Overview of Invention Disclosure Process. Spotting Inventions for Patenting.

Premnath V, PhD

Head, NCL Innovations | Founder Director, Venture Center

7 June 2024 | Workshop @ TechEx.in

Outline

Outline:

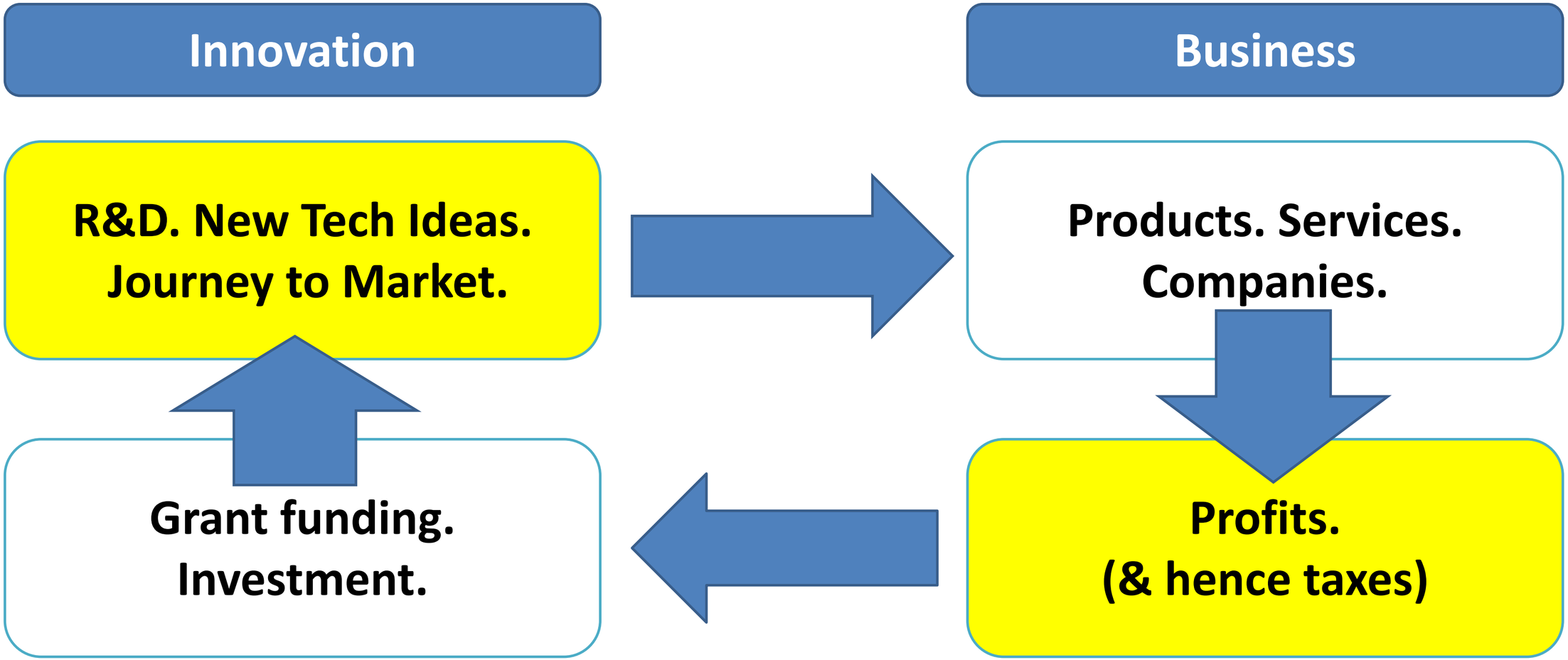
- Proactively identifying inventions and filing patents: The motivation
- The invention disclosure process
- For innovation managers: When researchers do not disclose inventions proactively, what can you do?
- For inventors: You do not think you have an invention for patent filing, what should you do?
- Mini-exercise

Proactively filing patents: Why?

Proactively identifying inventions and filing patents -- The motivation:

- Credit of being the originator
- Creating property (ownership, ability to exclude others, transactable)
- Ability to guide/ control the future development of the invention
- Ability to attract resources/ talent for further development of invention
- Indicator of inventive potential
- Rankings, recognitions, etc

Two sides of the Innovation economy!



Alert:

Most researchers who pursue technology commercialization pursue it to see their **ideas reach fruition**, **realize their own full potential** and **get satisfaction**.

Most institutions who promote technology commercialization do it to meet their **socio-economic mandate** of the organization and to demonstrate **significant diffusional impact**. Ex – Boston/SV area institutions

Direct financial returns to people or institutions is rarely the goal. It is an occasional happy by-product.

NIRF Innovation: Parameter 7

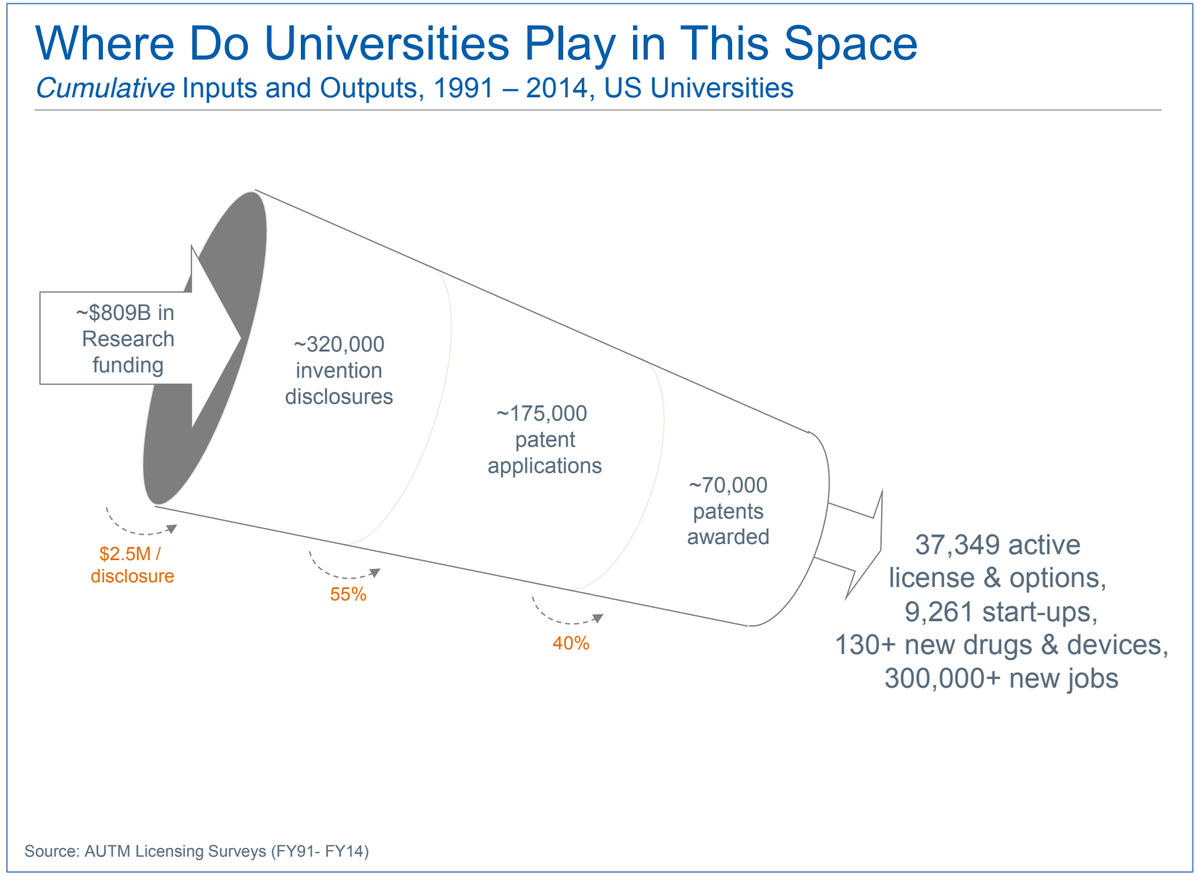
nirf-Innovation
National Institutional Ranking Framework for Innovation
Ministry of Education, Government of India

NIRF Innovation Ranking Framework: 7 Parameters & 22 Key Indiacators		Weightage	%
Parameter 7: Intellectual Property (IP), Generation and Commercialization (Annual Calendar 2020 & 2021):		0.25	100
7.1	Number of Copyrights/Designs Obtained during the Annual Calendar Year 2020 & 2021		15
7.2	Number of Patents Filed during the Annual Calendar Year 2020 & 2021		15
7.3	Number of Patents Published during the Annual Calendar Year 2020 & 2021		20
7.4	Number of Patents Granted during the Annual Calendar Year:2020 & 2021		25
7.5	Number of Technologies (Patents/Non-Patents) Commercialized/Transferred during the Financial Year 2020-21 and 2021-22		25
Total		1.00	700.00

Lesson: Innovation is a portfolio activity. It is difficult to pick winners upfront!

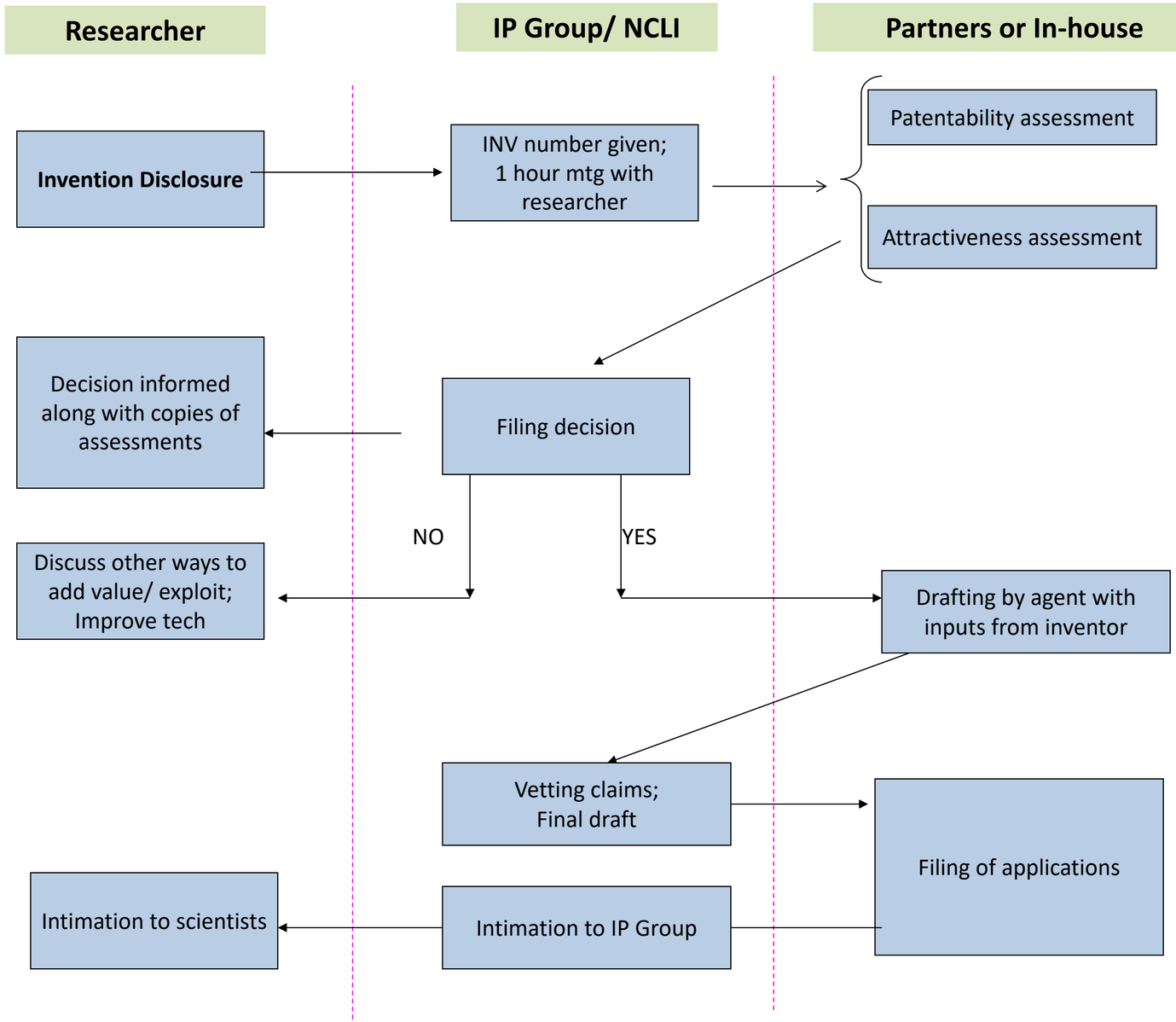
- Example: Google
- Example: Tesla
- Example: Ather

Investment in innovation should not be treated as an investment in a production process. It is like an investment in a defense forces. It is done to create "options".



Invention disclosure process

Example: NCL's patent document flow and decision points



Question: Is it patentable?

Question: Is it commercially/ strategically attractive ? Is it worth filing?

Example: JHU Tech Ventures

https://ventures.jhu.edu/technology-transfer/reports-of-invention/

Our Commitment to Service: 2-2-2

2 Days	2 Weeks	2 Months
JHTV will contact you within **2 business days** of receiving your disclosure.	JHTV will confer with you regarding your disclosure within **2 weeks** of receiving your disclosure.	JHTV will provide a written determination within **2 months** about the commercialization plan.

For innovation managers:
When researchers do not disclose inventions proactively, what can you do?

Building lasting organizations and systems:

Policies are the keystones

Policy	Ex: IP Policy (aligned to organizational policy)
Strategy (to implement policy)	Ex: Strategy Document
Institutional mechanisms	Ex: Patent Filing/Prosecution/Maintenance ; IP commercialization
Enabling resources	Ex: IP Service Provider

How to increase submissions of invention disclosures – basic needs:

- Do not ask inventors to find their own funds for patenting costs
- Reduce time spent by inventors on drafting, answering queries/ clarifications etc
- Reduce barriers/delays to publications/ presentations to minimum (**very important**)
- Reduce bureaucracy, paperwork, delays in decision making (committees and hierarchy), empowering inventors
- Awareness, remove fear of the unknown, remove myths
- High level support – commitment, carrot and stick
- Inventors should not have to deal with IP jargon and legal processes
- Sincere and authoritative efforts for licensing/ commercialization

Two approaches

- Basic
  - Responding to interest from scientists to file patents: Awareness and efficient systems; ensuring funding
  - Getting rid of myths (ex: patent filing is seen negatively by journal editors) and ideological barriers (ex: knowledge should be free).
  - Visible technology licensing results – actual products/ services, awards/ recognitions, revenue

- Proactive
  - Level 1: Visits to various groups; talks/ seminars etc; scanning publications
  - Level 2: IP landscaping and evolving integrated technology programs
  - Level 3: Drive with research funding and other resource allocations; Facilitate collaborative funding proposals around themes and calls.

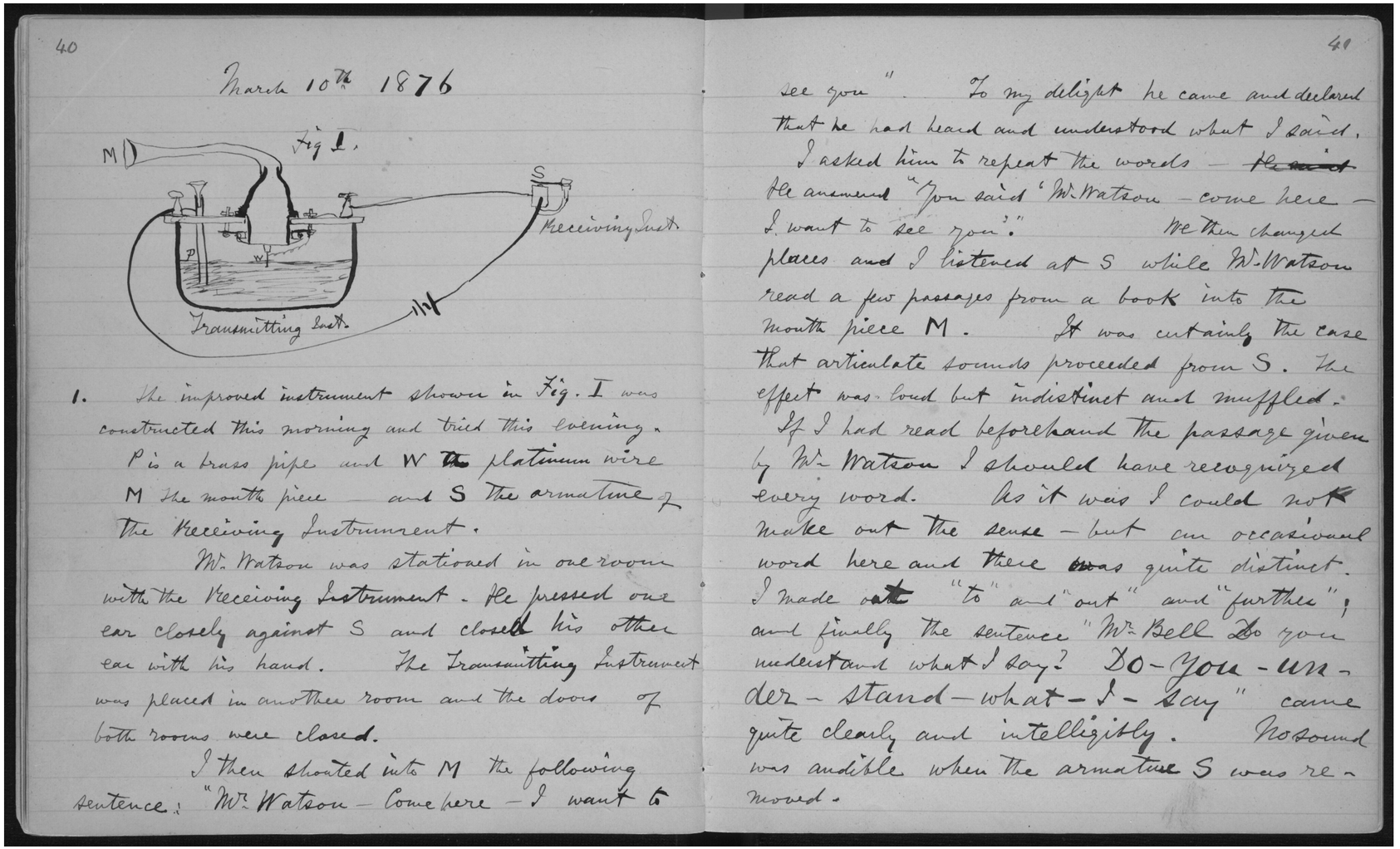
Myths to destroy:

- ❖ One cannot file a patent and publish an article on the same topic
- ❖ Journal editors look down on publications where previously a patent has been filed
- ❖ Patent filing can delay your publication
- ❖ Patents are not valued in CVs when research careers are involved
- ❖ One needs to show mechanistic data (and show how things work) in a patent

Ideas:

- IP Orientation Session when an employee joins the organization
- Making IP part of Orientation/ induction course for new PhD students
- Observership for students at IP/ Patent Group/Cell
- Sit in research seminars
- Scan all posters in Internal Poster Sessions
- Scan project proposals
- Scan your organization for research capabilities and knowhow. You might find patenting opportunities.
- Wall of Inventors; Most Prolific Inventor Badge
- Annual Inventors Day and honors
- Scan lab note books
- Scan conference presentations
- Scan publications

Invention Spotting in Lab notebooks



40

March 10th 1876

Fig 1.

1. The improved instrument shown in Fig. I was constructed this morning and tried this evening. P is a brass pipe and W the platinum wire M the mouth piece — and S the armature of the Receiving Instrument.

Mr. Watson was stationed in one room with the Receiving Instrument. He pressed one ear closely against S and closed his other ear with his hand. The Transmitting Instrument was placed in another room and the doors of both rooms were closed.

I then shouted into M the following sentence: "Mr. Watson — Come here — I want to

41

see you". To my delight he came and declared that he had heard and understood what I said.

I asked him to repeat the words — ~~he said~~ He answered "You said 'Mr. Watson — come here — I want to see you'."

We then changed places and I listened at S while Mr. Watson read a few passages from a book into the mouth piece M. It was certainly the case that articulate sounds proceeded from S. The effect was loud but indistinct and muffled.

If I had read beforehand the passage given by Mr. Watson I should have recognized every word. As it was I could not make out the sense — but an occasional word here and there was quite distinct. I made out "to" and "out" and "further", and finally the sentence "Mr. Bell Do you understand what I say? DO-YOU-UN-DER-STAND-WHAT-I-SAY" came quite clearly and intelligibly. No sound was audible when the armature S was removed.

Pages 40-1 of Alexander Graham Bell's unpublished laboratory notebook (1875-76), describing first successful experiment with the telephone.

https://en.wikipedia.org/wiki/Lab_notebook#/media/File:AGBell_Notebook.jpg

Invention Spotting in Publications

Carbon Nanotube Flow Sensors

Shankar Ghosh,[1] A. K. Sood,[1]* N. Kumar[2]

We report that the flow of a liquid on single-walled carbon nanotube bundles induces a voltage in the sample along the direction of the flow. The voltage that was produced fit a logarithmic velocity dependence over nearly six decades of velocity. The magnitude of the voltage depended sensitively on the ionic conductivity and on the polar nature of the liquid. Our measurements suggest that the dominant mechanism responsible for this highly nonlinear response involves a direct forcing of the free charge carriers in the nanotubes by the fluctuating Coulombic field of the liquid flowing past the nanotubes. We propose an explanation based on pulsating asymmetric ratchets. Our work highlights the device potential for nanotubes as sensitive flow sensors and for energy conversion.

Carbon Nanotube Flow Sensors

SHANKAR GHOSH, **A. K. SOOD**, AND N. KUMAR

SCIENCE
16 Jan 2003
Vol 299, Issue 5609
pp. 1042-1044

DOI: 10.1126/science.1079080

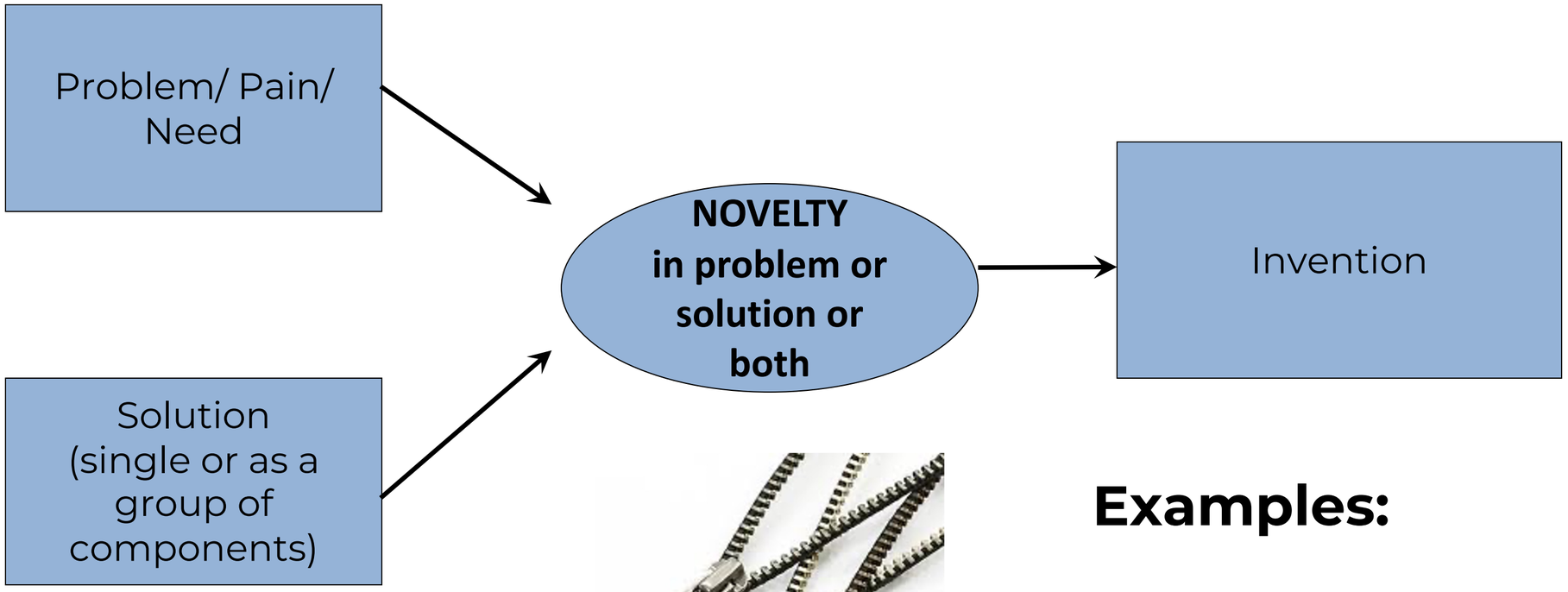
http://repository.ias.ac.in/50270/1/83_aut.pdf

For inventors:
You do not think you have an invention for patent filing, what should you do?

Typical questions/ doubts/ concerns of inventors:

- Is this an invention at all? I have just done an experiment and learnt something. What is the invention in this?
- Is this really novel?
- Is it worthy of a patent? Don’t inventions have to be disruptive?
- Do I enough data to file a patent? Should I not file after getting all the data together?

Invention



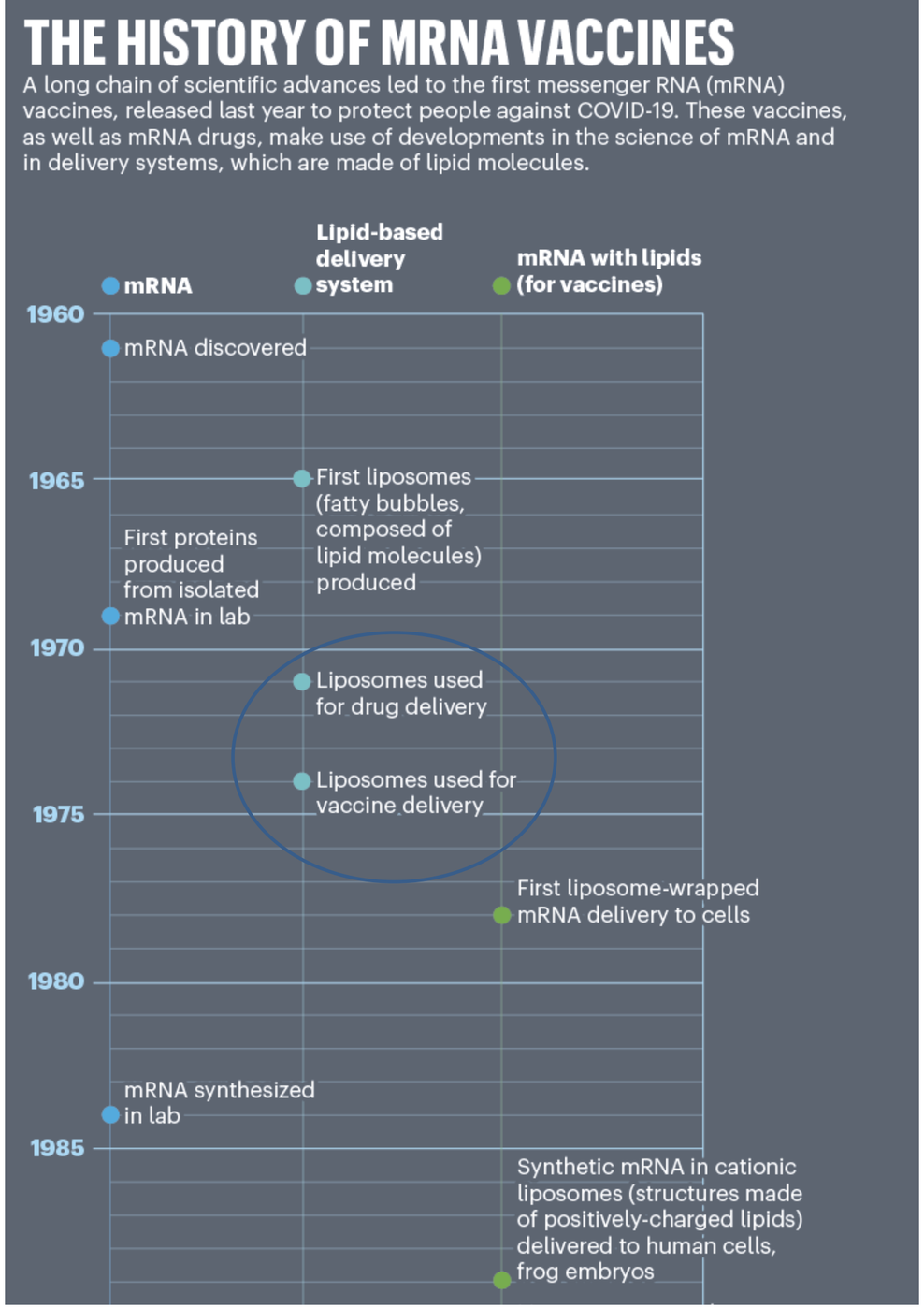
Examples:

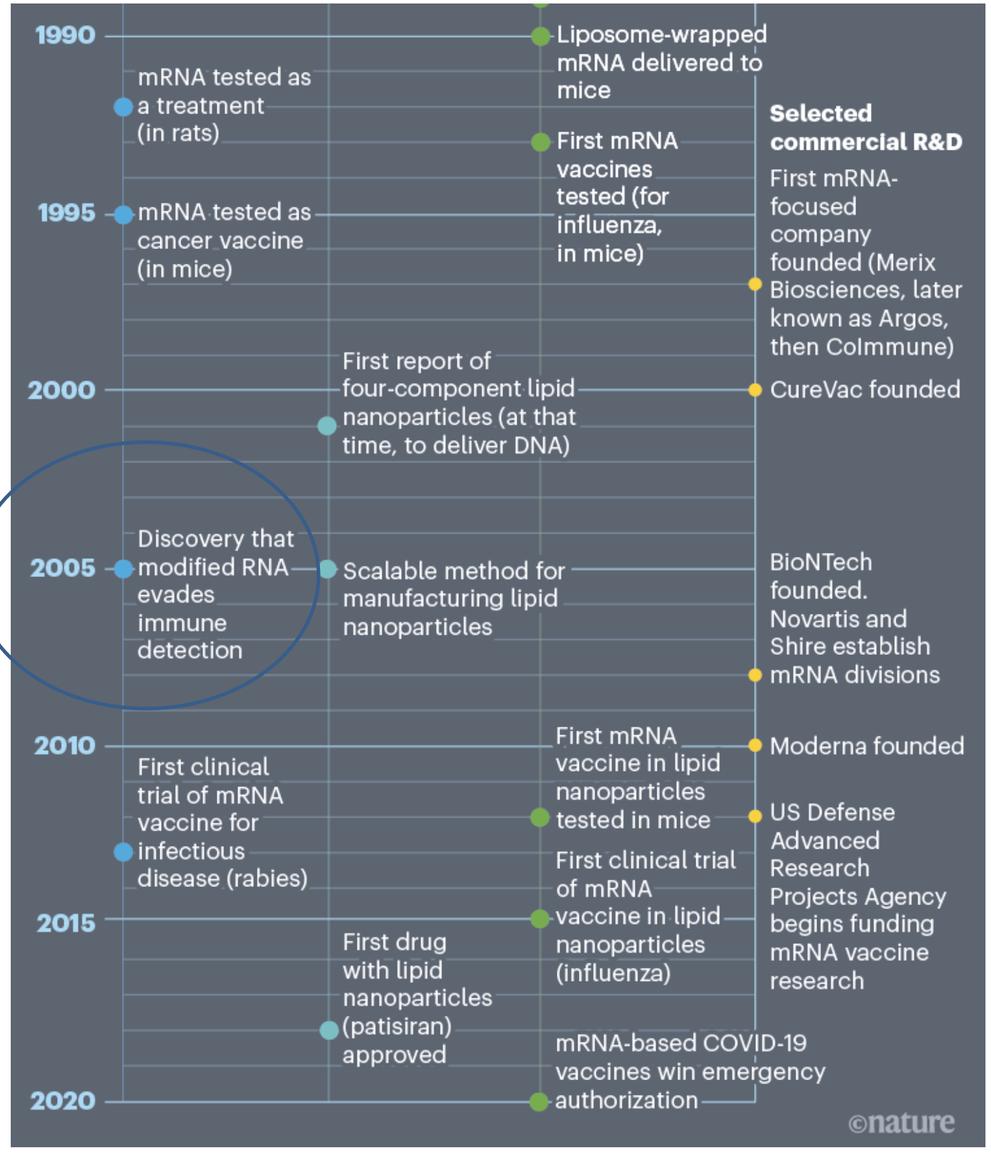
-- Zip/ Velcro/ Bundling tie

-- (Science-led) Vaccines, drugs

mRNA Vaccine

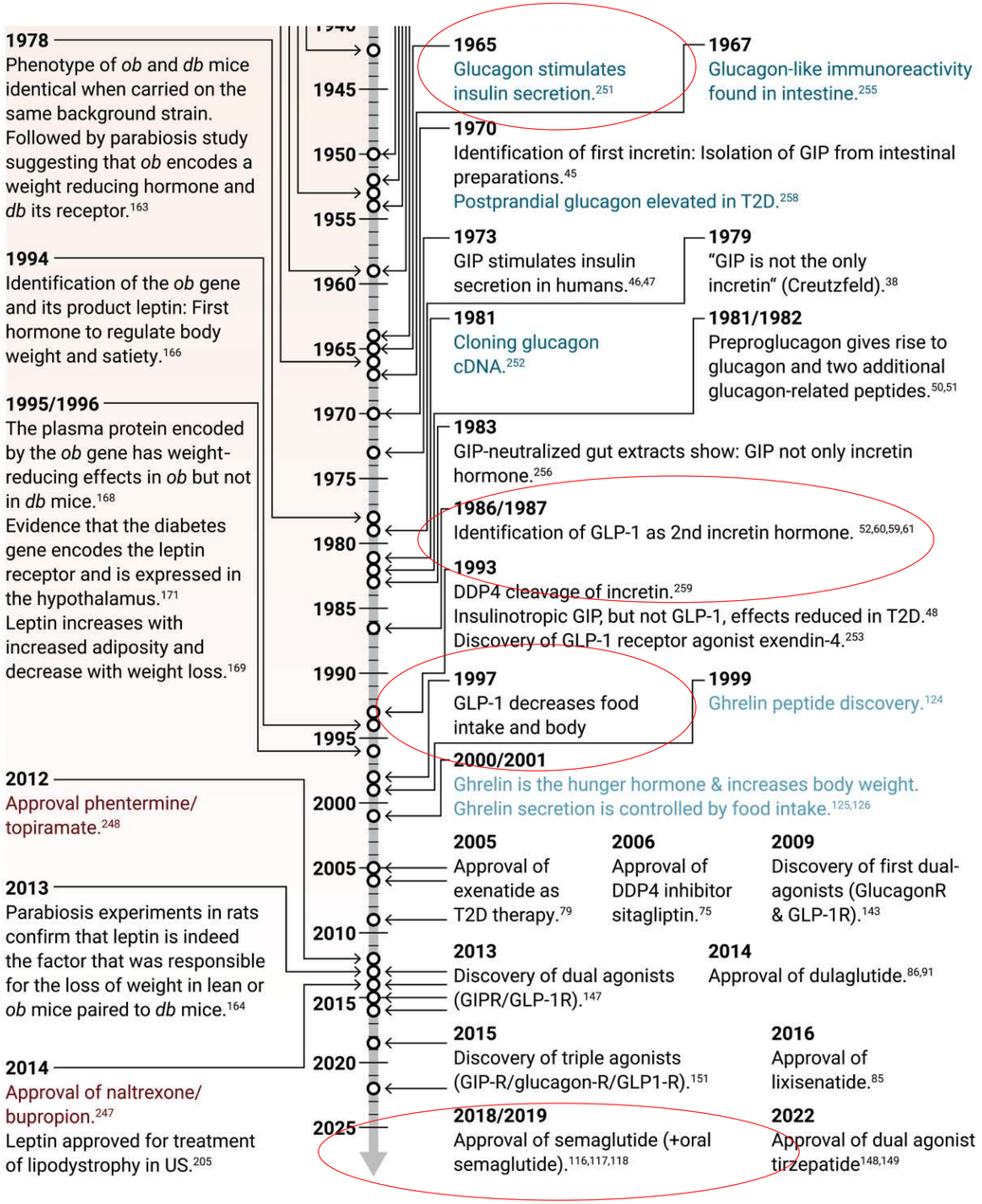
Source: https://www.nature.com/articles/d41586-021-02483-w





Seeking satiety: From signals to solutions

Source: Tschöp and Friedman, Sci. Transl. Med. (2023)
https://www.science.org/doi/10.1126/scitranslmed.adh4453



Early insights into GLP-1's structure and function were generated by (from left to right) Svetlana Mojsov, Joel Habener, and Dan Drucker of Massachusetts General Hospital and Jens Juul Holst at the University of Copenhagen.

CHRISTINE KAO/STAT

Fig. 1. Timeline of advances leading to the identification of short- and long-term satiety signals and their therapeutic applications. GI, gastrointestinal; IV, intravenous; RIA, radioimmunoassay; ob, obese; db, diabetic; R, receptor.

VENTURE CENTER

What can you protect?

- Composition (ex: membrane, catalyst)
- Method or process (ex: method of manufacturing membrane, method of coating catalyst)
- Product (ex: MEA, fuel cell stack)
- System (ex: FC based electricity generation system)
- Method of use (ex: FC in a drone for long distance delivery; drug delivered as an aerosol for asthma treatment)

Mini-exercises

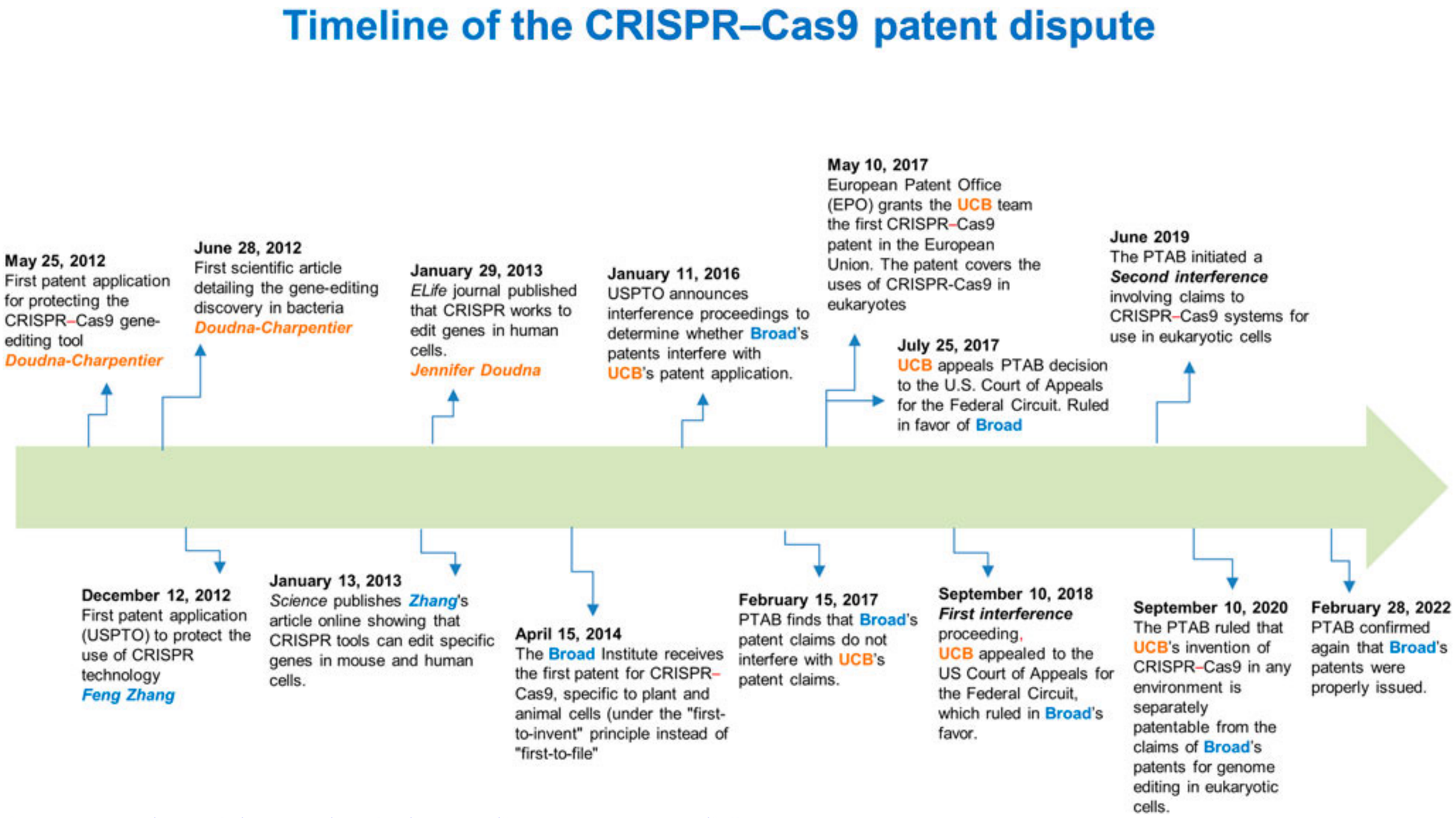
Mini-Exercise 1

Abstract

Clustered regularly interspaced short palindromic repeats (CRISPR)/CRISPR-associated (Cas) systems provide bacteria and archaea with adaptive immunity against viruses and plasmids by using CRISPR RNAs (crRNAs) to guide the silencing of invading nucleic acids. We show here that in a subset of these systems, the mature crRNA that is base-paired to trans-activating crRNA (tracrRNA) forms a two-RNA structure that directs the CRISPR-associated protein Cas9 to introduce double-stranded (ds) breaks in target DNA. At sites complementary to the crRNA-guide sequence, the Cas9 HNH nuclease domain cleaves the complementary strand, whereas the Cas9 RuvC-like domain cleaves the noncomplementary strand. The dual-tracrRNA:crRNA, when engineered as a single RNA chimera, also directs sequence-specific Cas9 dsDNA cleavage. Our study reveals a family of endonucleases that use dual-RNAs for site-specific DNA cleavage and highlights the potential to exploit the system for RNA-programmable genome editing.

https://www.science.org/doi/10.1126/science.1225829

Example: CRISPR



https://www.frontiersin.org/journals/genetics/articles/10.3389/fgene.2022.1009688/full

Example: CRISPR

US 20160046961A1

(19) **United States**

(12) **Patent Application Publication**

JINEK et al.

(10) **Pub. No.: US 2016/0046961 A1**

(43) **Pub. Date: Feb. 18, 2016**

(54) **METHODS AND COMPOSITIONS FOR RNA-DIRECTED TARGET DNA MODIFICATION AND FOR RNA-DIRECTED MODULATION OF TRANSCRIPTION**

(71) Applicants: **Emmanuelle Charpentier**, (US); **The Regents of the University of California**, Oakland, CA (US); **University of Vienna**, Vienna (AU)

(72) Inventors: **Martin JINEK**, Zurich (CH); **Emmanuelle CHARPENTIER**, Braunschweig (DE); **Krzysztof CHYLINSKI**, Vienna (AU); **James Harrison DOUDNA CATE**, Berkeley, CA (US); **Wendell LIM**, San Francisco, CA (US); **Lei QI**, Albany, CA (US); **Jennifer A. DOUDNA**, Berkeley, CA (US)

(21) Appl. No.: **14/403,475**

(22) PCT Filed: **Mar. 15, 2013**

(86) PCT No.: **PCT/US13/32589**

§ 371 (c)(1),
(2) Date: **Nov. 24, 2014**

Related U.S. Application Data

(60) Provisional application No. 61/652,086, filed on May 25, 2012, provisional application No. 61/716,256, filed on Oct. 19, 2012, provisional application No. 61/757,640, filed on Jan. 28, 2013, provisional application No. 61/765,576, filed on Feb. 15, 2013.

Publication Classification

(51) **Int. Cl.**
C12N 15/90 (2006.01)

(52) **U.S. Cl.**
CPC ***C12N 15/90*** (2013.01)

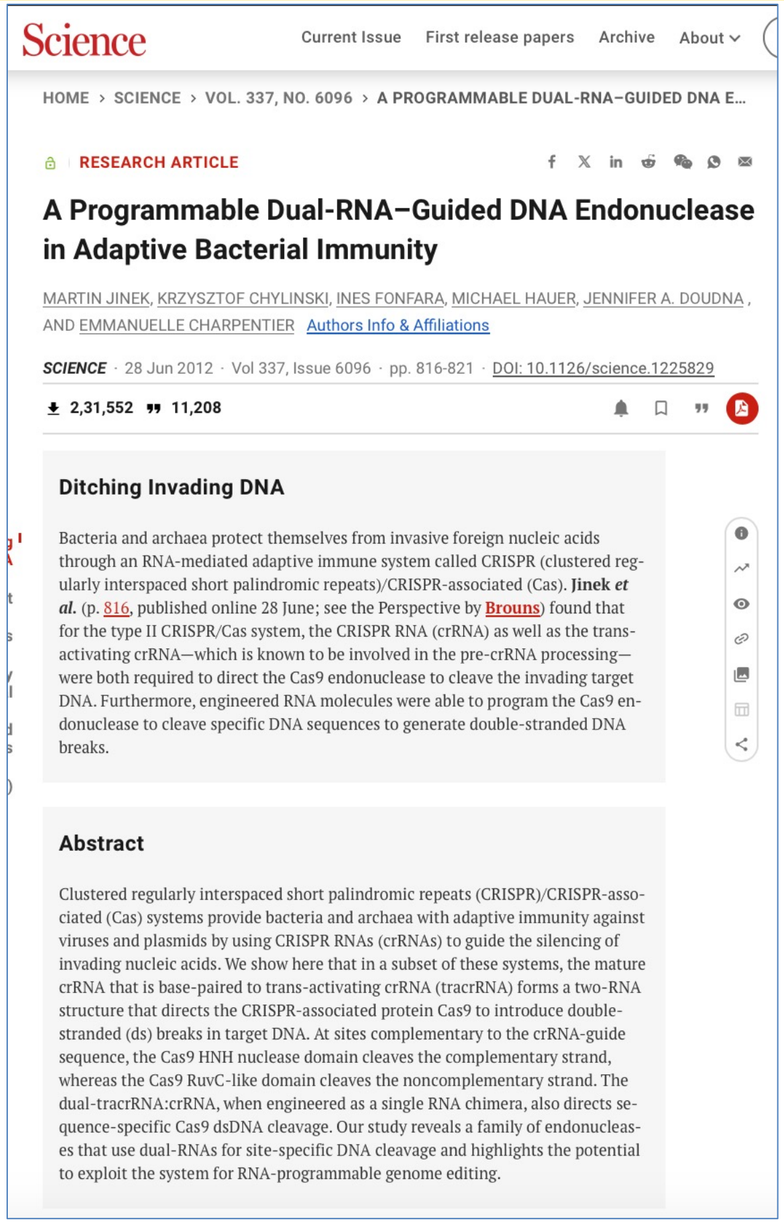
(57) **ABSTRACT**

The present disclosure provides a DNA-targeting RNA that comprises a targeting sequence and, together with a modifying polypeptide, provides for site-specific modification of a target DNA and/or a polypeptide associated with the target DNA. The present disclosure further provides site-specific modifying polypeptides. The present disclosure further provides methods of site-specific modification of a target DNA and/or a polypeptide associated with the target DNA The present disclosure provides methods of modulating transcription of a target nucleic acid in a target cell, generally involving contacting the target nucleic acid with an enzymatically inactive Cas9 polypeptide and a DNA-targeting RNA. Kits and compositions for carrying out the methods are also provided. The present disclosure provides genetically modified cells that produce Cas9; and Cas9 transgenic non-human multicellular organisms.

https://patents.google.com/patent/US20160046961A1/en

Priority date: 25 May 2012

Example: CRISPR



Science Current Issue First release papers Archive About

HOME › SCIENCE › VOL. 337, NO. 6096 › A PROGRAMMABLE DUAL-RNA–GUIDED DNA E…

RESEARCH ARTICLE

A Programmable Dual-RNA–Guided DNA Endonuclease in Adaptive Bacterial Immunity

MARTIN JINEK, KRZYSZTOF CHYLINSKI, INES FONFARA, MICHAEL HAUER, JENNIFER A. DOUDNA, AND EMMANUELLE CHARPENTIER Authors Info & Affiliations

SCIENCE · 28 Jun 2012 · Vol 337, Issue 6096 · pp. 816-821 · DOI: 10.1126/science.1225829

2,31,552 11,208

Ditching Invading DNA

Bacteria and archaea protect themselves from invasive foreign nucleic acids through an RNA-mediated adaptive immune system called CRISPR (clustered regularly interspaced short palindromic repeats)/CRISPR-associated (Cas). **Jinek *et al.*** (p. 816, published online 28 June; see the Perspective by **Brouns**) found that for the type II CRISPR/Cas system, the CRISPR RNA (crRNA) as well as the trans-activating crRNA—which is known to be involved in the pre-crRNA processing—were both required to direct the Cas9 endonuclease to cleave the invading target DNA. Furthermore, engineered RNA molecules were able to program the Cas9 endonuclease to cleave specific DNA sequences to generate double-stranded DNA breaks.

Abstract

Clustered regularly interspaced short palindromic repeats (CRISPR)/CRISPR-associated (Cas) systems provide bacteria and archaea with adaptive immunity against viruses and plasmids by using CRISPR RNAs (crRNAs) to guide the silencing of invading nucleic acids. We show here that in a subset of these systems, the mature crRNA that is base-paired to trans-activating crRNA (tracrRNA) forms a two-RNA structure that directs the CRISPR-associated protein Cas9 to introduce double-stranded (ds) breaks in target DNA. At sites complementary to the crRNA-guide sequence, the Cas9 HNH nuclease domain cleaves the complementary strand, whereas the Cas9 RuvC-like domain cleaves the noncomplementary strand. The dual-tracrRNA:crRNA, when engineered as a single RNA chimera, also directs sequence-specific Cas9 dsDNA cleavage. Our study reveals a family of endonucleases that use dual-RNAs for site-specific DNA cleavage and highlights the potential to exploit the system for RNA-programmable genome editing.

https://www.science.org/doi/10.1126/science.1225829

Date: 28 June 2012

Example: CRISPR Claims

CLAIMS: What is claimed is:

1. A DNA-targeting RNA comprising:
(i) a first segment comprising a nucleotide sequence that is complementary to a sequence in a target DNA; and
(ii) a second segment that interacts with a site -directed modifying polypeptide.
2. The DNA-targeting RNA of Claim 1 , wherein the first segment comprises 8 nucleotides that have 100% complementarity to a sequence in the target DNA.
3. The DNA-targeting RNA of Claim 1, wherein the second segment comprises a nucleotide sequence with at least 60% identity over a stretch of at least 8 contiguous nucleotides to any one of the nucleotide sequences set forth in SEQ ID NOs:563-682, or a complement thereof.

https://patents.google.com/patent/WO2013176772A1/en

Priority date: 25 May 2012

Example: CRISPR Claims

156. A method of cleaving a nucleic acid comprising contacting a target DNA molecule having a target sequence witha) a Cas9 protein; and
b) a single molecule DNA-targeting RNA comprisingi) a targeter-RNA that hybridizes with the target sequence, and
ii) an activator-RNA that hybridizes with the targeter-RNA to form a double-stranded RNA duplex of a protein-binding segment, wherein the activator-RNA comprises the nucleotide sequence set forth as SEQ ID NO:1347,
wherein the activator-RNA and the targeter-RNA are covalently linked to one another with intervening nucleotides,
wherein said contacting is in vitro outside of a cell,
wherein the single molecule DNA-targeting RNA forms a complex with the Cas9 protein,
whereby the single molecule DNA-targeting RNA targets the target sequence, and the Cas9 protein cleaves the target DNA molecule.

https://patents.google.com/patent/US20160046961A1/en

Priority date: 25 May 2012

Mini-exercise 2: What is the invention here?

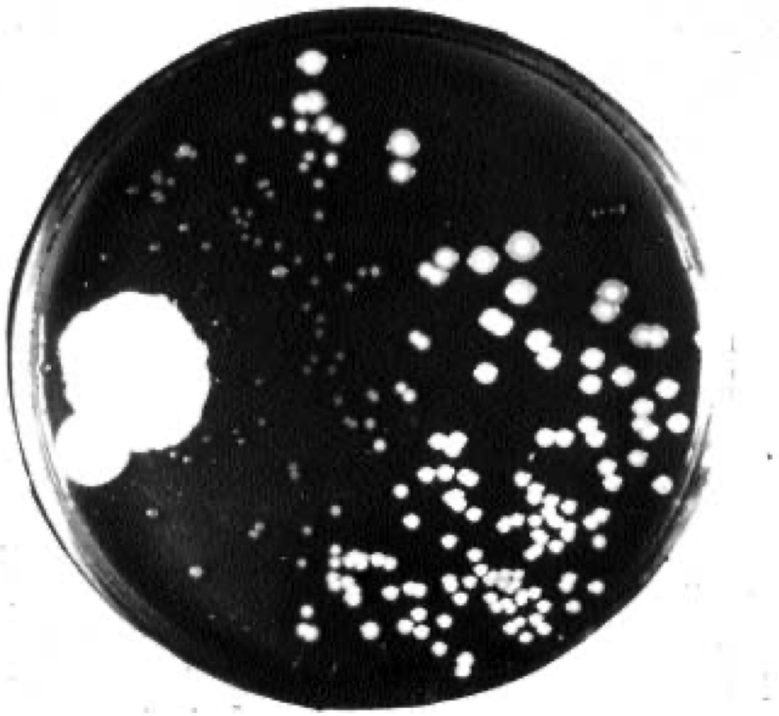


Fig 1. Photograph of the original culture plate, taken by Fleming in 1928

On 1 September 1928 Alexander Fleming became Professor of Bacteriology at St Mary's Hospital Medical School in London. He was an acknowledged expert on the staphylococcus and was following up a 1927 report by Bigger et al. describing changes in colour, texture and cohesion of Staphylococcus aureus colonies over time when left at room temperature. On 3 September 1928 he returned to London from his home in Suffolk, having been on holiday during August with his family. Before leaving for Suffolk, he had stacked all his S. aureus culture plates in one corner of his bench, out of the sun light, so that his new, young research scholar, Stuart Craddock, could work on his bench while he was away.

As Fleming started to examine his culture plates, his former assistant, Dr Merlin Pryce, walked into the laboratory and Fleming picked up the top plate, lifted the cover and said: "That's funny." Near the edge of the culture was a mould about 20 mm in diameter with a smaller satellite attached to it (Figure 1). Around it was a clear area in which organisms apparently had been lysed; further away were degenerate colonies, while still further away were normal colonies of S. aureus. Pryce looked and said: "That's how you discovered lysozyme."

Pryce left and thought nothing further of it. In February 1928 Pryce had decided to give up bacteriology and transferred to the Morbid Anatomy Department, leaving Fleming to continue the research by himself. Fortunately, this meant that he was the first person to see the penicillin effect and follow it up.

Mould contamination on culture plates had been seen by Fleming and many others before but he realised that here was something important. He subcultured the mould and kept it going in nutrient broth for further research. He found that the mould grew as a "thick, corrugated, felted mass and after a few days an intense yellow colour developed in the underlying clear fluid." He showed that after eight-days' growth at room temperature the culture fluid gave complete inhibition of staphylococci at a dilution of 1 in 500. For some months the culture fluid was known as 'mould juice' but on 7 March 1929 Fleming named the antibiotic 'penicillin'. On 10 May 1929 he submitted his first report on penicillin to the British Journal of Experimental Pathology.

https://www.fleming.gr/impact/fleming-museum

https://www2.samford.edu/~djohnso2/44962w/london/PenicillinTrue.pdf

TechEx.in

Tech Transfer Hub at Venture Center

Supported by NBM - BIRAC

THANK YOU