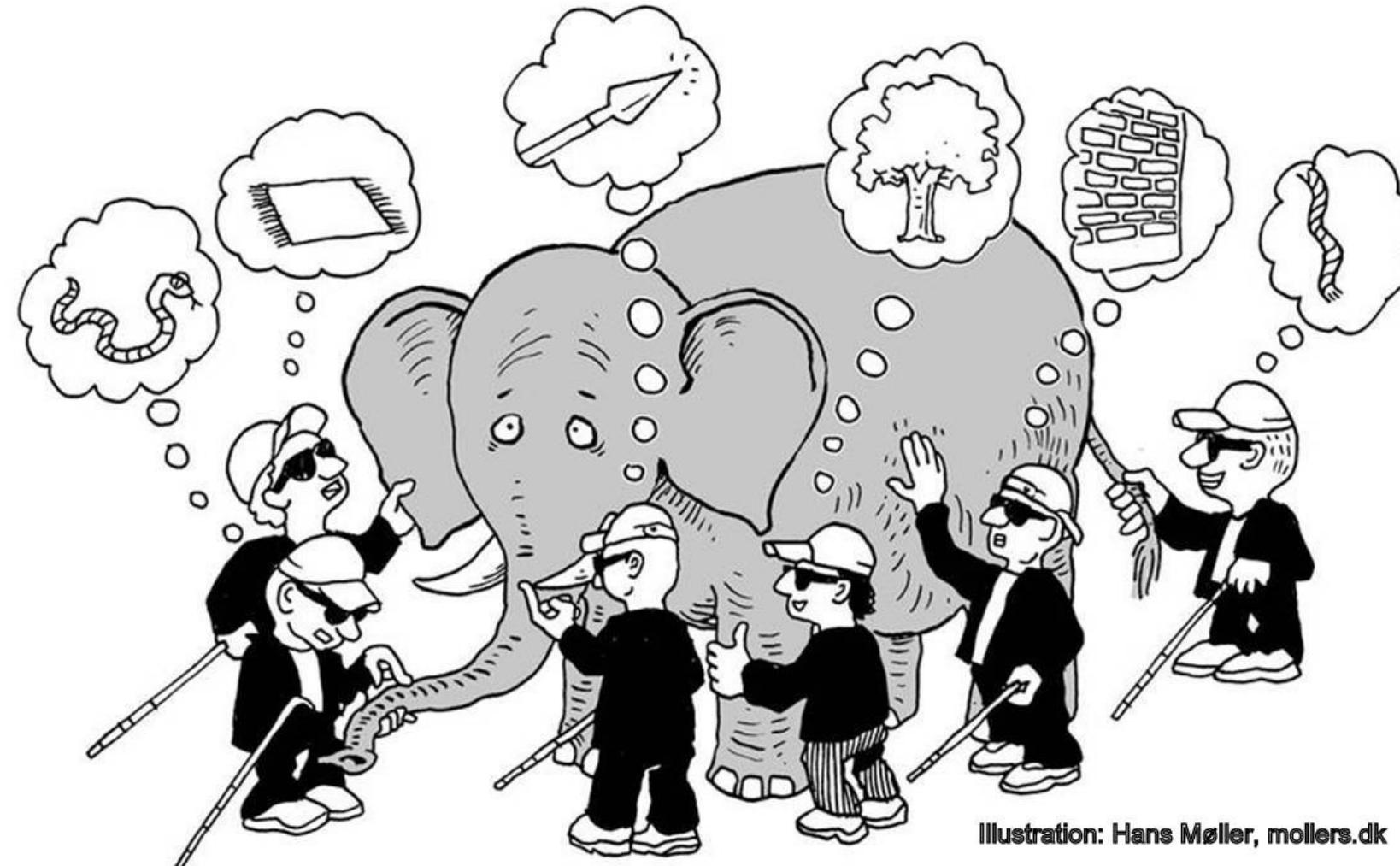


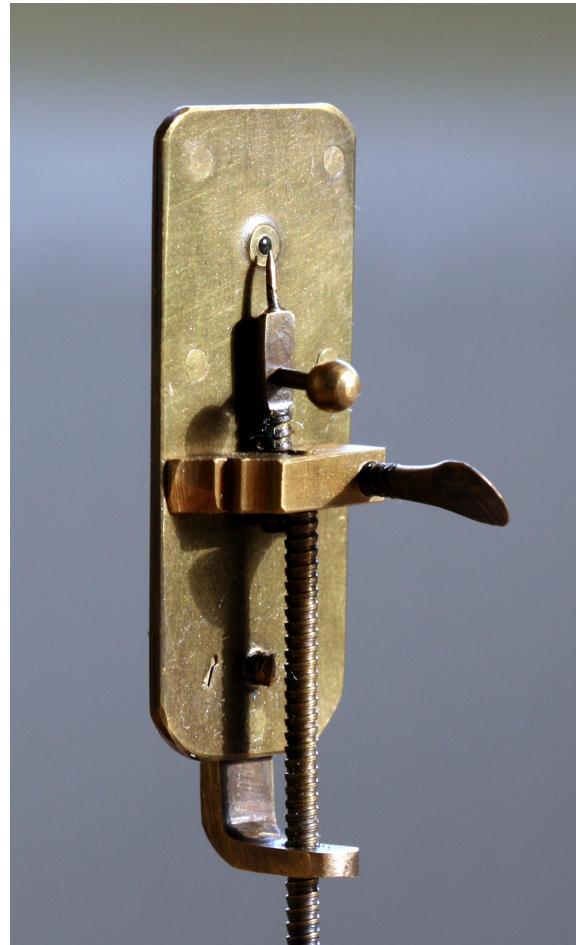
Illustration: Hans Møller, mollers.dk

Busting myths

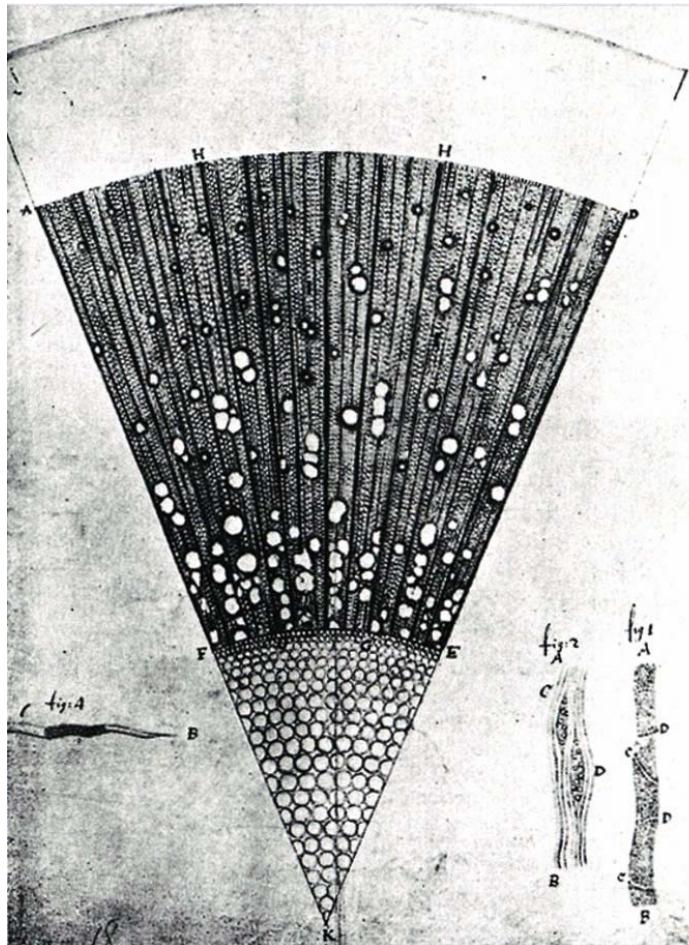
PERCEPTION

Biology requires good drawing skills

Recording observations: then...



A replica of a microscope by Antonie van Leeuwenhoek

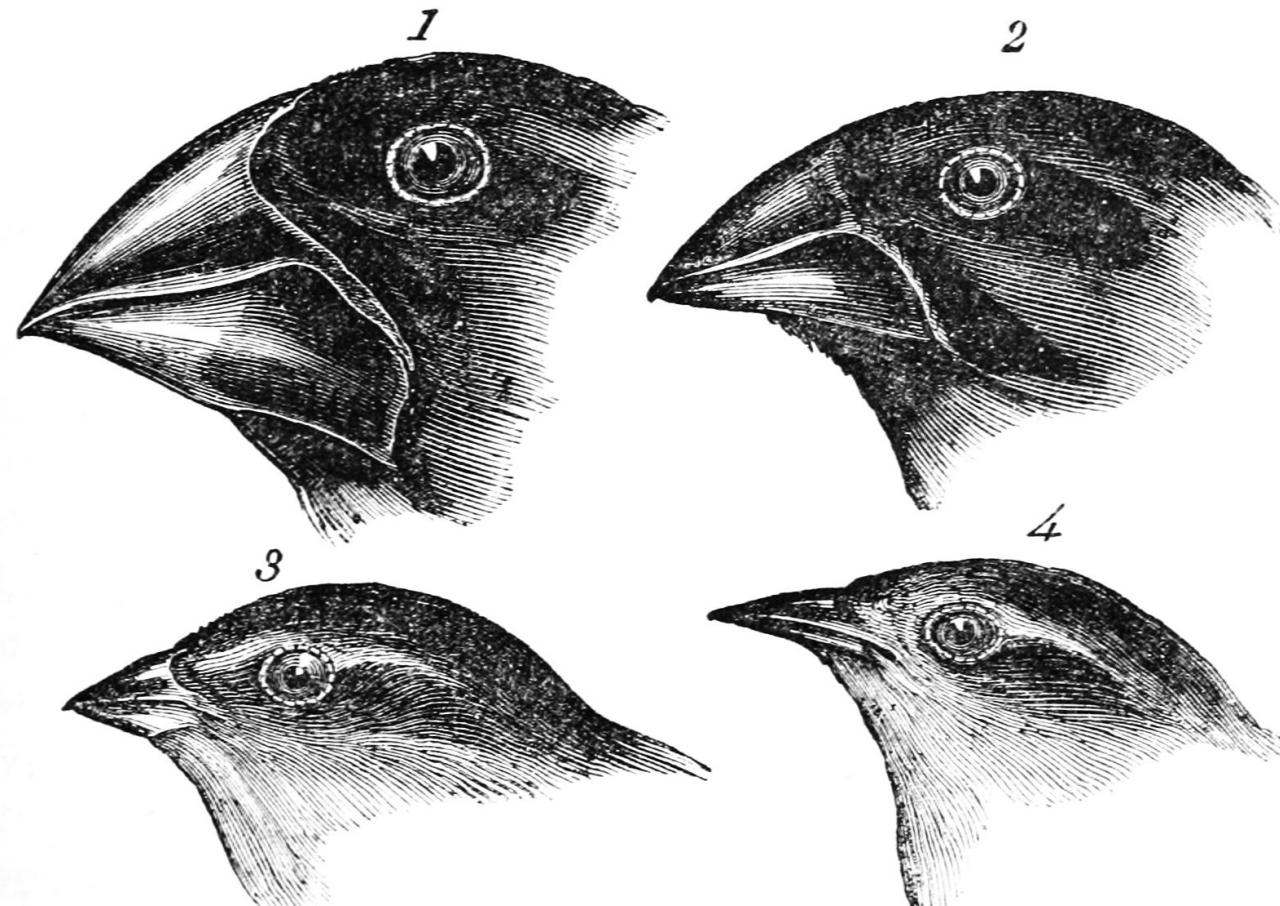


A microscopic section of an ash tree (*Fraxinus*) wood



Antonie van Leeuwenhoek

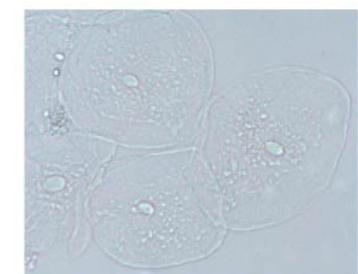
Recording observations: then...



1. *Geospiza magnirostris*.
3. *Geospiza parvula*.

2. *Geospiza fortis*.
4. *Certhidea olivacea*.

Recording observations: now...



Brightfield
(unstained
specimen)



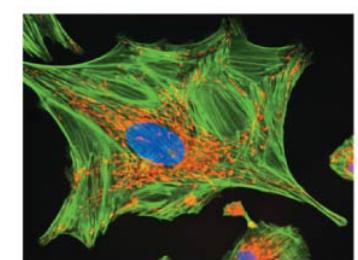
Brightfield
(stained specimen)



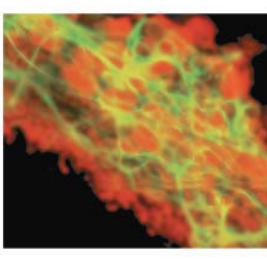
Phase-contrast



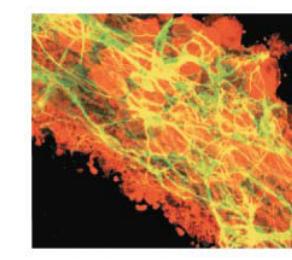
Differential-interference-contrast
(Nomarski)



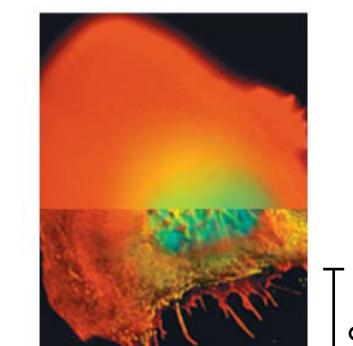
Fluorescence



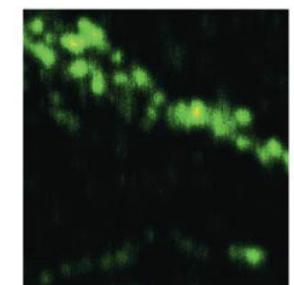
Confocal (without)



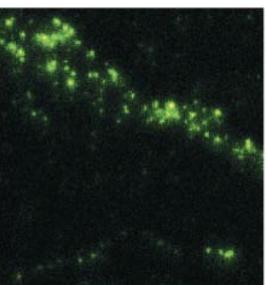
Confocal (with)



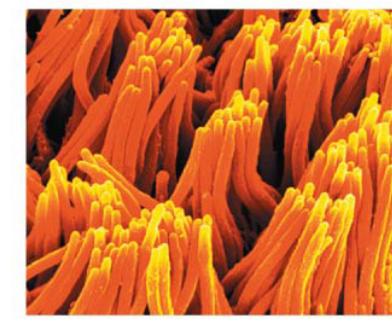
Deconvolution



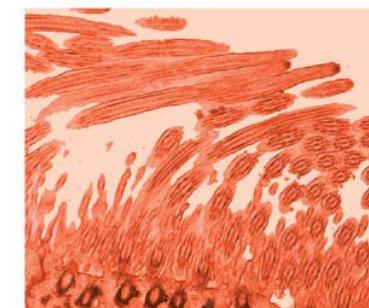
Super-resolution
(without)



Super-resolution
(with)



Scanning
electron
microscopy (SEM)



Transmission
electron
microscopy (TEM)



Bio Atomic Force Microscope



Laser scanning confocal microscope

Figure 6.3 from
Campbell's Biology

Legend for the images in the previous slide

- All are variants of light microscopy except SEM and TEM
- Light microscopy allows imaging of a live cell
- Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) use dead cells
- Note: artifacts are introduced while preparing specimens

Recording observations: now...



23 12 2013

Busting myths

PERCEPTION

Large vocabulary is unique to Biology

How many components does this have?



Image copied from the ISRO website

How many components does this have?

Chandrayaan-2
2019-07-22, 14:23
Photo: ISRO

- Many children want to become space scientists...
- Are they worried about the parts list?
- Do they have to memorize the name/use of each and every component?

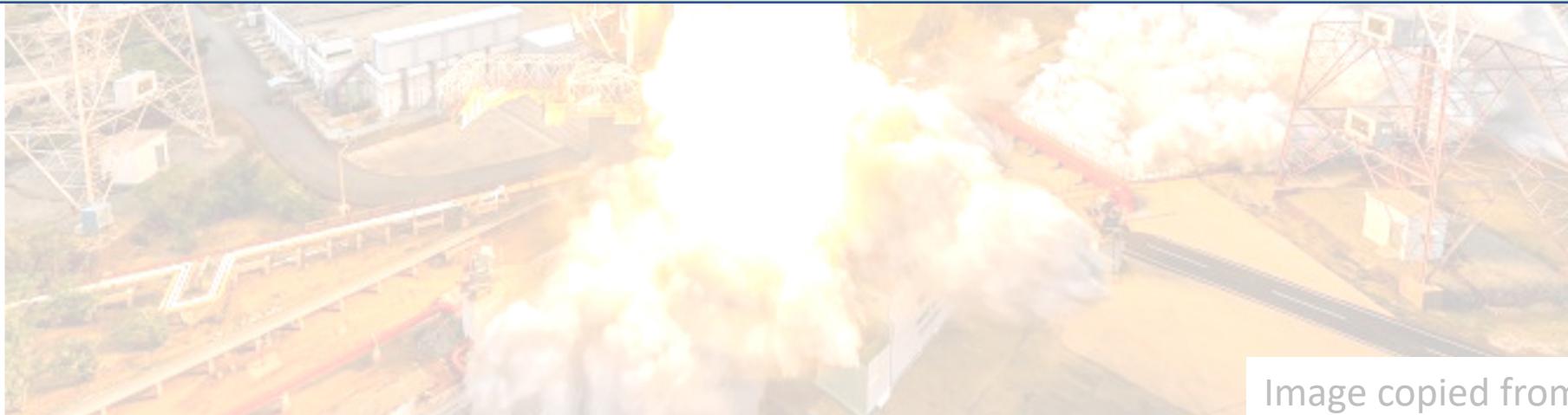


Image copied from the ISRO website

A cut-away view of a eukaryotic cell

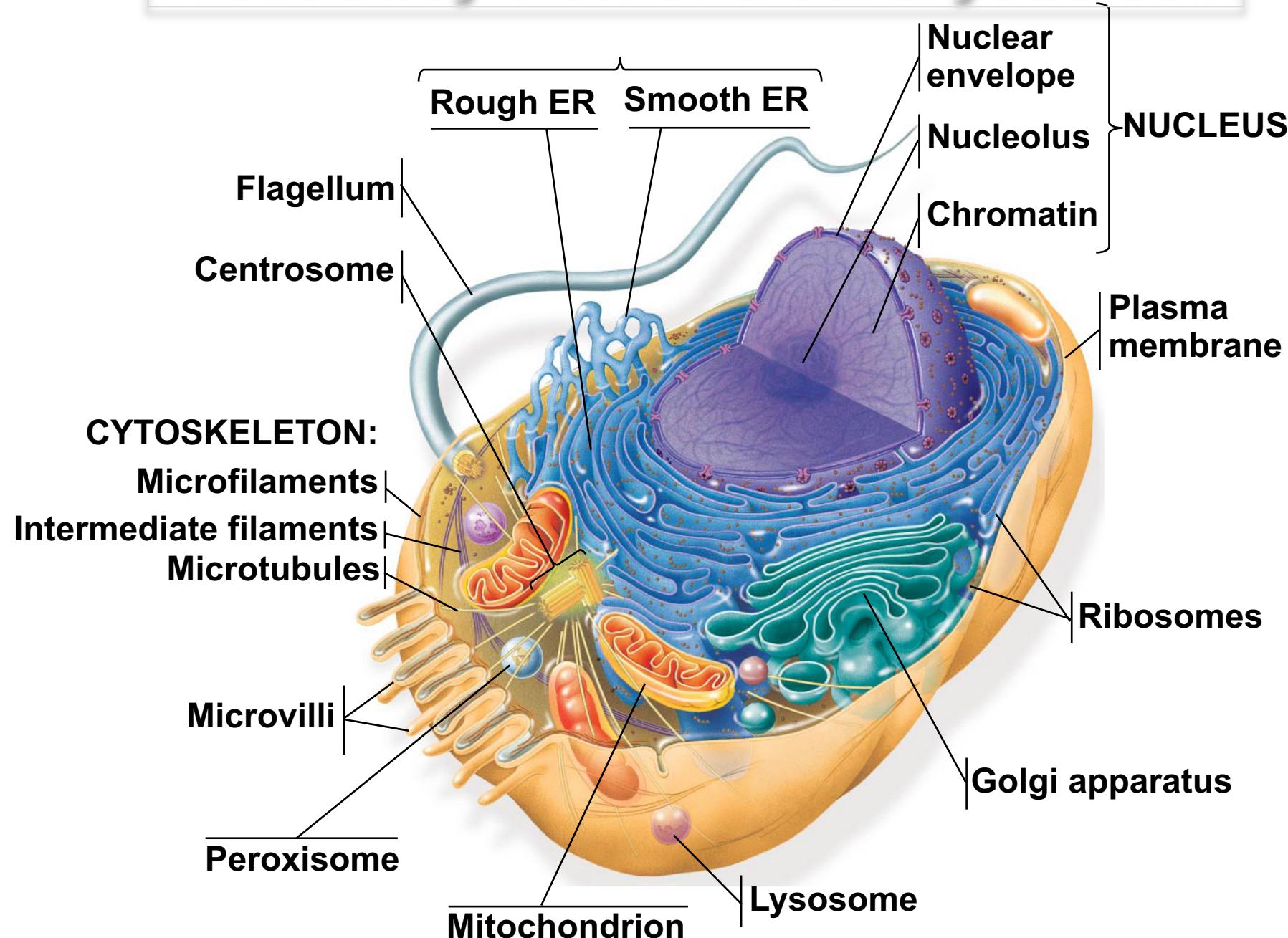


Figure 6.8 from
Campbell's Biology

Complex, self-regulated systems – rich vocabulary

Biology is a vocabulary-rich science

it has to be, like the study of any other complex and self-regulated system

Across the globe, Biology teaching has moved towards bringing out

- (i) the beauty of life,
- (ii) the benefits of understanding how they work,
- (iii) challenges associated with the study, and
- (iv) exploiting such a knowledge for a better living

Busting myths

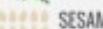
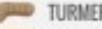
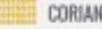
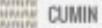
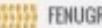
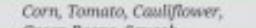
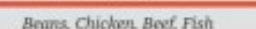
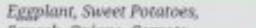
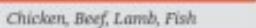
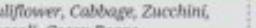
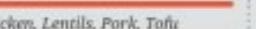
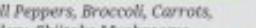
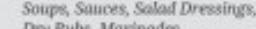
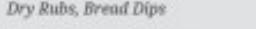
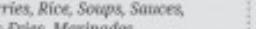
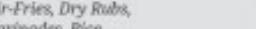
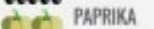
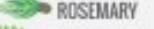
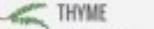
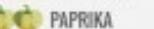
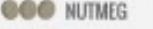
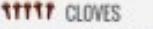
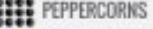
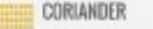
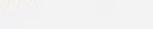
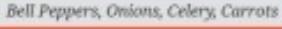
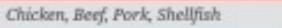
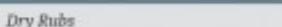
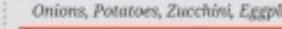
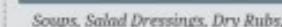
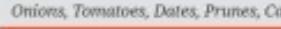
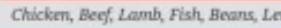
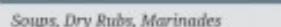
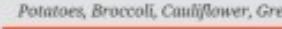
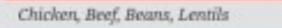
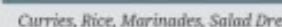
PERCEPTION

Study of Biology requires memorization

Life has moved on from memorization to ...

 **POPULAR SPICE BLENDS**

Spice blends combine complementary spices to create a whole new taste. Create them on your own or buy them as a blend to add instant flavor.

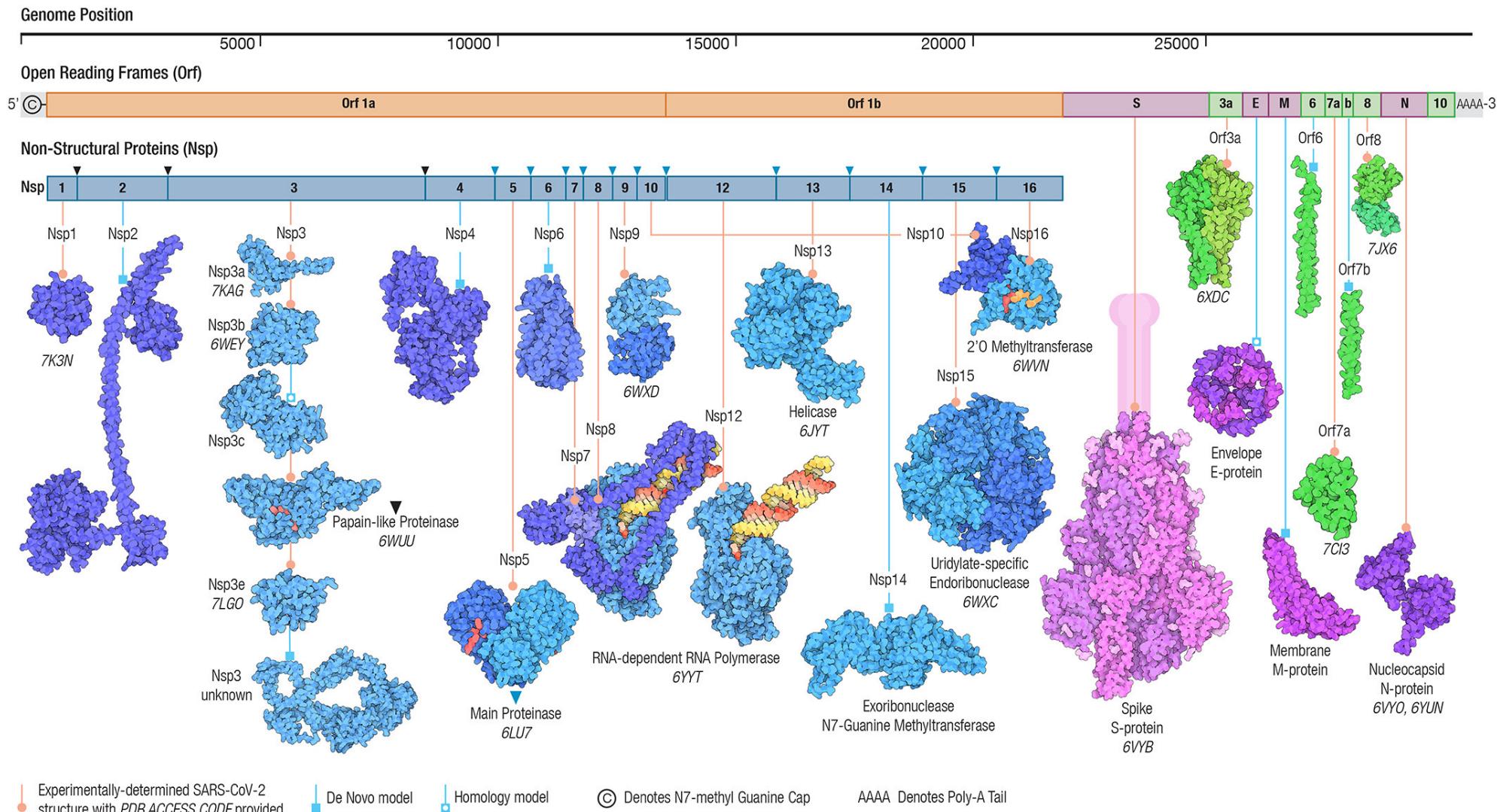
KEY FLAVOR PROFILE	CHILI POWDER SPICY, SMOKY	ZA'ATAR BITTER, WARM	CURRY POWDER WARM, SPICY	CHINESE FIVE SPICE WARM, SWEET, BITTER
 PRODUCE	 ANCHO CHILE  PAPRIKA  CUMIN  MEXICAN OREGANO	 THYME  SESAME SEEDS  SUMAC	 TURMERIC  CORIANDER  CUMIN  FENUGREEK  RED PEPPER	 CASSIA  CLOVE  FENNEL  STAR ANISE  SZECHUAN PEPPERCORNS
 PROTEINS	 Corn, Tomato, Cauliflower, Green Beans, Squash  Beans, Chicken, Beef, Fish	 Eggplant, Sweet Potatoes, Squash, Onions, Carrots  Chicken, Beef, Lamb, Fish	 Cauliflower, Cabbage, Zucchini, Broccoli, Green Beans  Chicken, Lentils, Pork, Tofu	 Bell Peppers, Broccoli, Carrots, Celery, Shiitake Mushrooms  Beef, Duck, Tofu, Pork
 USE IN	 Soups, Sauces, Salad Dressings, Dry Rubs, Marinades	 Dry Rubs, Bread Dips	 Curries, Rice, Soups, Sauces, Stir-Fries, Marinades	 Stir-Fries, Dry Rubs, Marinades, Rice
CAJUN SEASONING SPICY, EARTHY	HERBS DE PROVENCE EARTHY	RAS EL HANOUT SPICY, SWEET	GARAM MASALA WARM, SWEET, BITTER	
 BLACK PEPPER  PAPRIKA  CUMIN  CAYENNE PEPPER  THYME	 ROSEMARY  MARJORAM  THYME  OREGANO  SAGE  TARRAGON	 CARDAMOM  CLOVE  CINNAMON  PAPRIKA  CORIANDER	 CINNAMON  NUTMEG  CLOVES  CARDAMOM  MACE	 PEPPERCORNS  NUTMEG  CORIANDER  TURMERIC  CUMIN
 Bell Peppers, Onions, Celery, Carrots  Chicken, Beef, Pork, Shellfish  Dry Rubs	 Onions, Potatoes, Zucchini, Eggplant, Tomatoes  Chicken, Beef, Lamb, Fish  Soups, Salad Dressings, Dry Rubs, Marinades	 Onions, Tomatoes, Dates, Prunes, Carrots  Chicken, Beef, Lamb, Fish, Beans, Lentils  Soups, Dry Rubs, Marinades	 Potatoes, Broccoli, Cauliflower, Green Beans, Squash  Chicken, Beef, Beans, Lentils  Curries, Rice, Marinades, Salad Dressings, Stir-Fries	

COOKSMARTS helping home cooks live happier, simpler, smarter in the kitchen

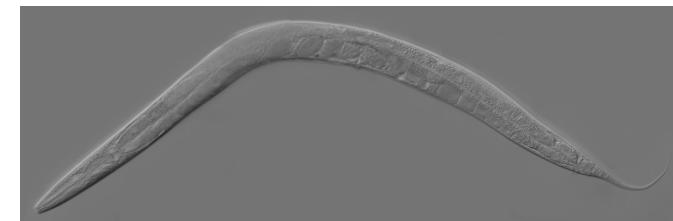
To learn more about adding flavor to your meals visit www.finedininglovers.com/blog/food-drinks/list-of-herbs-and-spices/

Vaccines and repurposing drugs in record time...

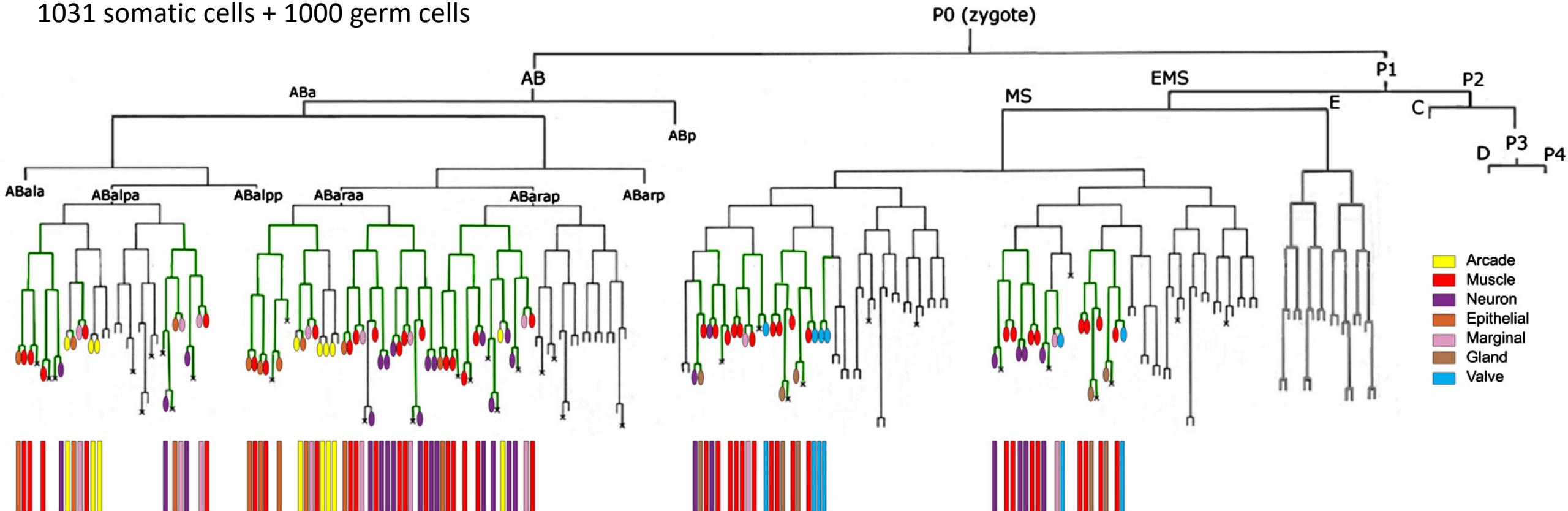
SARS-CoV-2 Genome and Proteins



Tracking development of every cell...



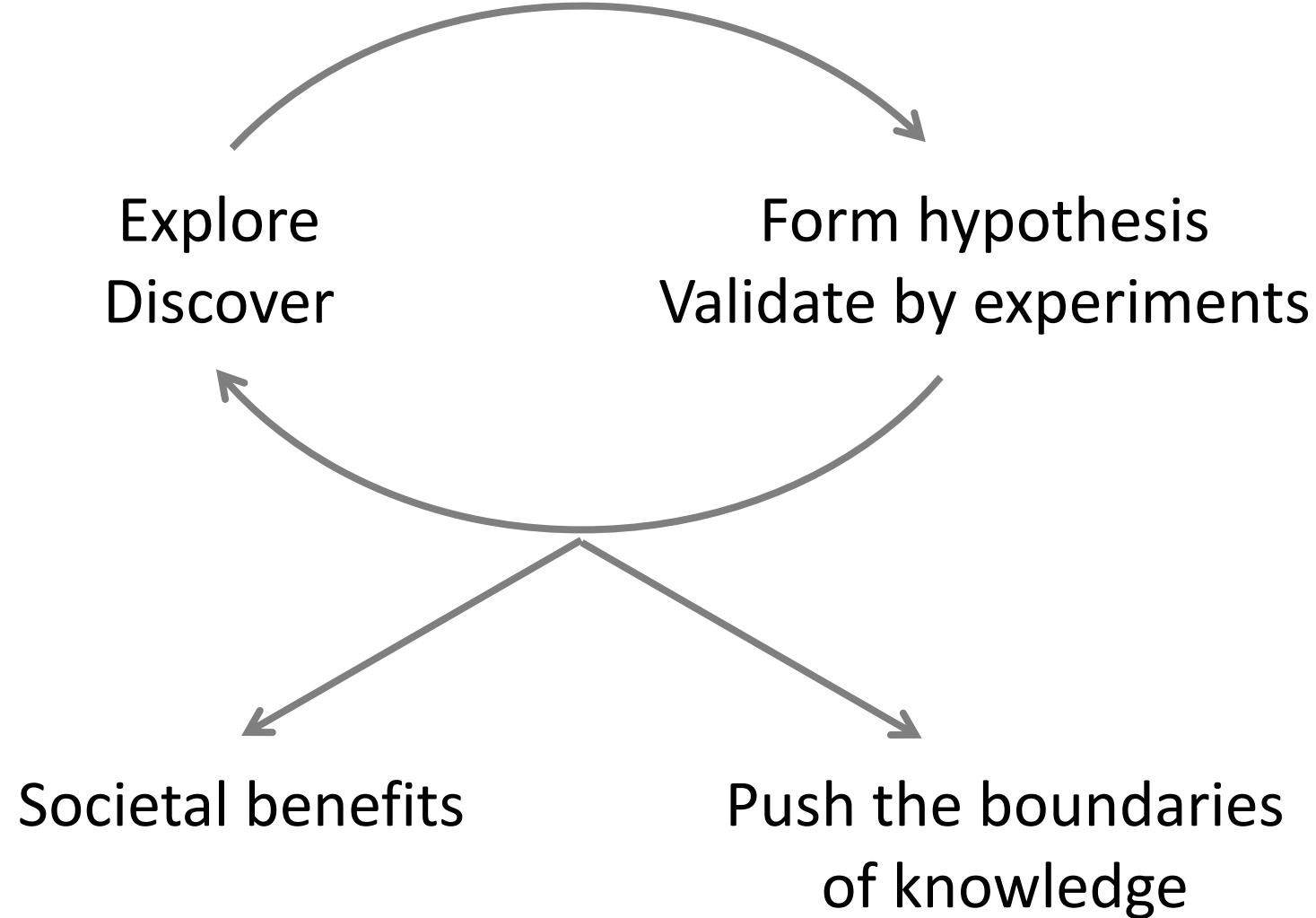
959 somatic cells + 2000 germ cells
1031 somatic cells + 1000 germ cells



Traditional Biology

- Emphasis on anatomy and taxonomy
- Field was not developed enough
 - Instrumentation and other tools were yet to be developed
- Importance, utility, intellectual challenges were known

Modern (or new age) Biology



Today's topics

- Perception versus reality
- What is Biology?
 - Why study Biology?
- Bottom-up and top-down approaches
- Applications of Biology
- Course related non-technical information

What is Biology?

Biochemistry	Cell biology	Genetics	Physiology
Bioinformatics	Computational Biology	Microbiology	Zoology
Biophysics	Developmental Biology	Molecular Biology	...
Biotechnology	Ecology	Neurobiology	...
Botany	Ethnobiology	Population Biology	...

What is Biology?

Biochemistry	Cell biology	Genetics	Physiology
Bioinformatics	Computational biology	Microbiology	Zoology
Biophysics	Biology is the study of life		
Biotechnology	Ecology	Neurobiology	...
Botany	Ethnobiology	Population Biology	...

What is life?

The phenomenon we call life defies a simple, one sentence definition

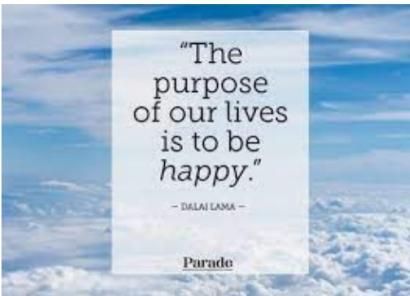
Move away from anthropocentric definitions

Google

life

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happy sad love beautiful wallpaper photography status journey alone meaning p >


150 Quotes About Life – Inspiring the ...
parade.com


What Is the Purpose of Life ...
psychologytoday.com


Timeless Tips ...
lifehack.org


Improve Your Life: What 10 Things ...
time.com


Work-life balance - SolDevelo Blog
soldevelo.com


What Is the Meaning of Life?
christianity.com


Life Balance Concept Stock Photos ...
istockphoto.com


Purpose in Life Quiz | Greater Good
greatergood.berkeley.edu


Having a sense of meaning in lif...
theconversation.com


Finding Ease, Loving Life - Three ...
three-principles.com


Waiting for www.google.com...







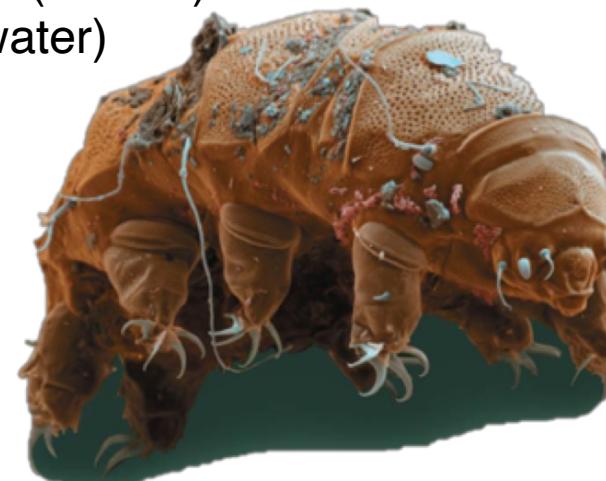




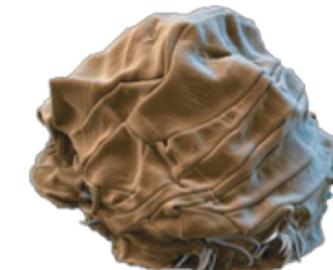
Tardigrade: an “ultimate” in evolution?

- Tardigrade is an invertebrate
- Lives in temporary ponds
- When water evaporates...
 - It shrinks to a dormant state
 - It can stay dormant for a decade or more
- When finds itself in water...
 - becomes active within hours
 - feeds, moves, reproduces, ...

Hydrated (normal) form
(~85% water)

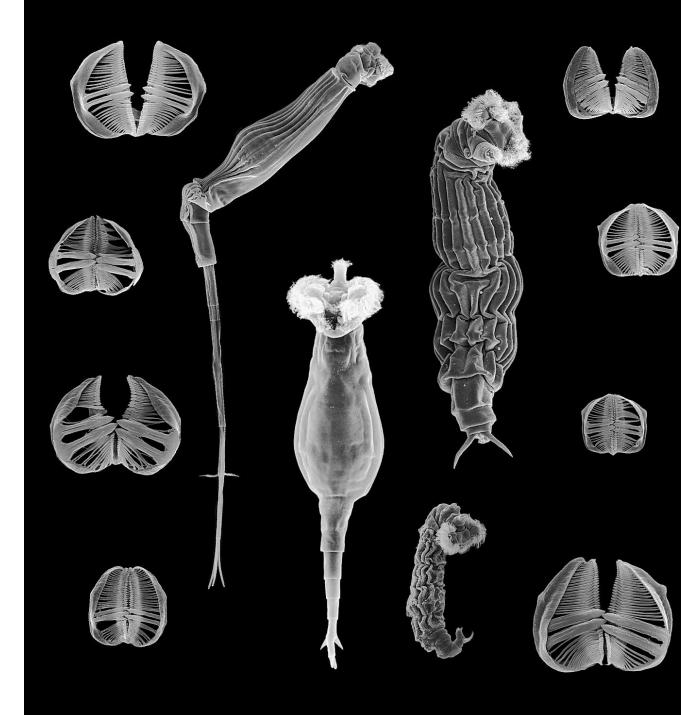


Dehydrated form
(< 2% water)



Revival of a rotifer frozen in permafrost

- A rotifer is a microscopic, aquatic invertebrate
- Asexual reproduction
- Recovered from northeastern Siberian permafrost
- Radiocarbon-dated to ~24,000 years before present
- Could continuously reproduce in the laboratory



Scanning electron micrographs showing morphological variation of bdelloid rotifers and their jaws.

Characteristics of “life”

▼ Order



▲ Evolutionary
adaptation



▲ Energy processing



▲ Growth and
development



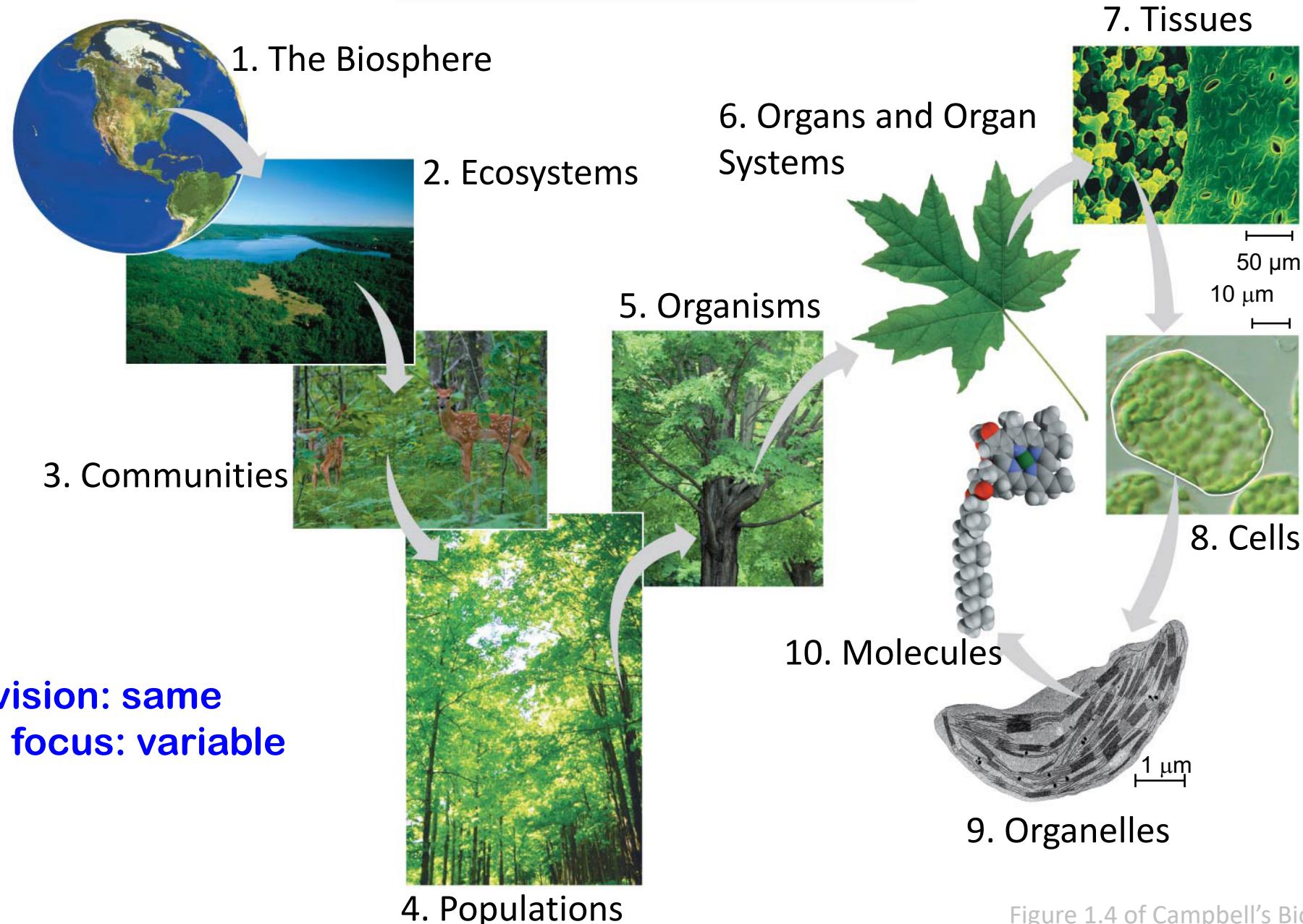
▲ Regulation

▼ Reproduction

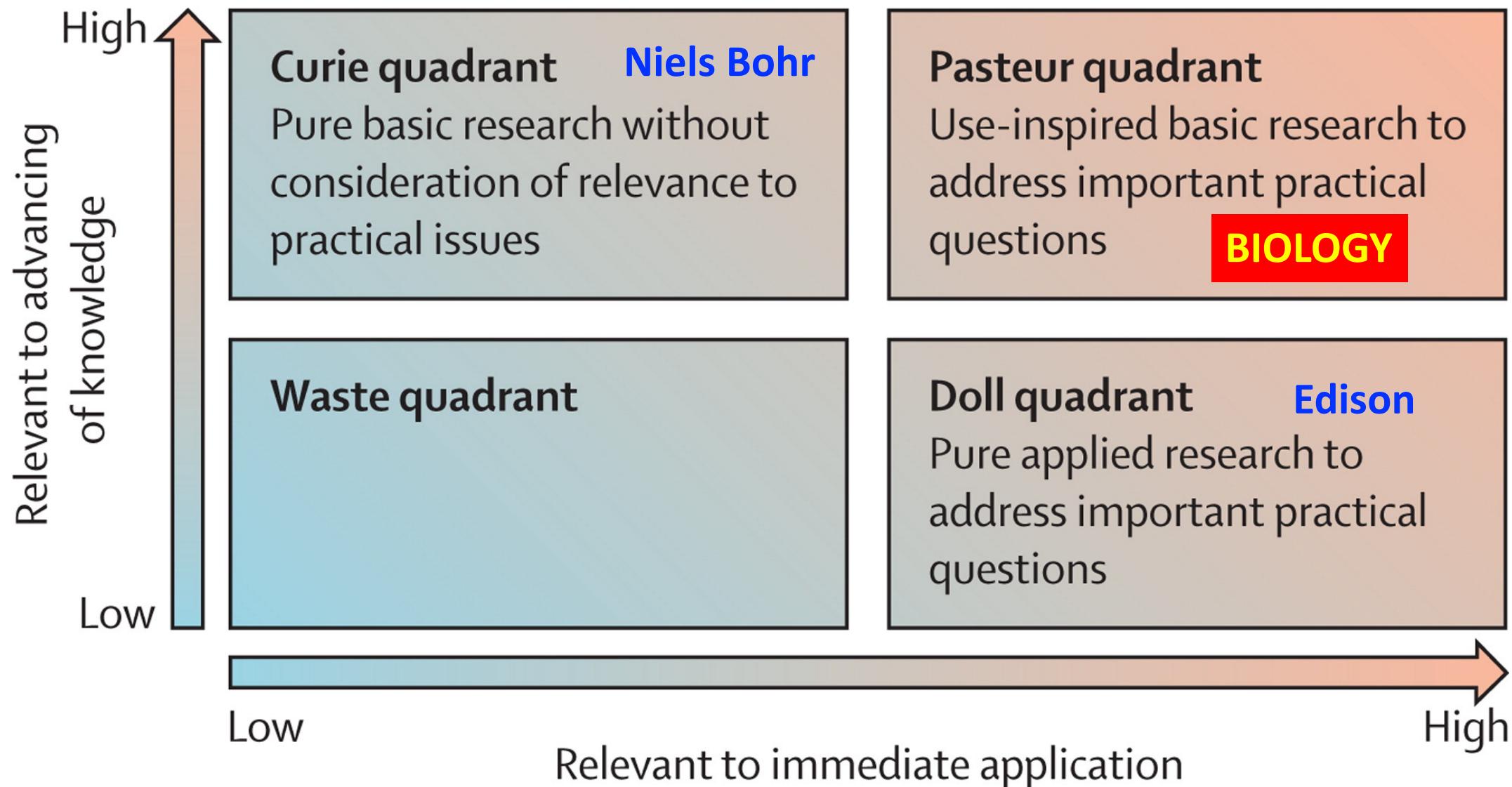


▲ Response
to the
environment

Study of biology



Study of Biology: invention or discovery?



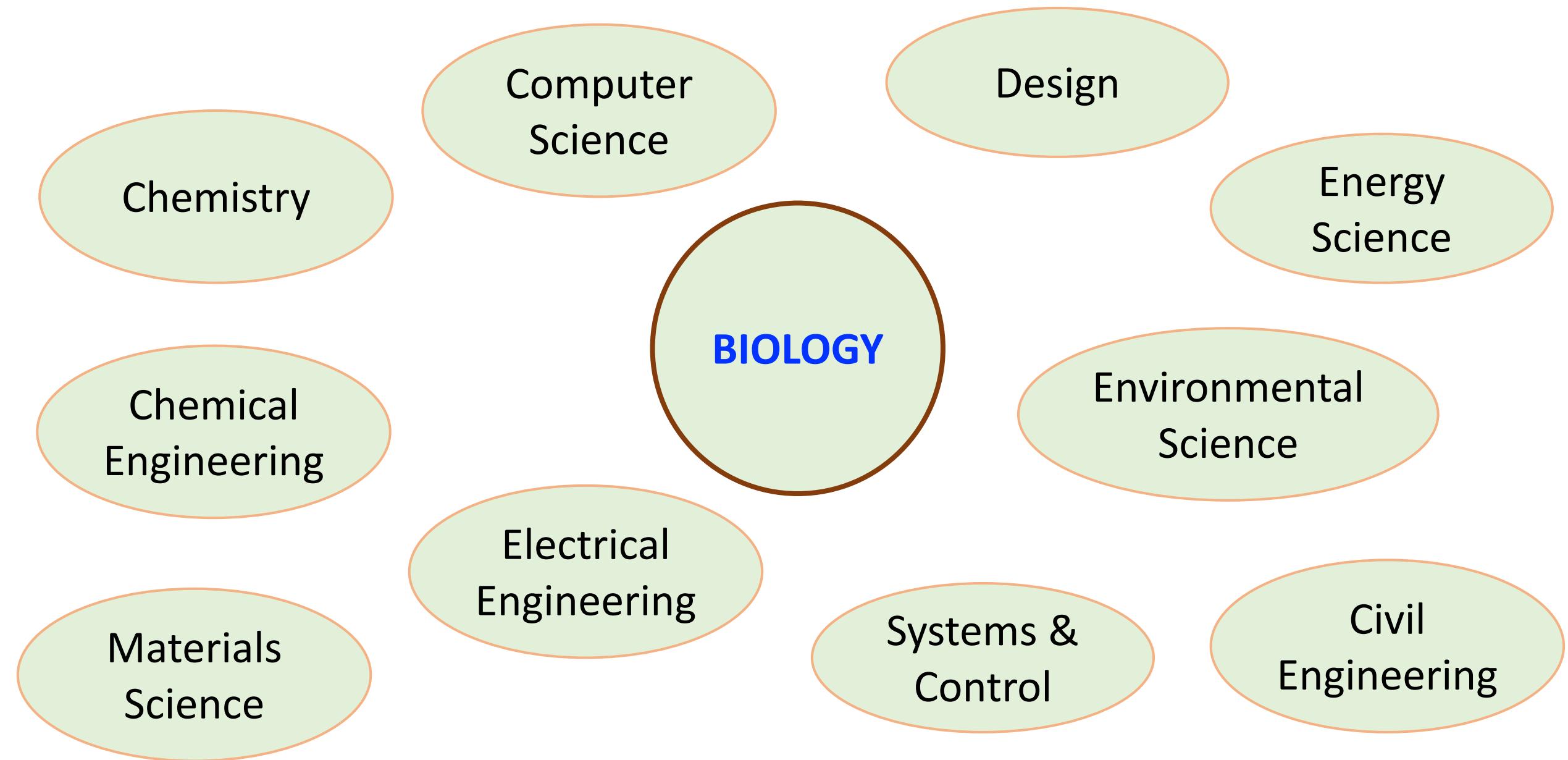
Richard Doll – showed that smoking causes lung cancer

From Lancet (2014) 383:156-165
Original: book entitled Pasteur's quadrant by Donald Stokes

Objectives of this course

- Today's world is one where advances in biology affect us day-to-day
 - COVID-19 pandemic
 - Going to the hospital for any kind of ailment
 - Should I buy GM vegetables?
 - ...
- Just enough background to have a decent understanding as we move on in life

Objectives of this course



https://www.fredhutch.org/en/faculty-lab-directory/malik-harmit.html

80%

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← Faculty & Lab Directory Spotlight on Harmit Malik

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FACULTY MEMBER

Harmit Malik, Ph.D.

Professor and Associate Director
Basic Sciences Division, Fred Hutch

Phone: [206.667.5204](tel:206.667.5204) Email: hsmalik@fredhutch.org Fax: 206.667.6522 Mail Stop: A2-025

Dr. Harmit Malik studies genetic conflict, the competition between genes and proteins with opposing functions that drives evolutionary change. His research could have implications for a range of diseases, from HIV to cancer. As part of this work, his team developed an approach for identifying genes that divide one species from another, which could help solve the riddle of how new species evolve. Dr. Malik also studies the evolutionary processes that drive our body's interactions with viruses, including contemporary scourges like HIV as well as ancient viruses whose fossils litter our genome. With Hutch colleagues, he has characterized the rapidly evolving interface between proteins on human cells and viruses that make us sick. This work has highlighted surprising deviations from "textbook" models of these interactions, and it is revealing gene variants that could influence our susceptibility to infection.

Malik Lab

Spotlight on Dr. Malik

Follow Harmit Malik



Other Appointments & Affiliations

Howard Hughes Medical Institute Investigator
Howard Hughes Medical Institute

Education

Ph.D., Biology, University of Rochester, 1999

B.Tech., Chemical Engineering, Indian Institute of Technology, Bombay, 1993

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 - Why study Biology?
- Bottom-up and top-down approaches
- Applications of Biology
- Course related non-technical information

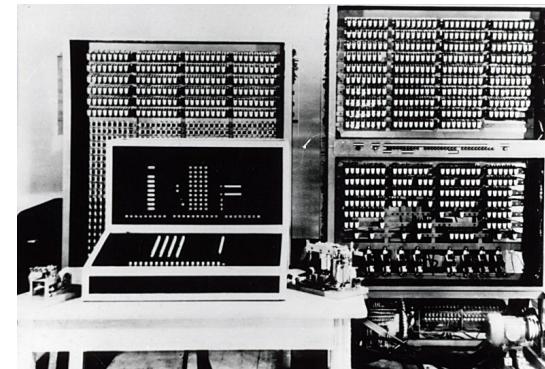
Design complex systems: bottom-up approach



Model K adder



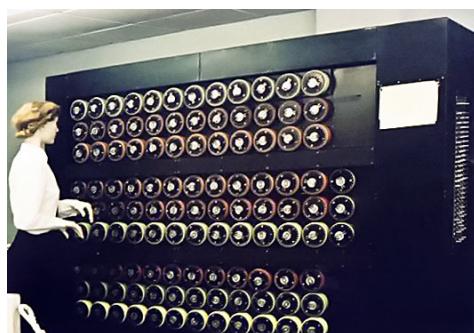
Hewlett-Packard



Z3



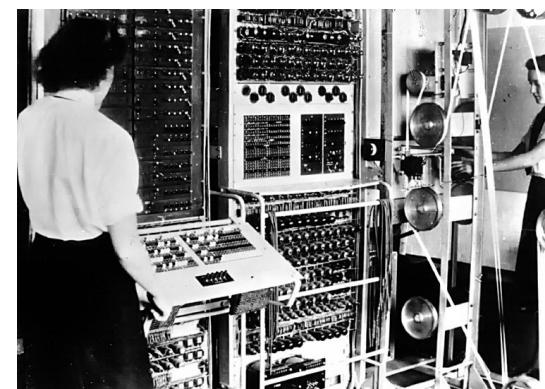
Complex number calculator



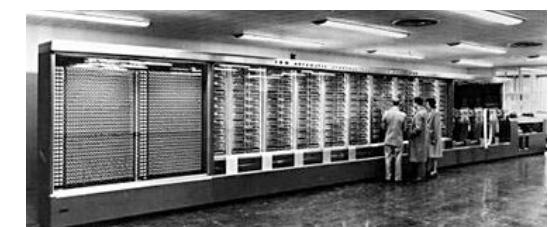
Bombe



A-B computer



Colossus



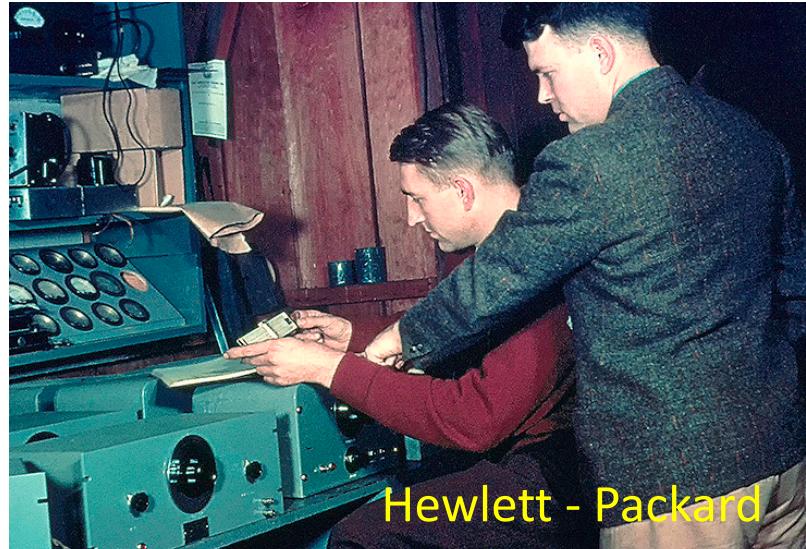
Harvard mark 1

Reductionistic approach: Reverse engineering



WisdomTimes.com

Reverse engineering with invisible components?



Manual
available



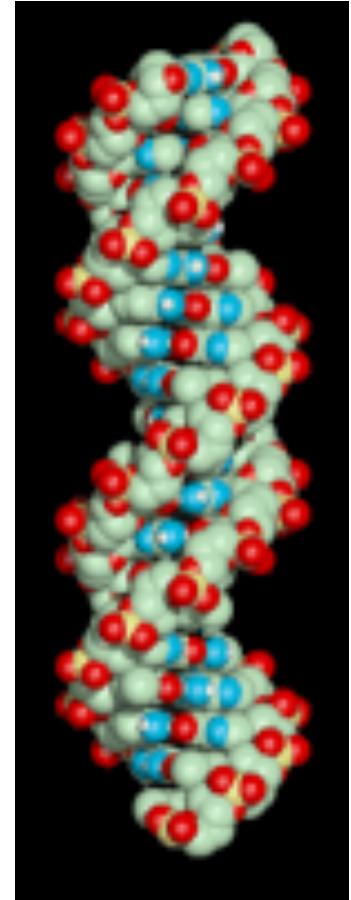
Manual
available?

- Mother Nature has given us end products (= organisms) of millions of years of evolution
- The components of these end products are invisible to naked eye. In fact, most organisms are themselves invisible

DNA is like Coca Cola but... it carries information



Coke	DNA	Solubility
Water	Water	Not applicable
Sugar (sucrose)	Sugar (deoxyribose)	Very high
Phosphate	Phosphate	Moderate
Caffeine (a nitrogenous base)	A, C, G, and T (nitrogenous bases)	Extremely low

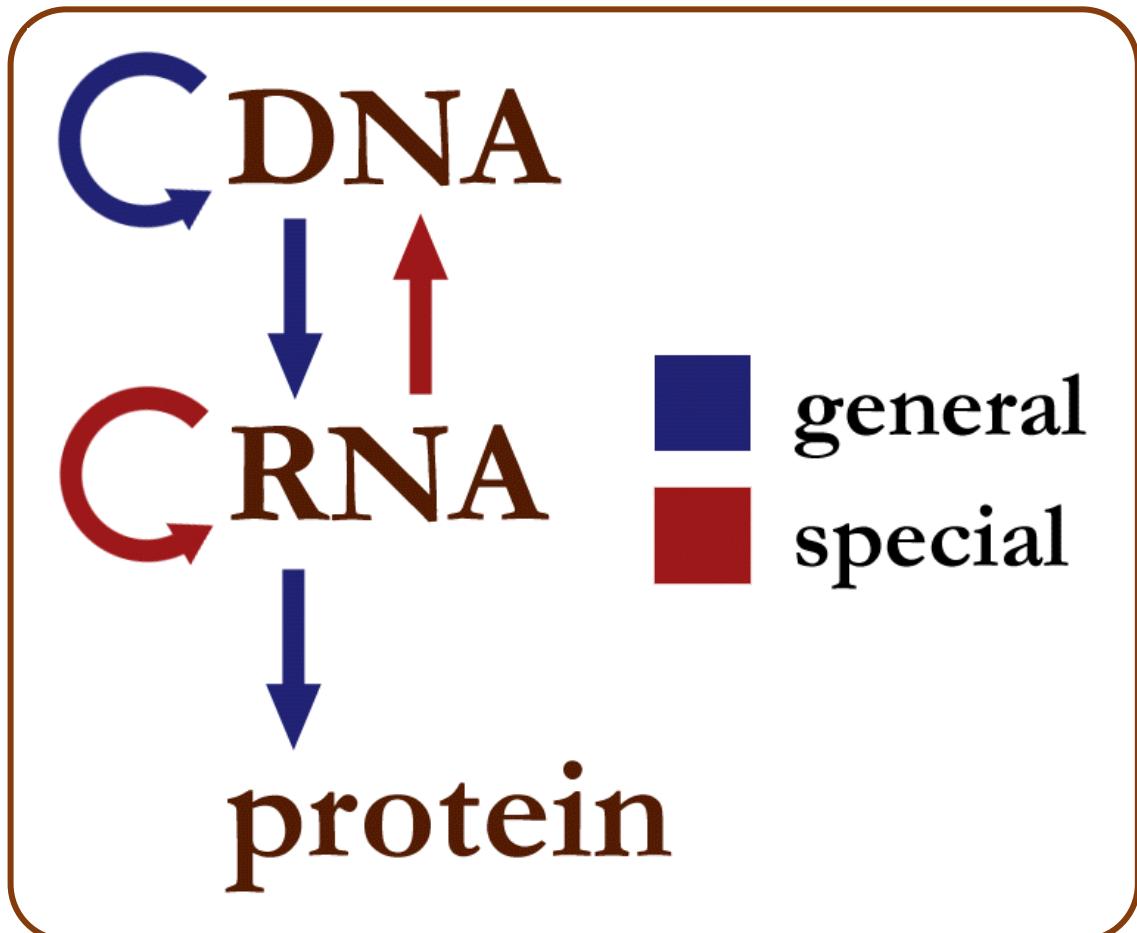


DNA is THE manual

<https://commons.wikimedia.org/wiki/File:CocaColaGlassBottle.jpg>

DNA image – from Prof. Swati Patankar

Flow of information from DNA, THE manual



Central Dogma

Human DNA manual is huge: ~3 billion bp



Phage λ
(virus)
50 kb
2 pages



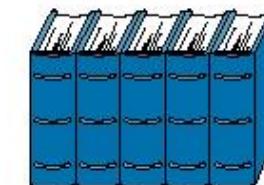
Escherichia coli
(bacteria)
4.7 Mb
200 pages



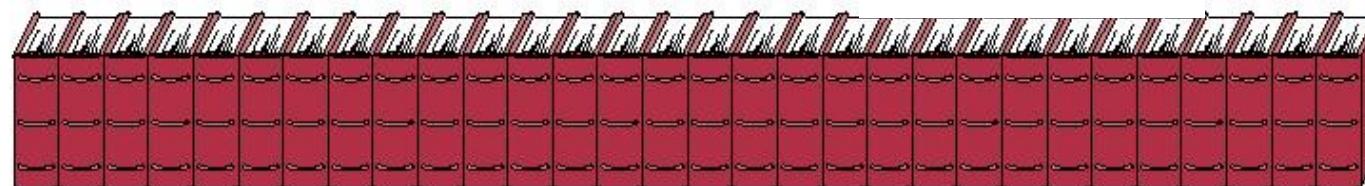
Saccharomyces cerevisiae
(yeast)
12.5 Mb
500 pages



Caenorhabditis elegans
(nematode)
Arabidopsis thaliana
(plant)
100 Mb
3 volumes



Drosophila melanogaster
(fruit fly)
165 Mb
5 volumes

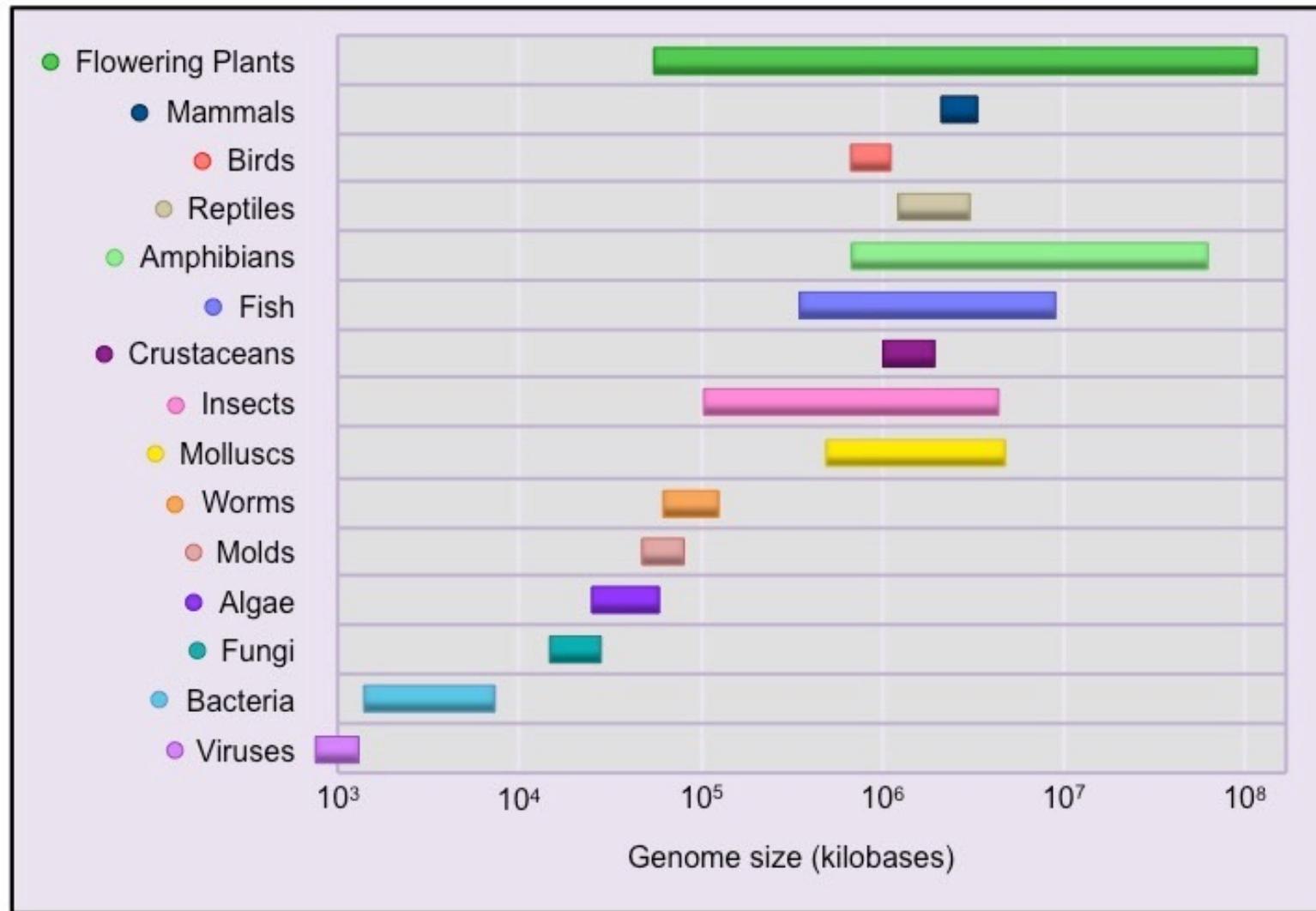


Human being
3000 Mb
80 volumes



25 kb per page
1500 pages per volume
(2 inches thick)

Genome (manual) sizes and complexity



De-constructing biological systems

Serendipity (*noun*): luck that takes the form of finding valuable or pleasant things that are not looked for

- Serendipity – smartness to understand the implications of an observation
- In the 21st century, Biology is all about
 - Being observant, extremely clever thinking, choosing the right system, designing clever experiments, ...
 - NOT memorization, drawing, large vocabulary, ...

Today's topics

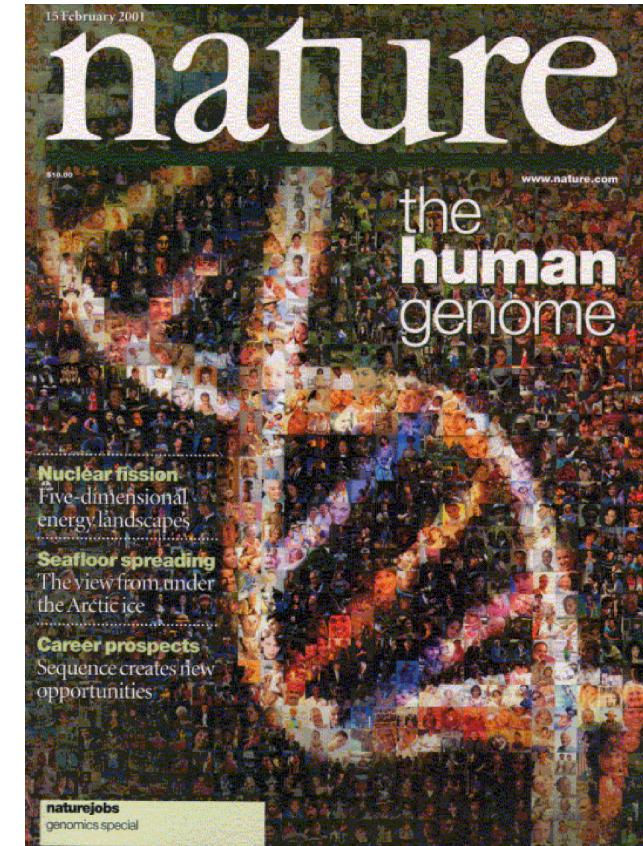
- Perception versus reality
- What is Biology?
 - Why study Biology?
- Bottom-up and top-down approaches
- Applications of Biology
- Course related non-technical information

- Basis of many things that happen to us today
 - Cancer
 - Life style diseases (diabetes, heart attacks, hyper- and hypo-tension, ...)
 - Addiction (drugs, pornography, social media, alcohol, ...)
 - Pandemics (covid-19, ...)
- Biology is the future
 - Sustainable living and “quality” of life (especially in older age)
 - Personalized medicine, genetically modified crops, ...

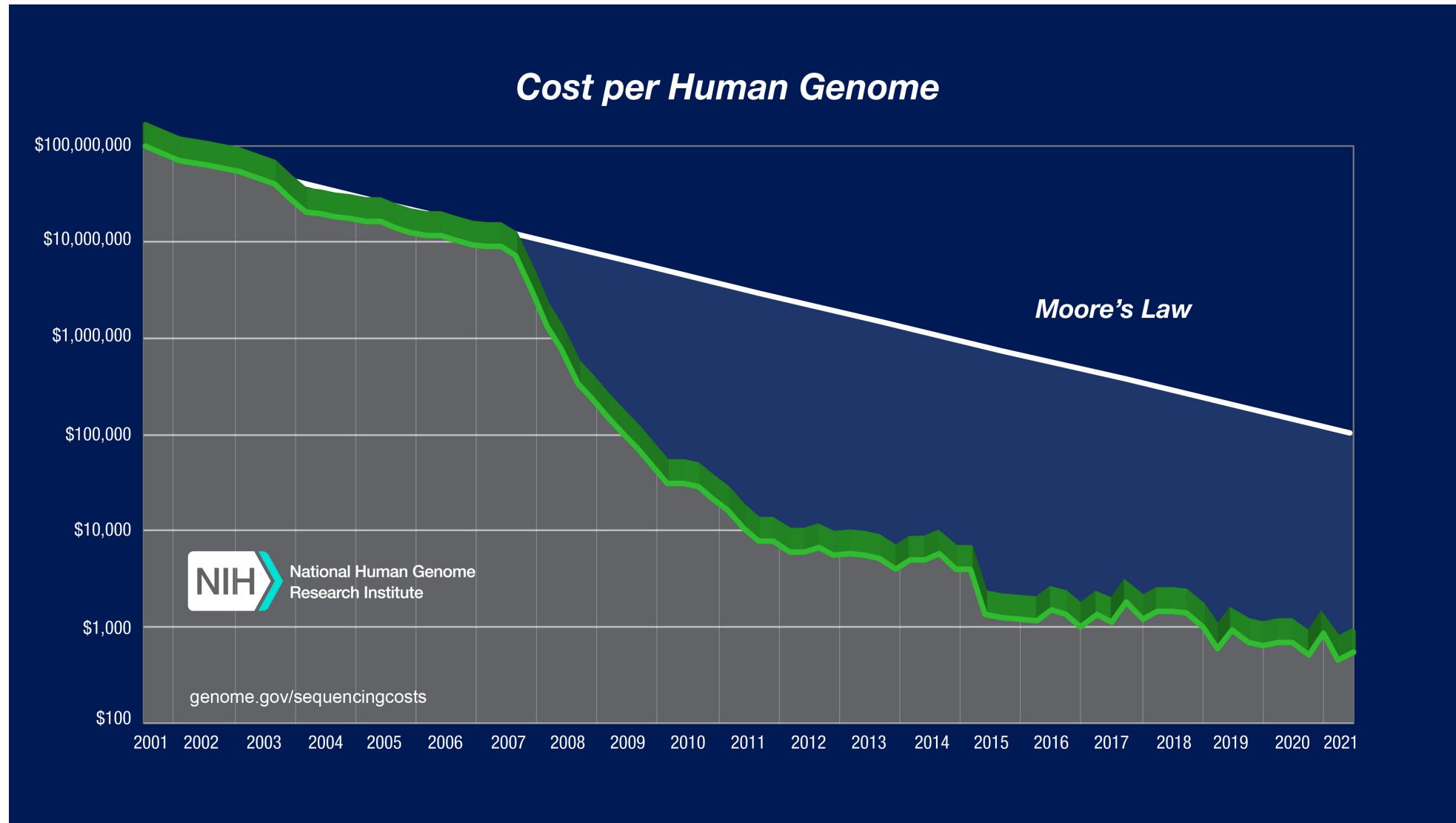
Make informed decisions

Sequence of the human genome (DNA) is known

- Human genome: ~3 billion bases
- We now know the DNA sequence of the entire human genome
 - ...ATGCAATCCGTGCAT...



These days, we can sequence whole genome



Sequencing data looks like this...

AGCTTTCATTCTGACTGCAACGGGCAATATGTCTCTGTGTGGATTAAAAAAAGAGTCTCT
GACAGCAGCTTCTGAACCTGGTTACCTGCCGTGAGTAAATTAAAATTATTGACTTAGGTC
ACTAAATACTTAACCAATATAGGCATAGCGCACAGACAGATAAAAATTACAGAGTACACA
ACATCCATGAAACGCATTAGCACCAACCATTACCAACCACCATCACCAACCACCATTA
CCATTACCACAGGTAACGGTGCAGGCTGACGCGTACAGGAAACACAGAAAAAGCCCGCAC
CTGACAGTGCAGGCTTTTCGACCAAAGGTAACGAGGTAACAACCATGCGAGTGTGA
AGTCGGCGGTACATCAGTGGCAAATGCAGAACGTTCTGCAGGTTGCCATATTCTGGA
AAGCAATGCCAGGCAGGGCAGGTGGCCACCGTCCTCTGCCCGCCAAAATACCAAC
CACCTGGTGGCGATGATTGAAAAAACATTAGCGGCCAGGATGCTTACCCAAATATCAGCG
ATGCCAACGTATTTGCCAACCTCTGACGGACTCGCCGCCAGCCGGATTCCC
GCTGGCGCAATTGAAAACTTCGTCGACCAGGAATTGCCAAATAAACATGTCCTGCAT
GGCATTAGTTGTTAGGGCAGTGCCCGGATAGCATTACGCTGCGCTGATTGCCGTGGCG
CCATTATCTCGGTGGTAGGTGATGGTATGCGCACCTGCGTGGATCTCGCGAAATTCTT

Sequencing data looks like this...

- Are there words and paragraphs?
- Is there punctuation?
- What do these data mean?
- How to decode this information?

- What skills are required to decode this information?
- Domain knowledge, computer programming, machine learning algorithms, ideas from natural language processing, ...

Differences in genomes

- Differences between individuals at the DNA level
 - Siblings differ by 1 to 2 million bases, ~99.98% identical
 - Unrelated humans differ by 6 million bases, ~99.8% identical
- Chimpanzees and humans: ~98% identical
- Baboons and humans: ~92% identical
- Mice differ from humans by ~2.8 billion bases
- Leaf spinach differs from humans by ~2.9 billion bases

DNA variations: SNPs

SNP: single nucleotide polymorphism

SNP

1. ATCCTGT **A** CCTACGTGTACAATAGTA .. CTGATCA **T** CTCTATGGG...
2. ATCCTGT **T** CCTACGTGTACAATAGTA .. CTGATCA **T** CTCTATGGG...
3. ATCCTGT **A** CCTACGTGTACAATAGTA .. CTGATCA **G** CTCTATGGG...

SNP



DNA variations: mutations

The blue cow did not notice anyone looking at him.

He kept on eating and eating and eating.

....

Leaving the store, a funny looking horse sat blocking the door.

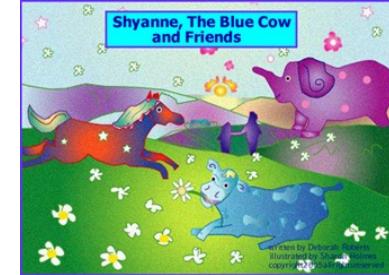
"Excuse me," Shyanne said, "may we pass by please?"

....

"Where are you going?" Shyanne asked the horse.

"I was on my way home," answered the sleepy horse, "but I think I **missed** my bus."

....



Author: [Deborah Roberts](#)

Illustrator: [Sharon Holmes](#)

DNA variations: mutations

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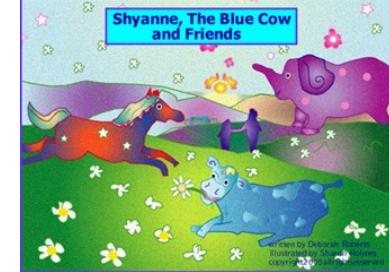
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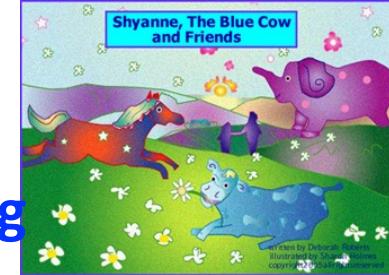
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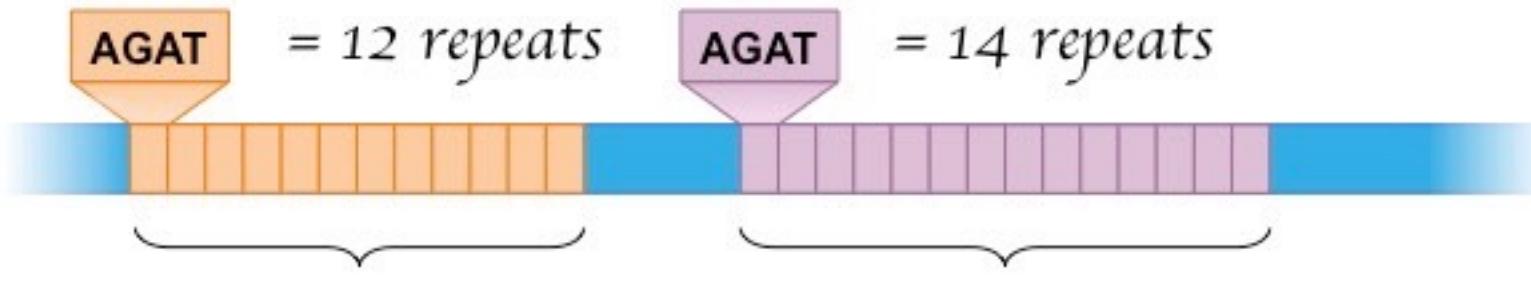
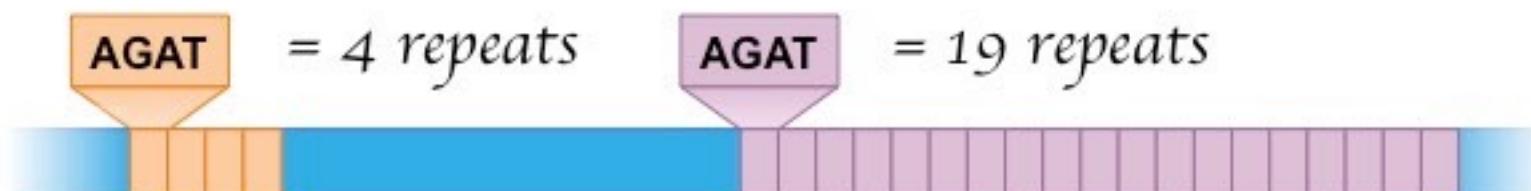
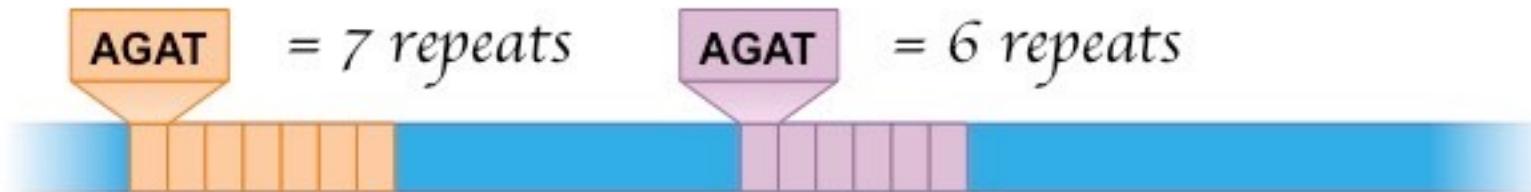
....



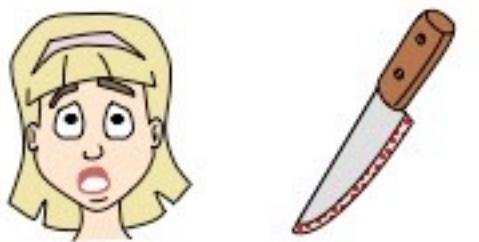
Author: [Deborah Roberts](#)

Illustrator: [Sharon Holmes](#)

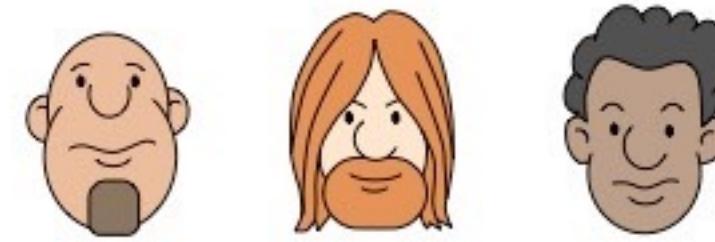
DNA variations: variable repetitive elements



Forensic investigation



Victim Crime Scene

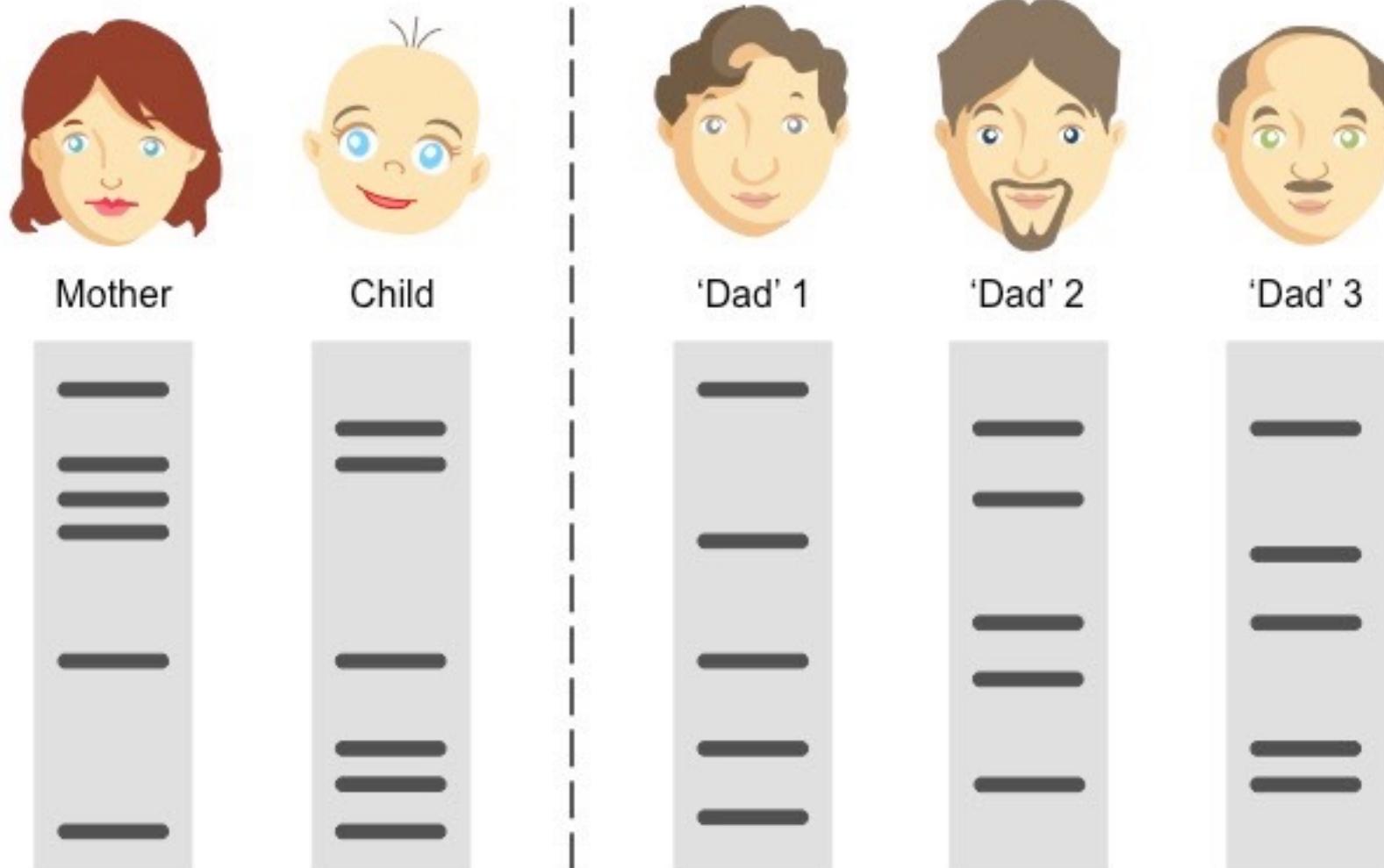


Suspect 1 Suspect 2 Suspect 3



DNA fingerprinting

Paternity testing



DNA fingerprinting

Whose baby is it?



- Delivers a baby boy in a maternity hospital
- Is given a baby girl on discharge from the hospital
- Baby swapping racket

**Can we say with certainty that a child
is the offspring of his/her parents?**

Ms. Latha Reddy

Genome companies in India

Many other companies based out of UK, USA, ...



[] **HaystackAnalytics**

@ SINE, IIT Bombay incubator

**GENOMICS FOR
PRECISION MEDICINE INDIA**

Immunotherapy is being advertised... Go for it?

21:48 5G M • 4G 12%  HAPPPIEST HEALTH

5 mins read | Nov 09 2022 114

Made-in-India CAR T-cells raise cancer 'cure' hopes

Results of Phase 1 clinical trials by researchers in Mumbai establish safety of indigenous drug and its efficacy in treating two hematological malignancies

Sunitha Rao R

Feedback

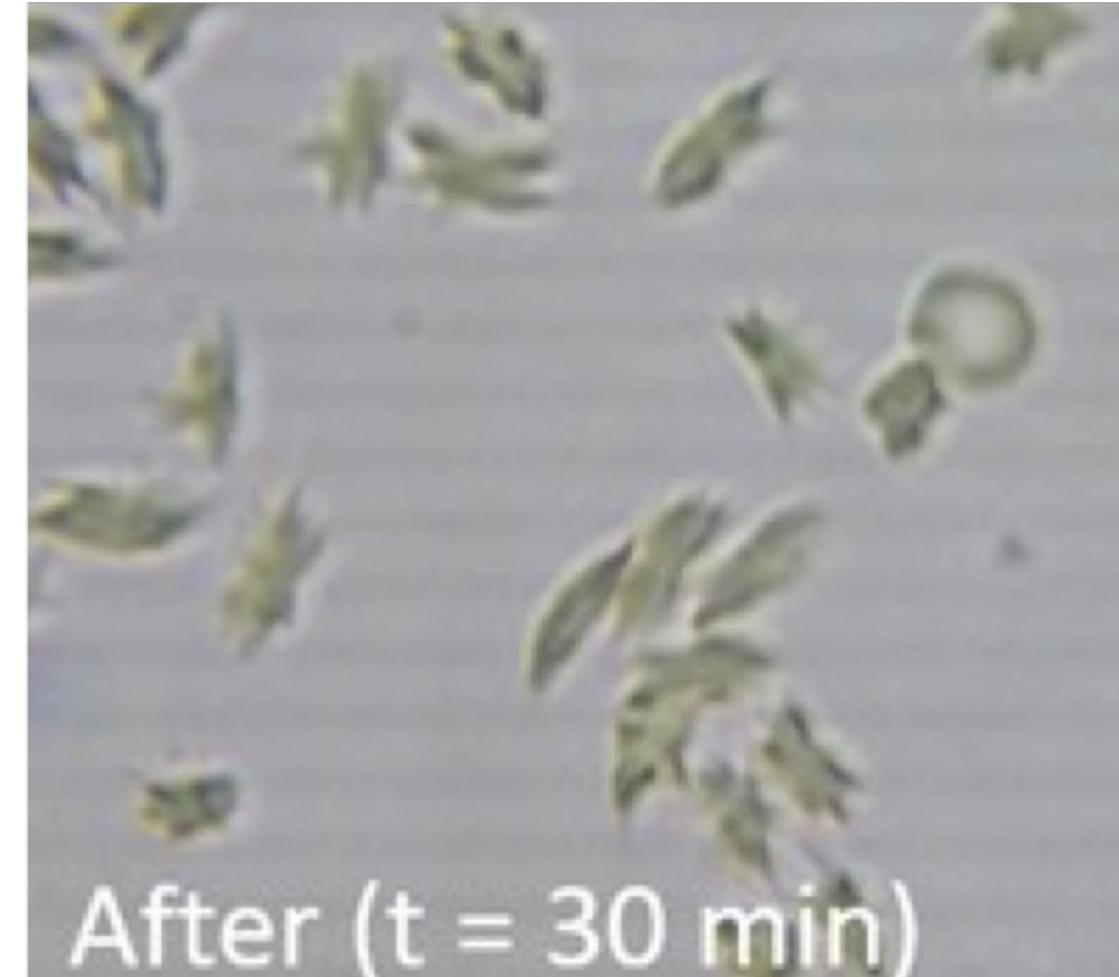
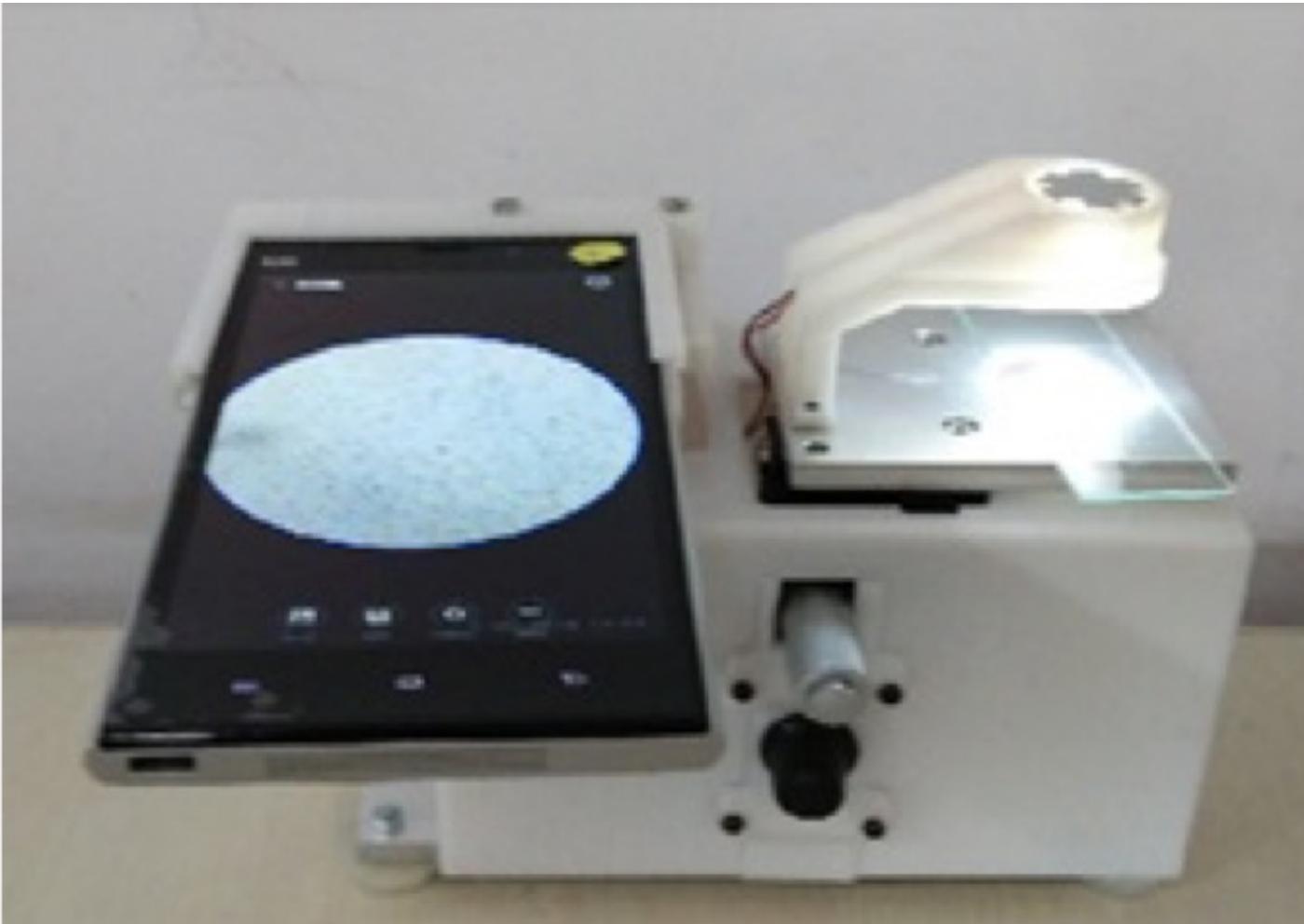


Team of researchers and doctors from the Tata Memorial Centre and IIT Bombay who worked successful Phase 1 trial of CAR T-cell therapy.

Privacy Settings



Point-of-care screening for sickle cell anemia







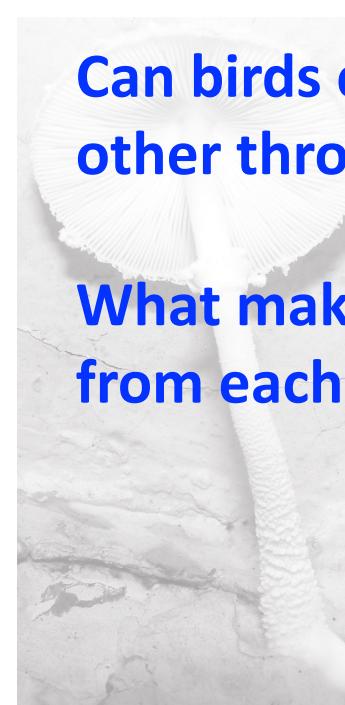
Trees
Insects
Soil



Humans
Water
Birds



How do trees know when to shed their leaves?
Why do insects make a chirping noise?
Do any creatures live in the soil?



Can birds communicate with each other through song?

What makes every human different from each other?

An interesting question in biology...

- Are we humans all same or different?
 - If we are same, how are we same?
 - If we are different, how are we different from each other?
- Our DNA – is this the answer to which of the two questions?
- How can we leverage this similarity or difference?
 - Forensics, Causality of, and susceptibility to, diseases
- Population biology and ethnicity
- And... ??

Are you ready for BB101?

- What is the difference between Covaxin and Covishield?
- My cousin has leukemia and there is a new treatment based on immunotherapy. Should she take this?
- A family member has diabetes. Home test for blood glucose is expensive... Can I make a cheaper test?
- It is a common practice to marry close cousins in our family... May I also marry my cousin? (consanguineous marriages)
- What is meant by ‘genetically modified’ crop?
 - Is it good or bad? (human health, corporate profits, ...)

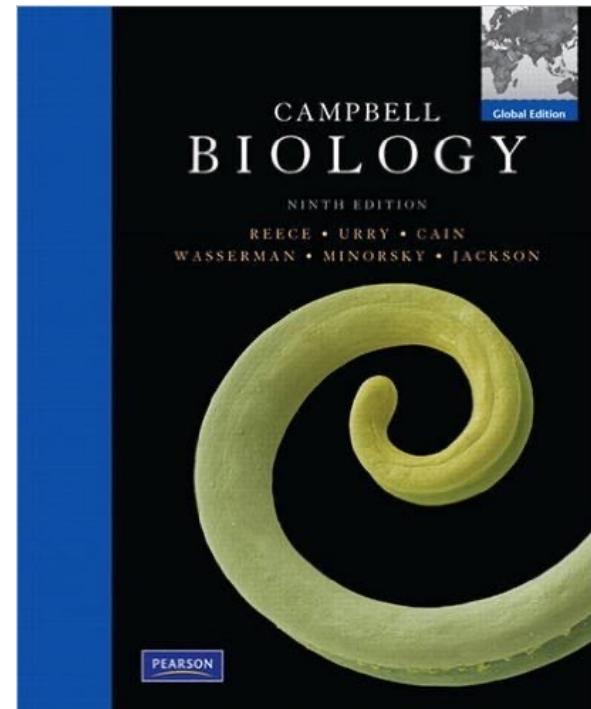
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Today's topics

- Perception versus reality
- What is Biology?
 - Why study Biology?
- Bottom-up and top-down approaches
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- Course related non-technical information

Primary reference book



Campbell Biology, 9th edition

by Reece, Urry, Cain, Wasserman,
Minorsky, Jackson

We will use material / information from other sources also
Will give source of information in respective slides

Lecture and tutorial time table

	Division D3	Division D4
Weekly lecture 1 of 2	Wednesday	Tuesday
Venue: LA 201	11:05 am to 12:30 pm	2:00 to 3:25 pm
Weekly lecture 2 of 2	Friday	Friday
Venue: LA 201	11:05 am to 12:30 pm	2:00 to 3:25 pm
Tutorial (one per week)	Thursday	Tuesday
Venue: in next slide	8:30 to 9:25 am	11:35 am to 12:30 pm

Teaching Assistants

Tutorial batch No.	Tutorial Room	Thursday 8:30 to 9:30	Tuesday 11:30 to 12:30
		Division D3	Division D4
T1	LT 204	Arkaprovo Sarkar	Abhijit Das
T2	LT 205	Sumana Paul	Chandan Kumar Pradhan
T3	LT 206	Ananya Asthana	Shabduli Shinde
T4	LT 301	Lekhashree L. K.	Aranyak Mitra
T5	LT 302	Mangal Talpade	Sudipti Shaw
T6	LT 303	Shivali Patkar	Sumon Kumar Saha
T7	LT 304	Arpita Bhattacharyya	Sayantan Jash
T8	LT 305	Rashi Sharma	Arpita Prasad
T9	LT 306	Riyanka Chatterjee	Hoimee Banerjee
	Hindi TA	Pravallika	Pravallika

Course Instructors

Lectures	Division D3	Division D4
Lectures 1 to 10	Prof. Petety V. Balaji Lab 402 Phone: 7778 balaji@iitb.ac.in	Prof. Rajesh Patkar Lab 403 Phone: 7772 rajeshpatkar@iitb.ac.in
Lectures 11 to 21	Prof. Roop Mallik Lab 406 Phone: 7769 rmallik@iitb.ac.in	Prof. Roop Mallik Lab 406 Phone: 7769 rmallik@iitb.ac.in

Course Instructors

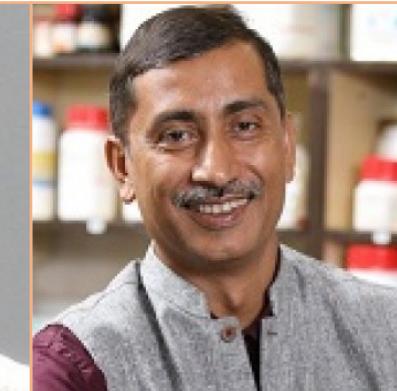
Balaji



Rajesh



Roop



Lecture and tutorial plan

Week #	Week starting date (starting from Monday)	D4 in Slot 3B Tuesday 11:35 am to 12:30 pm Tutorial	D4 in Slot 10A Tuesday 2:00 to 3:25 pm Lecture 1 of 2	D3 in Slot 6A Wednesday 11:05 am to 12:30 pm Lecture 1 of 2	D3 in Slot 3C Thursday 8:30 to 9:25 am Tutorial	D3 in Slot 6B Friday 11:05 am to 12:30 pm Lecture 2 of 2	D4 in Slot 10B Friday 2:00 to 3:25 pm Lecture 2 of 2
1	Week of 6th March	7th Holi	7th Holi	Skip	Skip	Lecture 1	Lecture 1
2	Week of 13th March	Tutorial: Lec 1	Lecture 2	Lecture 2	Tutorial: Lec 1	Lecture 3	Lecture 3
3	Week of 20th March	Tutorial: Lec 2-3	Lecture 4	22nd Gudi padwa	Tutorial: Lec 2-3	Lecture 4	Lecture 5
4	Week of 27th March	Tutorial: Lec 4	Lecture 6	Lecture 5	Tutorial: Lec 4	Lecture 6	Lecture 7
5	Week of 3rd April	Tutorial: Lec 5-6	4th Mahavir Jayanti	Quiz Lecture 7	Tutorial: Lec 5-6	7th Good Friday	7th Good Friday
6	Week of 10th April	Tutorial: Lec 7	Lecture 8	Lecture 8	Tutorial: Lec 7	Lecture 9	Lecture 9
7	Week of 17th April	Skip	Skip	Mid-sem	Mid-sem	Mid-sem	Mid-sem
8	Week of 24th April	Mid-sem	Mid-sem	Skip	Skip	Lecture 10	Lecture 10
9	Week of 1st May	Tutorial: Lec 10	Lecture 11	Lecture 11	Tutorial: Lec 10	5th Buddha Purnima	5th Buddha Purnima
10	Week of 8th May	Tutorial: Lec 11	Lecture 12	Lecture 12	Tutorial: Lec 11	Lecture 13	Lecture 13
11	Week of 15th May	Tutorial: Lec 12-13	Lecture 14	Lecture 14	Tutorial: Lec 12-13	Quiz 2 (8:15 to 9:15 am) Lecture 15	Lecture 15
12	Week of 22nd May	Tutorial: Lec 14-15	Lecture 16	Lecture 16	Tutorial: Lec 14-15	Lecture 17	Lecture 17
13	Week of 29th May	Tutorial: Lec 16-17	Lecture 18	Lecture 18	Tutorial: Lec 16-17	Lecture 19	Lecture 19
14	Week of 5th June	Tutorial: Lec 18-19	Lecture 20	Lecture 20	Friday time-table Tutorial: Lec 18-19	Lecture 21	Lecture 21
15	Week of 12th June	End-sem	End-sem	End-sem	End-sem	End-sem	End-sem
16	Week of 19th June	End-sem					

Lecture slides

On Moodle

The screenshot shows the IIT Bombay Moodle interface. On the left is a vertical navigation bar with icons and text for Dashboard, Site home, Calendar, Private files, My courses, and several course entries: BB 101-2022-2-D4, BB 101-2022-2-D3, BB 101-2022-2, BB 400-2022-2, and BB 101-2022-1-D1. The main area displays a "Recently accessed courses" section with three cards: "Spring 2022 (2022-2) | BB 101-2022-2-D3 Biology" (blue background), "Spring 2022 (2022-2) | BB 400-2022-2 Molecular Biophysics" (blue background), and "Autumn 2022 (2022-1) | BB 101-2022-1-D1 Biology" (grey background). Below this is a "Course overview" section with three cards: "Autumn 2022 (2022-1) | BB 101-2022-1-D1 Biology" (grey background), "Spring 2022 (2022-2) | BB 101-2022-2 Biology" (green background), and "Spring 2022 (2022-2) | BB 101-2022-2-D3 Biology" (grey background). The bottom right corner of the main area has two dropdown menus: "Short name" and "Card".

Assessment scheme

- Assignments (up to 20%)
- Quizzes (up to 30%)
- Mid-semester and end-semester examination (up to 50%)

Division D3

Chemical Engineering (CL)

Computer Science and Eng. (CS)

Mathematics (MA)

Total 358 students

Division D4

Aerospace Engineering (AE)

Civil Engineering (CE)

Chemistry (CH)

Energy Science and Eng. (EN)

Total 338 students

Each division is divided into nine (9) tutorial batches
(37 to 40 students in each batch)