A woman wearing a pink hijab and safety glasses is smiling and looking down at something in a laboratory. She is wearing a white lab coat. In the background, other people in lab coats are visible, and a piece of laboratory equipment with a digital display is partially visible in the foreground.

Introduction to Biotech and Biogen



Mass Stem Week: The Wonderful World of Biotech!

Biotechnology, Biogen's History & Culture



**Caring Deeply.
Working Fearlessly.
Changing Lives.**

- I. Biotechnology
- II. Biogen's 40+ Year History
- III. Community Lab
- IV. Corporate Citizenship

**At its essence, biotechnology is the use of _____
to develop or make useful products.**



1. Living organisms

2. Nucleotides/DNA

3. High-tech machines

4. Your biology teacher's awesome skills



Meaning & Root Words

Bio =

Technology =

Meaning & Root Words

Bio = Life

Technology = Applying scientific knowledge for practical purposes

Techno = tools (Greek)

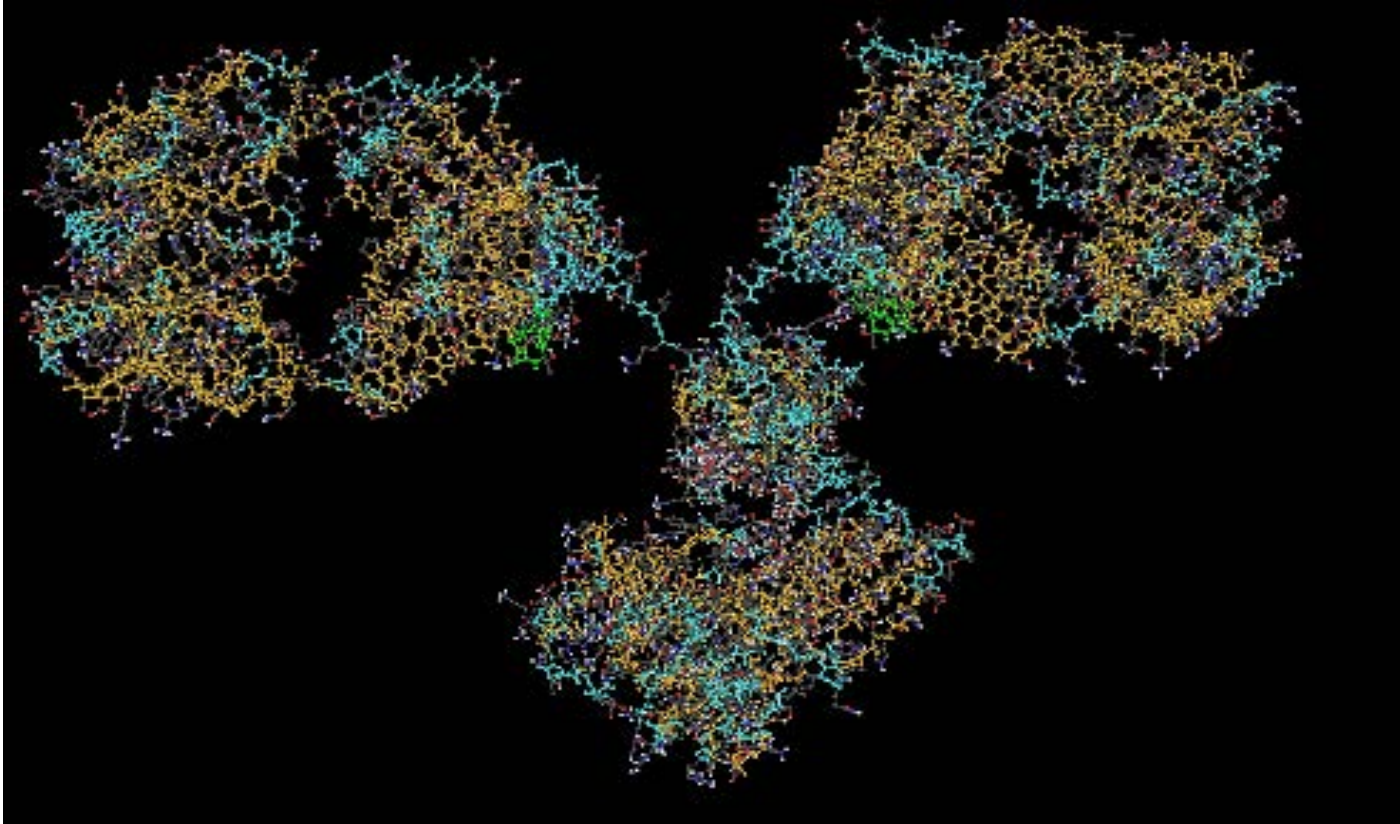
ology = study of

What do we do at Biogen?

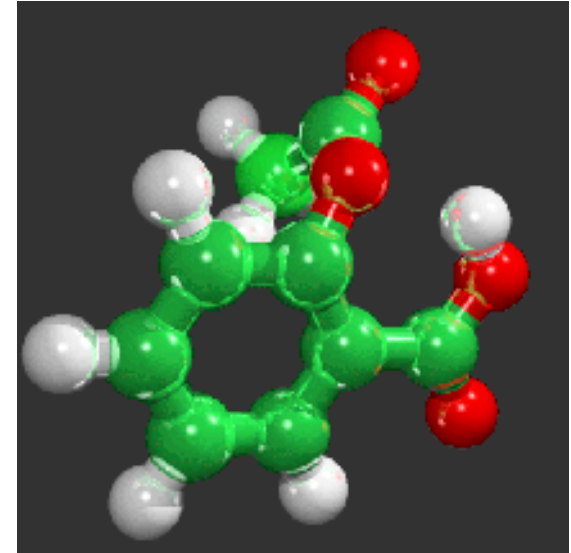
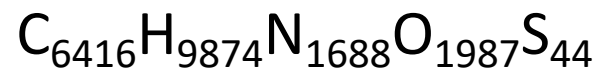
1. Make robots
2. Create new life forms
- ✓ 3. Discover and make new medicines
4. Treat patients



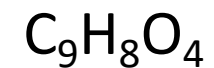
Biotechnology vs. Traditional Pharmaceuticals



A Protein Medicine ~20,000 atoms



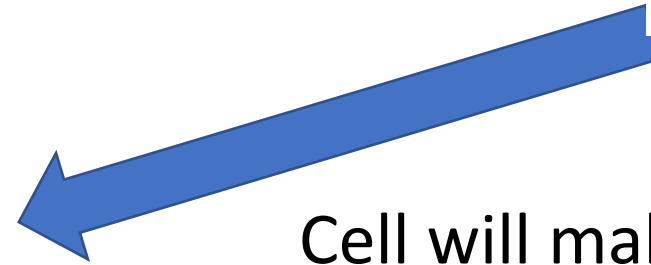
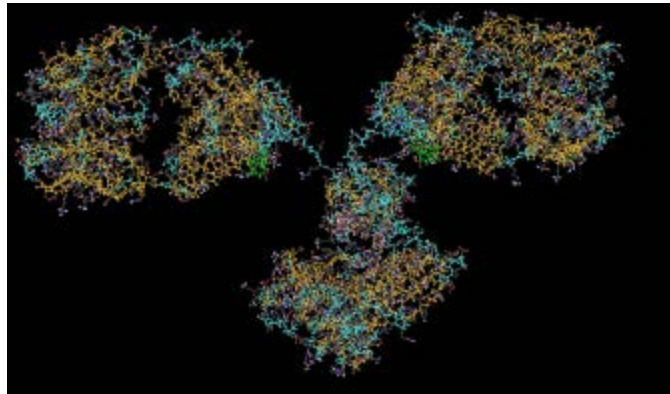
Aspirin (Acetylsalicylic Acid) 21 atoms



Biotechnology



Insert gene into cell



Cell will make protein medicine

Biotechnology

- Need to grow lots of cells to make enough proteins (medicine)
- Now when the cell divides each new cell will have a copy of the recipe for the protein





**Our MISSION is clear.
We are PIONEERS in neuroscience.**



Contributing to the
COMMUNITIES
where we live
and serve

53k+

STUDENTS VISITED OUR
COMMUNITY LABS IN THE
U.S. SINCE OPENING*

\$6.2m

DONATED BY OUR
FOUNDATION TO STEM
NON-PROFITS & LOCAL
COMMUNITIES IN 2018

3,000+

EMPLOYEES
PARTICIPATED IN ANNUAL
CARE DEEPLY VOLUNTEER
DAY IN 2019

* Biogen data on file as of September 30, 2019.

Biotech In Action: A Virtual Summer Lab

- Spring 2020 required a major change in teaching and learning
- Biogen and the Lemelson-MIT Program collaborated on Biotech in Action
- State-of-the-art virtual program to inspire and empower a new generation of young scientists and inventors
 - 400 students/80 per week
 - 28 hours of synchronous instruction



Labster



LEMELSON-MIT

Labster


- Labster offers a virtual laboratory experience
- Realistic
- Practice your skills
- Fun and risk-free





**WE CARE
DEEPLY**

about making
a difference.



**WE WORK
FEARLESSLY.**

We do not give up
even when challenged,
pursuing innovation
in all that we do.

We are humbled by
the opportunity to
**CHANGE
LIVES.**





Biogen.



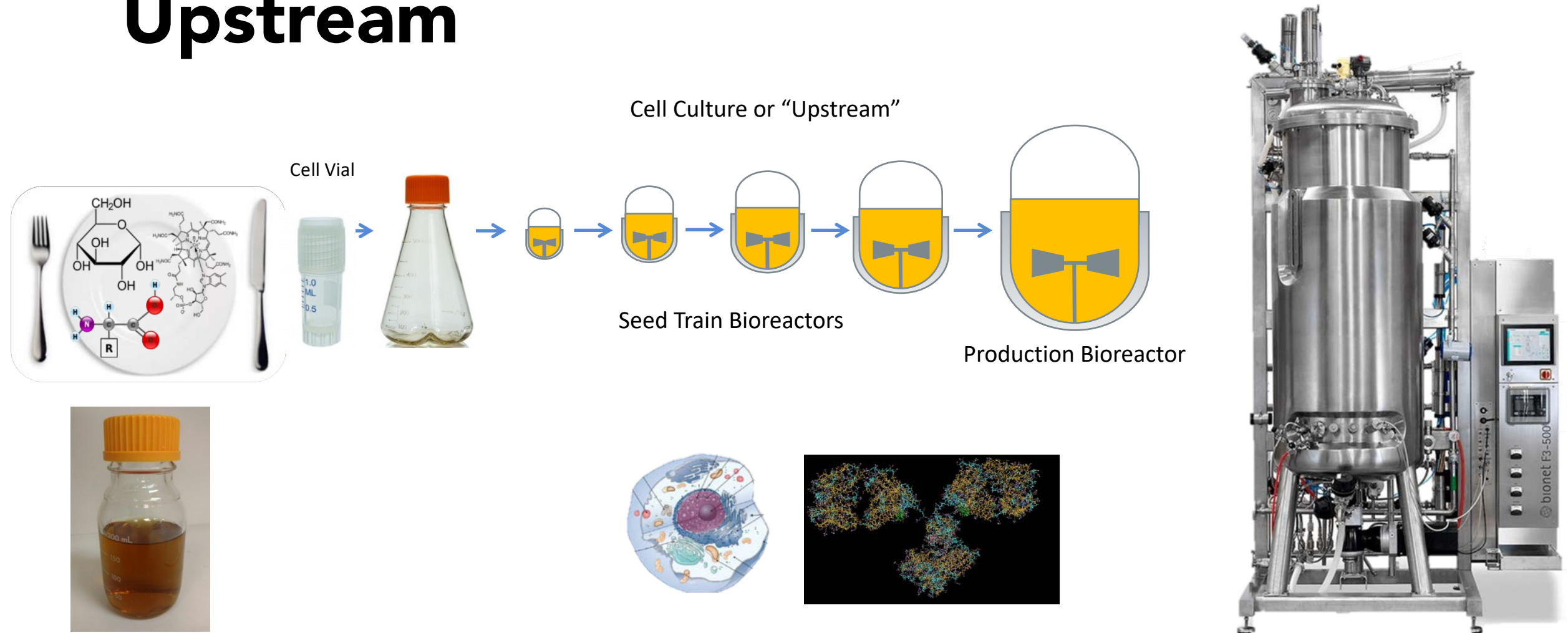
Biogen

LEMELSON-MIT



Caring Deeply. Working Fearlessly. Changing Lives.™

Biotechnology Process Overview - Upstream



Biotechnology Process Overview - Downstream



Centrifuge



Chromatography
Columns



Packaging

Making New Medicines

Making New Medicines

Research



Making New Medicines

Research

Development



Making New Medicines

Research

Development

Pre-Clinical

Making New Medicines

Research

Development

Pre-Clinical

Clinical Trials

Phase I

Phase II

Phase III



Making New Medicines

Research

Development

Pre-Clinical

Clinical Trials

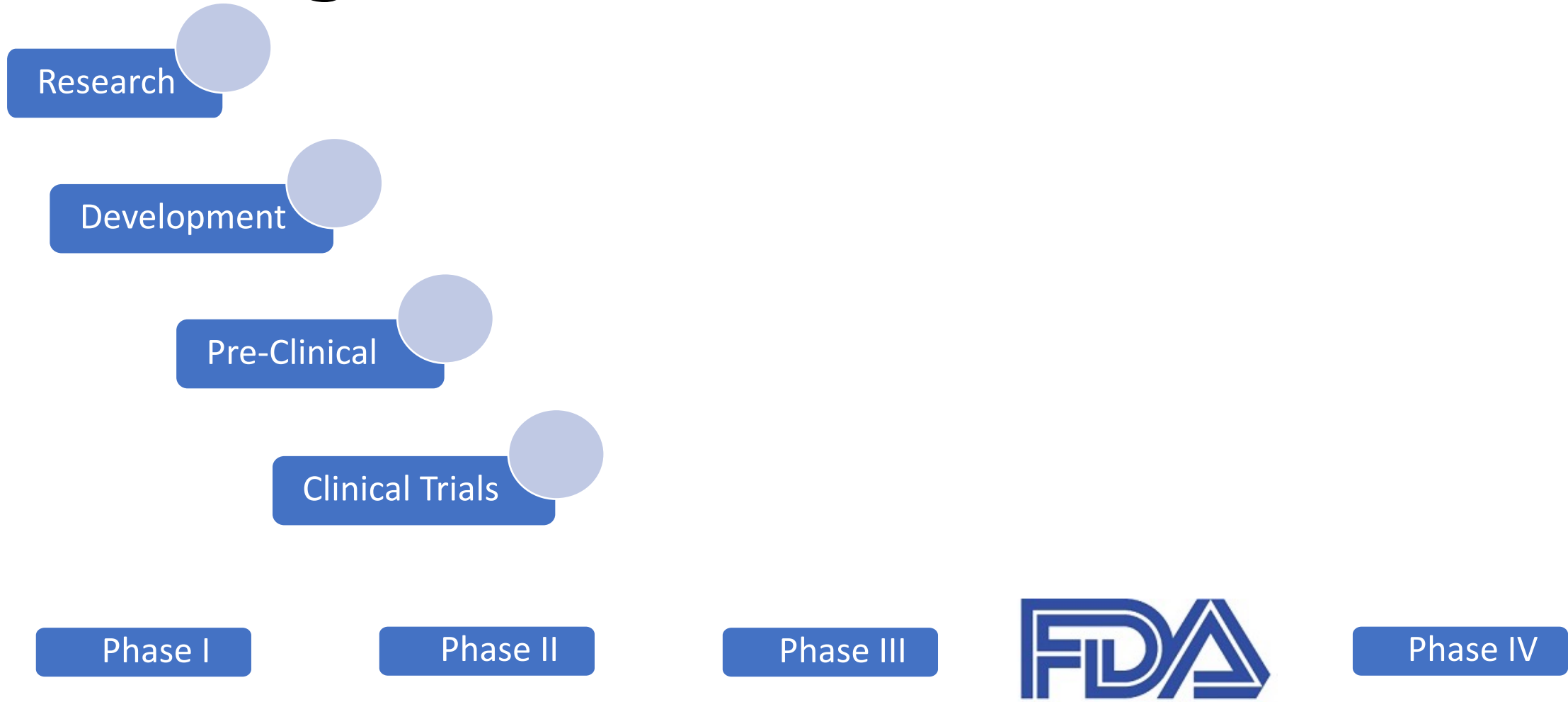
Phase I

Phase II

Phase III



Making New Medicines



Making New Medicines

Research

Development

Pre-Clinical

Clinical Trials

Manufacturing



Making New Medicines

Research

Development

Pre-Clinical

Clinical Trials

Manufacturing

Marketing/Sales



Making New Medicines

Research

Development

Pre-Clinical

Clinical Trials

Manufacturing

Marketing/Sales



Legal Department

Human Resources

Finance and Accounting

Patient Services

Facilities and Maintenance

Information Technology



University Relations



Public Affairs

How long does it take to create a new medicine?

1. 2 - 4 weeks
2. 1 year
3. 5 - 8 years
- ✓ 4. 10 - 15 years



How much does it cost to bring a new medicine to market?

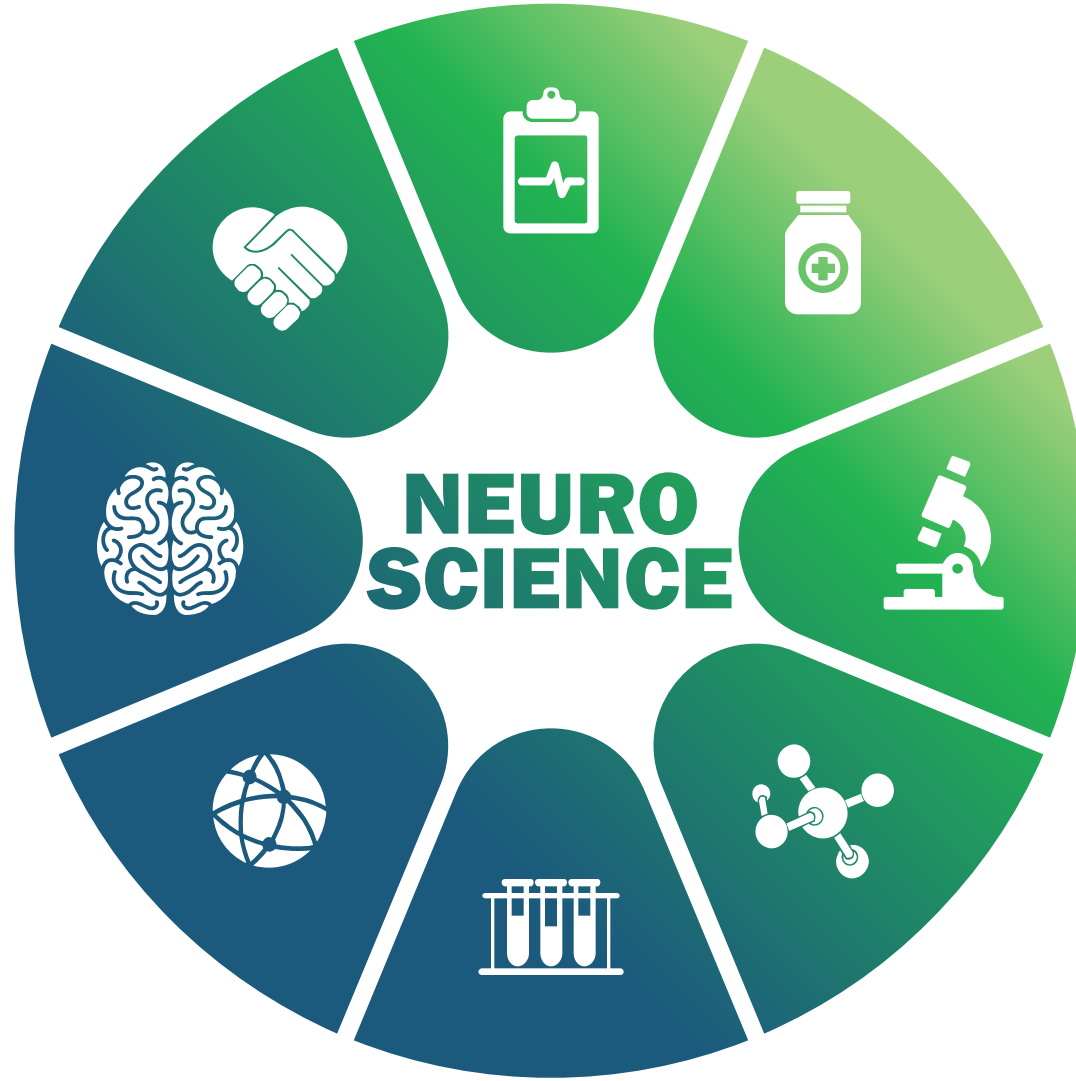
1. \$1,000
2. \$100,000
3. \$1 million
4. \$1 billion



<https://www.biospace.com/article/median-cost-of-bringing-a-new-drug-to-market-985-million/>

Estimated Research and Development Investment Needed to Bring a New Medicine to Market, 2009-2018;
March 3, 2020 <https://jamanetwork.com/journals/jama/article-abstract/2762311>

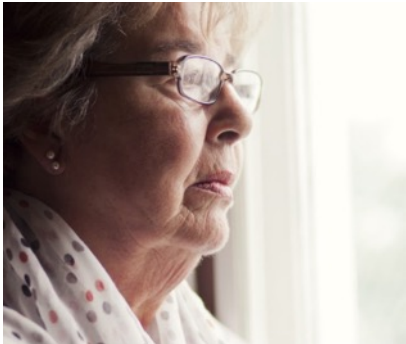
No other
disease area
holds as much
NEED



or as much
PROMISE
for medical
breakthroughs.

ONE BILLION PEOPLE

affected by neurological disorders worldwide



DEMENTIA
60-70% HAVE
ALZHEIMER'S
DISEASE



**PARKINSON'S
DISEASE**



**MULTIPLE
SCLEROSIS**



**AMYOTROPHIC
LATERAL
DISEASE**



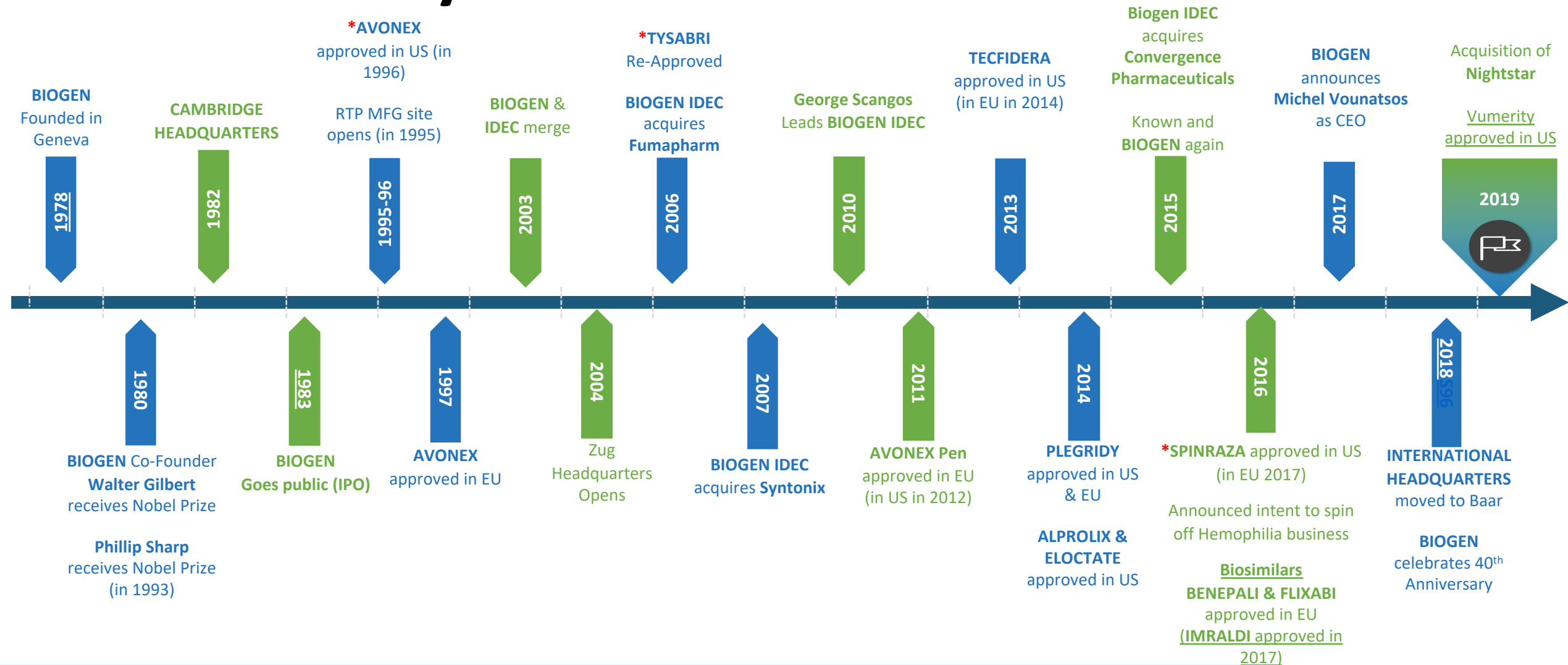
**PROGRESSIVE
SUPRANUCLEAR
PALSY**



**SPINAL
MUSCULAR
ATROPHY**

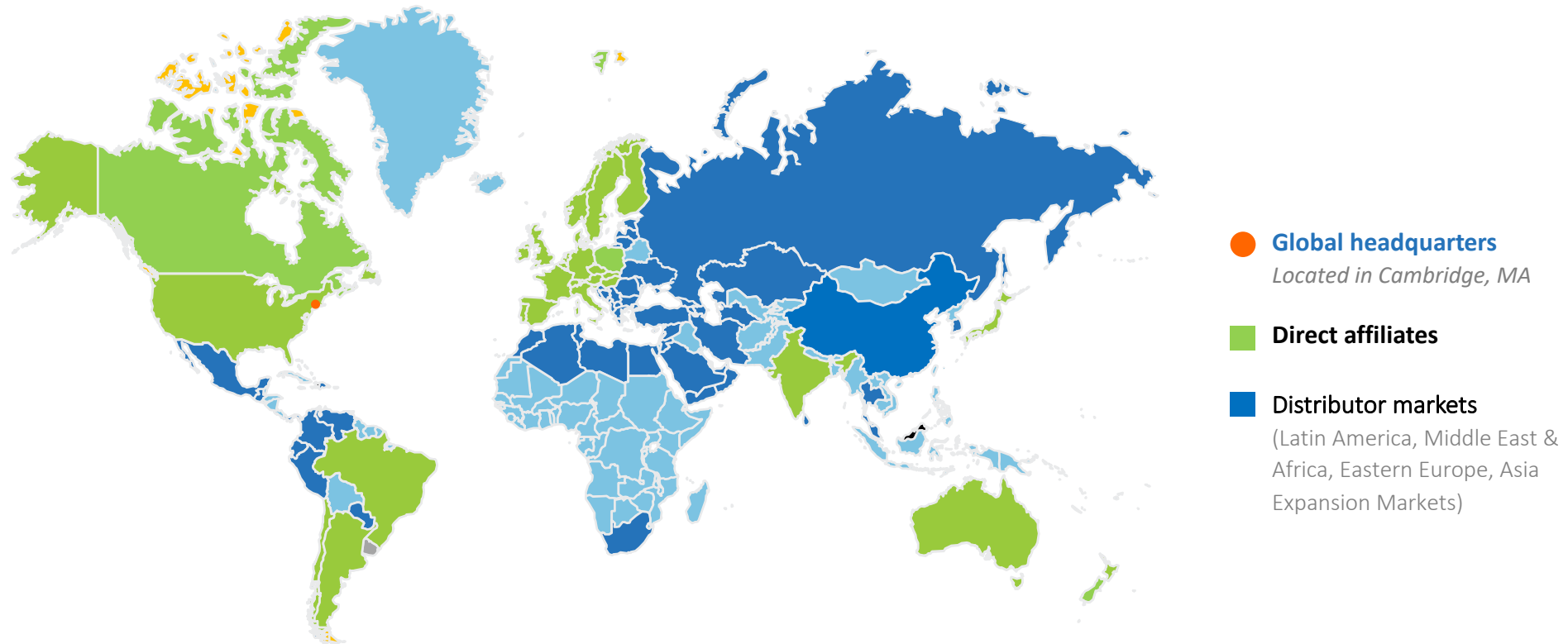
Huge impact on the global healthcare system

Our History



Global Footprint: Direct & Distributor Markets

With a strong affiliate presence in more than 30 countries and a network of distribution partners in more than 50 additional countries, Biogen has established a global footprint that allows us to capture the greatest value for the products we develop.





102
COUNTRIES RECEIVE
OUR PRODUCTS

39
DIRECT AFFILIATE
MARKETS

Working to bring
our high-quality
**MEDICINES
TO MARKET**



ONE OF THE
LARGEST PRODUCERS
OF BIOLOGICS
IN BIOTECH

248k L
OF BIOREACTOR
CAPACITY GLOBALLY*

2
MANUFACTURING
SITES
North Carolina, U.S.
Solothurn, Switzerland#

* Includes anticipated capacity of Solothurn, Switzerland, which is expected to be partially operational by the end of 2020.
Expected to be partially operational by the end of 2020.



7,300+
EMPLOYEES WORLDWIDE

46%
OF DIRECTOR-LEVEL
POSITIONS & ABOVE HELD
BY WOMEN GLOBALLY*

6
CONSECUTIVE YEARS
“BEST PLACE TO WORK FOR
LGBTQ EQUALITY”

COMMITTED
to our employees,
diversity and inclusion,
and environmental
sustainability



**CARBON NEUTRAL
COMPANY SINCE 2014**

~70%
REDUCTION IN
POTABLE WATER
INTENSITY
IN 2018**

76%
REDUCTION IN
OPERATIONAL
CARBON INTENSITY
SINCE 2006

100%
RENEWABLE POWER
COMMITMENT





Caring Deeply.
Working Fearlessly.
Changing Lives.™

