SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF CARDIAC TECHNOLOGY

COURSE NAME: GENERAL MICROBIOLOGY

TOPIC : INTRODUCTION AND HISTORY OF MICROBIOLOGY

INTRODUCTION

- Microbiology is a branch of science deals with the structure, function, classes and economic importance of microorganisms.
- Study of all living organisms that are too small to be visible with the naked eye.
- Includes bacteria, archaea, viruses, fungi, prions, protozoa and algae, collectively known as 'microbes'.
- Plays a key roles in nutrient cycling, biodegradation/biodeterioration, climate change, food spoilage, the cause and control of disease, and biotechnology.

MEMBERS OF THE MICROBIAL WORLD

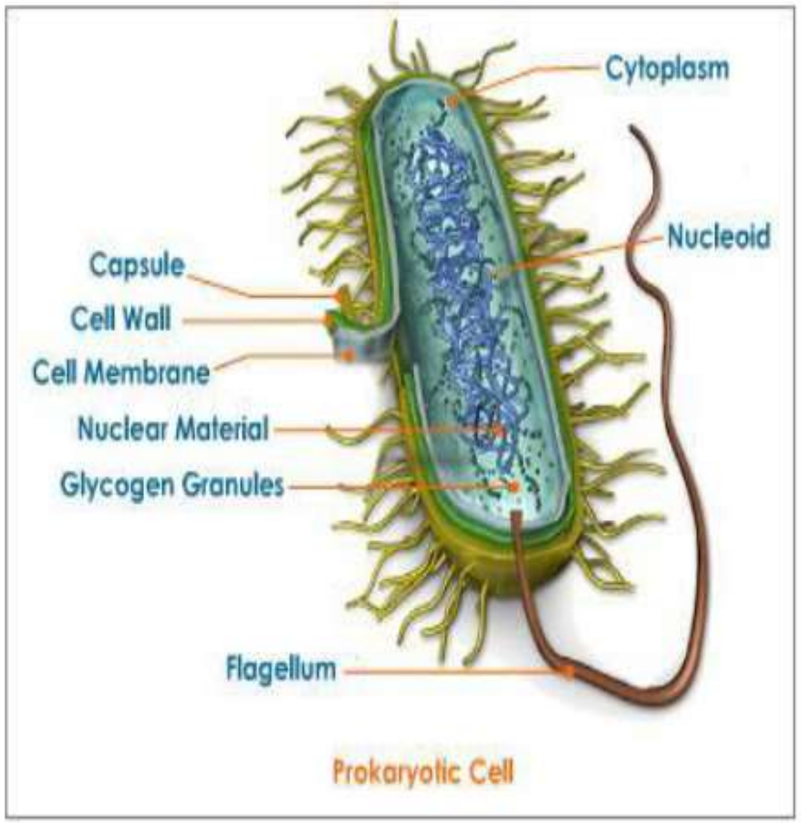
- Based on the structure of nucleus, fundamentally two types of cells exist. They are
- i. Prokaryotes and
- ii. Eukaryotes

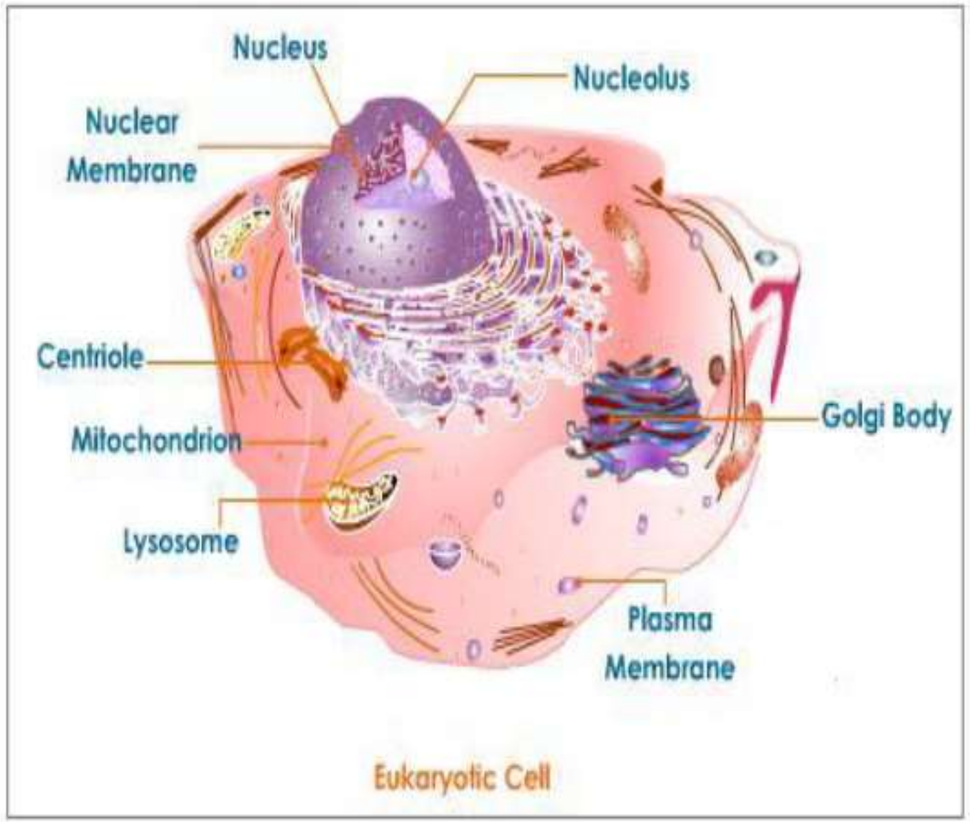
PROKARYOTIC CELLS

- Prokaryote is a Greek word, *pro* - before and *karyon* - nut or kernel.
- Organism with a primordial nucleus.
- Have a much simpler morphology than eukaryotic cells and **lack** a true membrane bound nucleus and cell organelles like mitochondria, golgi bodies, endoplasmic reticulum, etc.
- All **bacteria** and **archaea** are prokaryotic.

EUKARYOTIC CELLS

- Eukaryote is a Greek word, *eu* - true and *karyon* - nut or kernel.
- It **posses** a membrane enclosed nucleus and cell organelles.
- They are more complex morphologically and are usually larger than prokaryotes.
- **Algae, fungi, protozoa, higher plants** and **animals** are eukaryotic.





SCOPE OF MICROBIOLOGY

- **Agricultural Microbiology** - Soil nutrient cycling by microbes, microbial decomposition of organic wastes, plant associated microbes that enhance soil fertility.
- 2. **Food Microbiology -** Involved in food spoilage, food borne diseases, commercial food products prepared using microbes, etc.
- 3. **Industrial Microbiology - I**n the production of antibiotics, enzymes, alcoholic beverages, fermented food products, etc.
- 4. **Medical Microbiology -** Microbes causing diseases, their diagnostic and preventive measures, drug designing, etc.
- 5. **Aquatic Microbiology** - Water purification and biological degradation of wastes in aquatic ecosystems by microbes.
- 6. **Aero Microbiology** -Prevalent in air, their abundance and beneficial or harmful issues.
- 7. **Exomicrobiology** - Exploration of life in outer space.

Contributions by

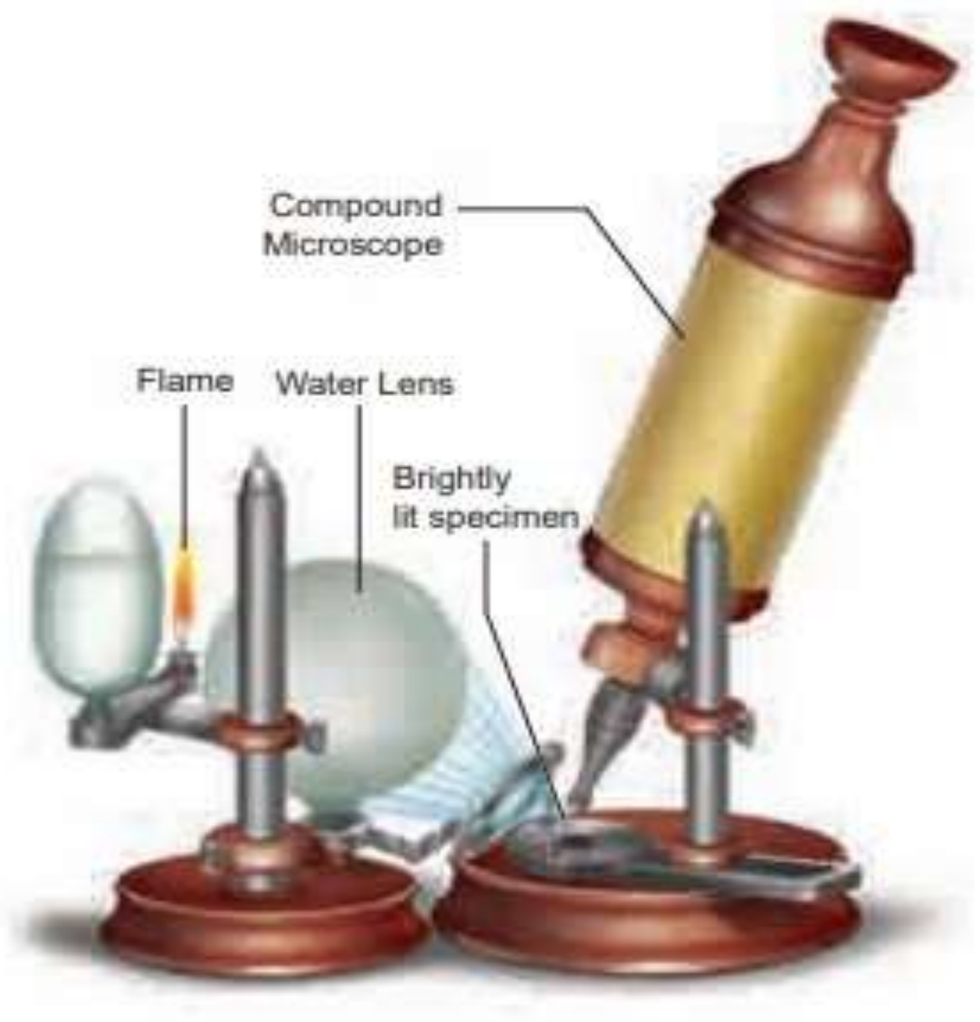
- Robert Hooke
- Antonie Van Leeuwenhoek
- Louis Pasteur
- John Tyndall
- Robert Koch
- Edward Jenner
- Joseph Lister
- Alexander Flemming
- Paul Ehrlich

ROBERT HOOKE (1635 – 1700)

Robert hooke

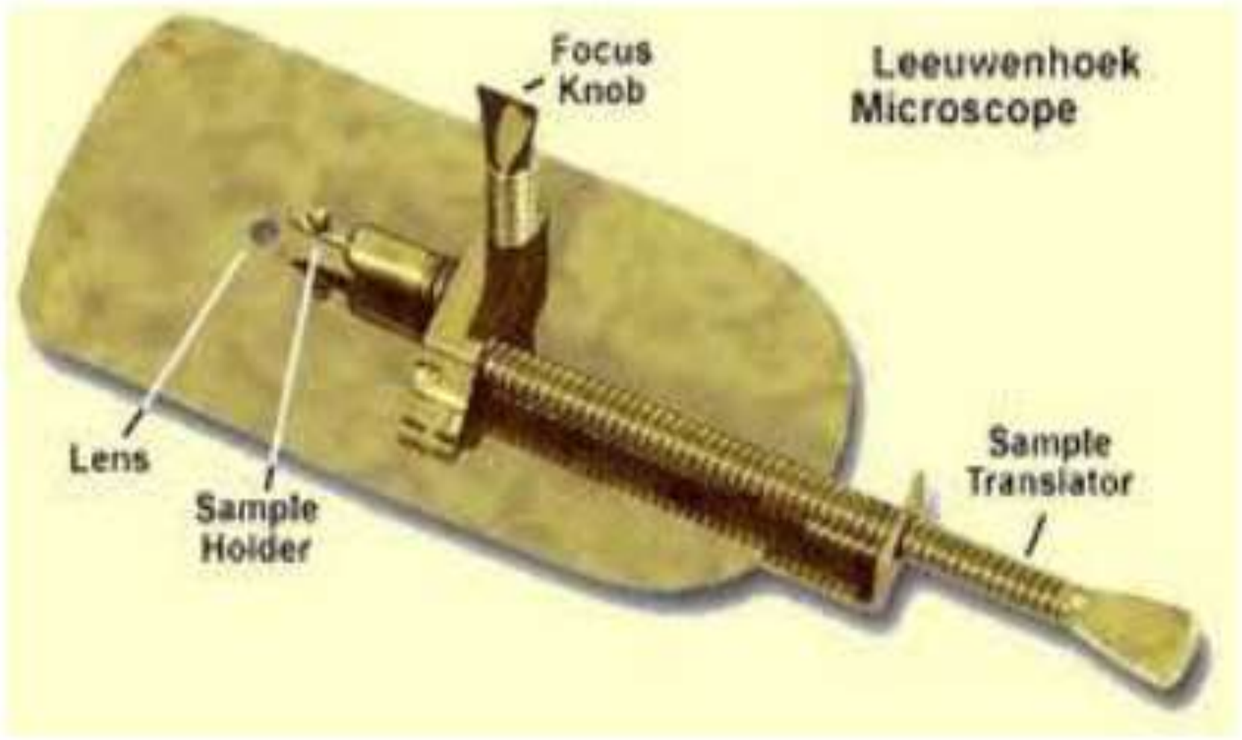
- First person to discover the **cell -** (honey comb like structures) from cross sections of a cork.

- Developed simple microscopes of 30x magnification and observed few microorganisms.



ANTONY VAN LEEUWENHOEK (1632 – 1723)

- Dutch merchant - Praised as the **Father of Microbiology**
- Hobby was making lenses and microscopes.
- His microscopes were simple microscopes
- Composed of double convex glass lenses held between two silver plates that could magnify 50 to 300 times.
- First to describe the protozoa and bacteria.
- Observed some bacteria from plagues of his own teeth and named them as **animalcules**.



Leeuwenhoek and his microscope that was developed first

LOUIS PASTEUR (1822-1895)

- Considered as “Pioneer of Microbiology”

- He **proved** the theory of “**Biogenesis**” and **disproved** the **“Theory of spontaneous generation”**

- He is a founder of **“Germ theory of disease”** as he visualized that diseases are caused by microorganisms.

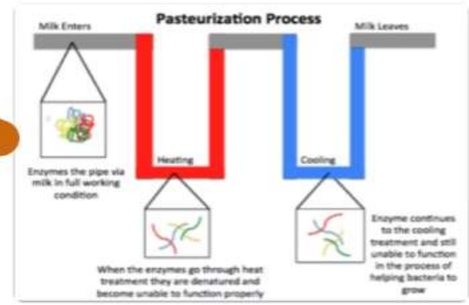
- Developed a **vaccine against rabies** (Hydrophobia)

- Gave the general term “**Vaccine**” (Vacca=cow) in honour of Jenner’s cow pox vaccine.

Louis Pasteur discovered that microbes cause food to decay

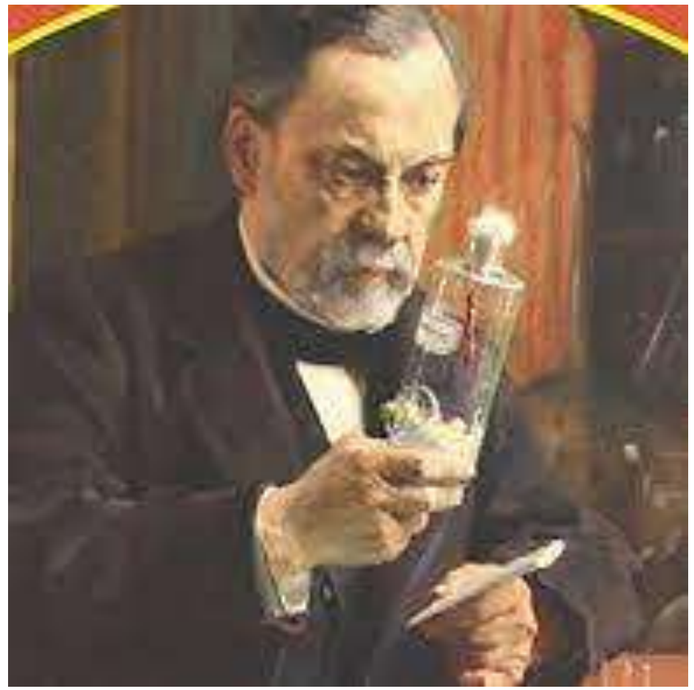
He found this out by conducting experiments on souring alcohol.

Louis Pasteur used his findings and research to invent a technique which is now called “Pasteurization”.



This is a diagram explaining the process.

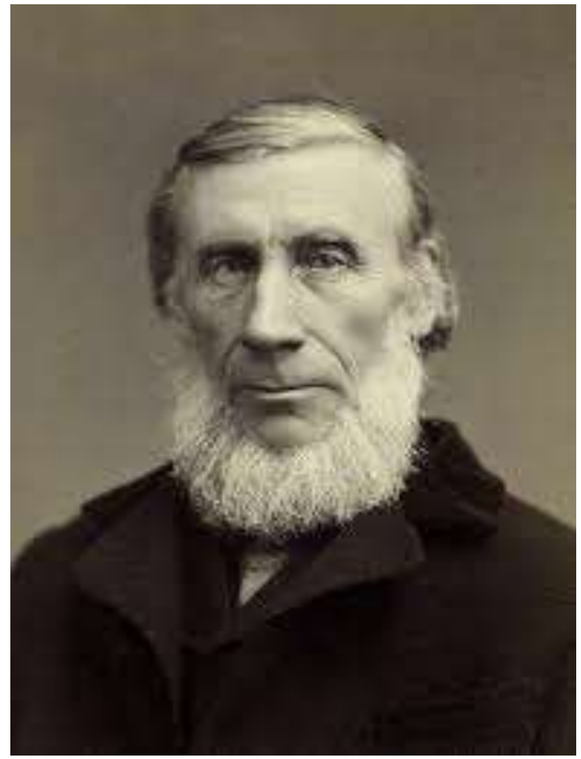
- Discovered the importance of sterilization, steam sterilizer, autoclave and hot air oven.
- Differentiated aerobic and anaerobic bacteria
- Coined the term "**anaerobic**" organisms that do not require oxygen for growth.
- Worked on souring of wine and beer
- Found that this alcohol spoilage is due to the growth of undesirable organisms, while the desirable microorganisms produce alcohol by a chemical process called "**Fermentation**".



- He showed that wine did not spoil, if it is heated to 50-60°C for a few minutes.
- This method is called **"Pasteurization" -** widely used in dairy units, to kill pathogenic microorganisms in milk.

JOHN TYNDALL (1820-1893)

- Designed a special chamber to free the dust in the air and kept the sterile broth in the chamber.
- No microbial growth was observed
- He also developed a sterilization method called **tyndallization -** Otherwise called as the intermittent or fractional sterilization.
- Heating at 100oC kills the vegetative cells.
- The spore forms are killed on subsequent heating upon germination of spores.



ROBERT KOCH (1843-1912)

- Perfected many bacteriological techniques and he known as "**Father of Practical Bacteriology**".
- Introduced staining techniques.
- Discovered tubercle bacillus (*Mycobacterium tuberculosis*), popularly called as **Koch's bacillus**.
- Injected tubercle bacilli into laboratory animals and reproduced the disease, satisfying all Koch's postulates.
- Discovered *Vibrio cholerae*, the causative agent of cholera disease.

Koch's postulates

1. A specific organism should be found constantly in association with the disease.

2. The organism should be isolated and grown in a pure culture in the laboratory.

3. The pure culture when inoculated into a healthy susceptible animal should produce symptoms/ lesions of the same disease.

4. From the inoculated animal, the microorganism should be isolated in pure culture.

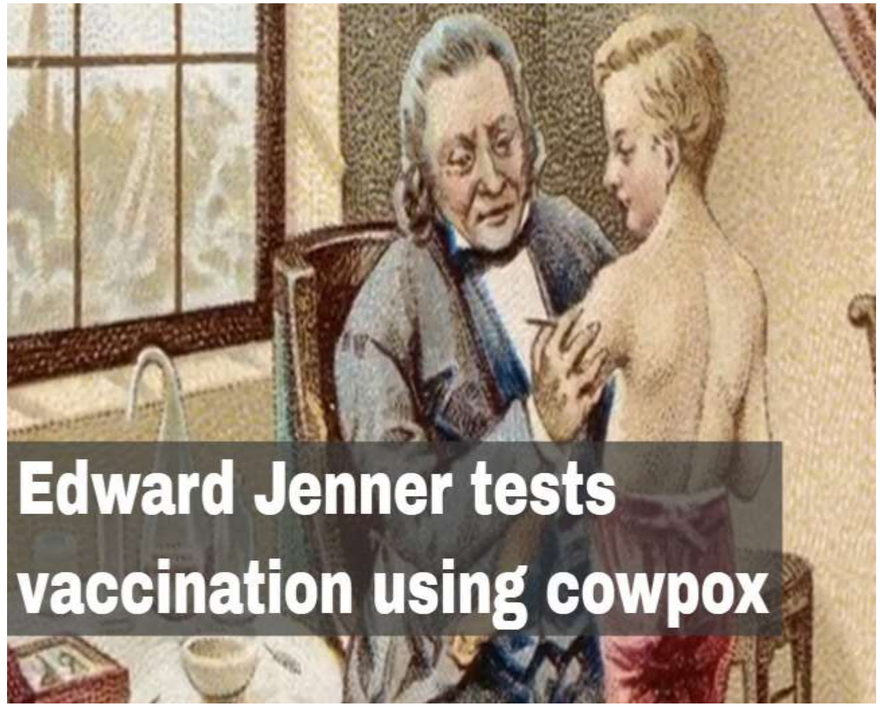
5. An additional criterion introduced is that specific antibodies to the causative organism should be demonstrable in patient's serum.

EDWARD JENNER (1749-1823)

- Discovered a safe and efficient vaccination against small pox which ultimately led to the eradication of small pox (**Variola**).

- Jenner observed that dairy workers, exposed to occupational cowpox infection were immune to small pox.

- He proved experimentally that resistance to small pox can be induced by injecting cow pox material (**Vaccinia**) from disease pustules in to man (in 1796).



JOSEPH LISTER (1827-1912)

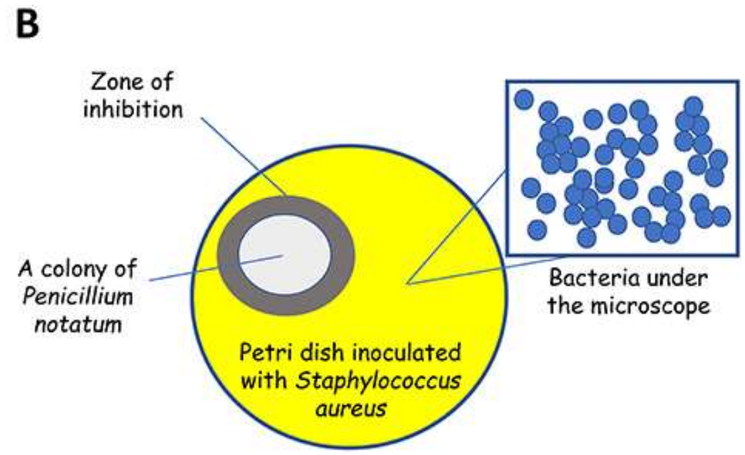
- **“Father of antiseptic surgery”.**

- Interested in the prevention of post-operative sepsis.

- Attracted by Pasteur’s germ theory of disease
- Concluded that sepsis or wound infection may be due to microbial growth, derived from the atmosphere.

ALEXANDER FLEMMING (1881-1955)

- Flemming was associated with two major discoveries - **lysozyme** and **penicillin**.
- In 1929, Flemming made an accidental discovery that the fungus *Penicillium notatum* produces an antibacterial substance which he called penicillin.
- Flemming was culturing Staphylococci in Petridishes - some of his cultures were contaminated with a mold, subsquently identified as *Penicillium notatum*.



PAUL EHRLICH (1854-1915)

- Pioneered the technique of **chemotheraphy** in medicine.

- From his discovery that certain tissues have a specific affinity, he reasoned that organisms causing diseases could be selectively killed with chemical drugs.

- This led him to produce “arsphenamine” (an arsenic compound), the first synthetic drug, which destroyed the syphilis microbe in the body.

Assessment

1. Difference between Prokaryotic and Eukaryotic cells?

2. Who is called as Father of Microbiology?

3. Who is a founder of “Germ theory of disease”?

4. Who is the “Father of antiseptic surgery”?

5. Who discovered Penicillin?

THANK YOU