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REALISING OPPORTUNITIES
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MASTERING ACADEMIC NOTE-TAKING: BRIDGING FROM SIXTH FORM TO INDEPENDENT LEARNING

RO Mop-up Event

Wednesday 22nd October 2025

Saba Alhagagi, PhD Student and Reflective Tutor

Today’s objectives

1. Understand how university learning differs from sixth form
2. Note-taking as a bridge between taught content and your own learning
3. How to get the most out of academic content
4. Condensing and structuring notes effectively
5. Improving and organising notes
6. Practising live note-taking!

Tell me about you:

- Name
- Where you're coming from
- What subject you're interested in and why

… in one sentence!

Examples:

"Hi, I'm Kateryna, I'm from London, and I want to study neuroscience better understand the human brain."

How is learning different at university?

Sixth Form
Guided
Regular homework and assignments
Recap and revision in class
Assessments testing recall
One or two sources/textbooks
Teachers lead your learning

How is learning different at university?

Sixth Form	University
Guided	Independent
Regular homework and assignments	Less frequent assessments, self—driven research
Recap and revision in class	Self-led recap
Assessments testing recall	Assessments testing understanding
One or two sources/textbooks	The world is your oyster for seeking information!
Teachers lead your learning	**You lead your learning**

Learning at University

Teaching

Overview of the topic

Essential information

Key theories and ideas

Reading/independent learning

Deepen your understanding

Clarify anything you didn't understand

Go beyond the lecture

Explore your own interests

Assessment

Demonstrate your learning

Show that you understand your subject

Show you have engaged with your subject

Notes are the foundation for your learning journey at university. They **bridge** between lectures and independent learning, helping you to **understand** and **remember** key concepts, and they come in very handy for revision and assignments!

How do you take notes?

What to note in a lecture/academic text: key information

Less recall, more understanding

Lecture cues: what to watch and listen out for

- "This will be on the exam…"
- "For example…"
- "You might want to read…"
- Slide changes, lecturer gestures/emphasis
- Repetition = importance
- Summaries/Conclusions = testable themes

Lecture/research paper

"Cell division is a basic requirement for bacterial life and a major antibiotic target. At a molecular level, division is a remarkable feat of engineering by the bacterial cell: a set of nanoscale proteins must cooperate over large distances to build a micron-scale cross-wall (septum) across the middle of the cell against heavy outward pressure. Many of the proteins involved are highly conserved across the bacterial domain, including the septal peptidoglycan (sPG) synthases that insert new cell wall material into the ingrowing septum and the cytoskeletal tubulin homologue FtsZ (Megrian et al, 2022). FtsZ forms short filaments that move around the division septum by treadmilling (Bisson-Filho, 2017; Yang et al, 2017; Monteiro et al, 2018; Perez et al, 2019)—a type of motion where monomers bind one end of a filament at the same rate they unbind the opposite end, causing the filament to move forward even though monomers remain stationary."

Taken from Whitley et al, Nature Microbiology (2024)

Notes

Bacterial cell division

Conserved process, proteins build a cross-wall in the cell. Examples of proteins involved: Peptidoglycan synthases and FtsZ.

What is FtsZ/ how does it work?

- Cytoskeletal filaments that "treadmill" around the division site (tubulin homologue?)
- Treadmilling = binding at one end and unbinding at other end (difficult concept- visualise later)
- See (Bisson-Filho, 2017; Yang et al, 2017; Monteiro et al, 2018; Perez et al, 2019) for more details

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Which proteins? How are FtsZ and peptidoglycan synthases related?

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I will use these papers to fill gaps in my knowledge…

Post-lecture notes (after wider reading)

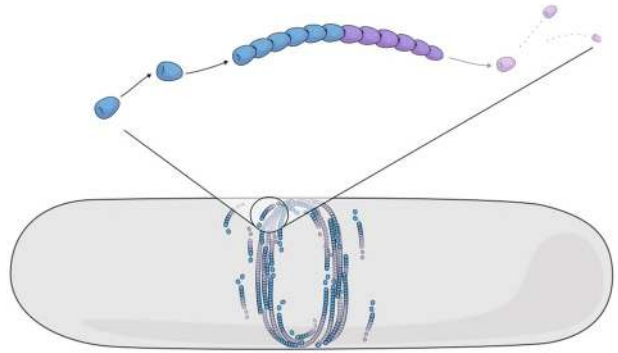
Bacterial cell division

A conserved process important for microbial life, where a group of proteins, called the **divisome core complex**, build a cross-wall (**peptidoglycan**) at the **septum** (division site in the middle of the cell).

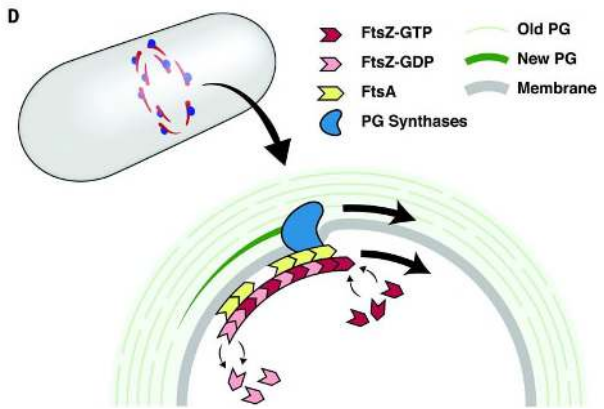
To enable cell division, a protein called **FtsZ**, forms protein filaments and polymerises with itself to form a “Z-ring” structure (see work by Garner, Holden, Pinho). This is like tubulin and other cytoskeletal filaments in eukaryotic organisms. The Z-ring serves as a scaffold to recruit the divisome core complex. At the heart of the complex are peptidoglycan synthases- these are two conserved enzymes:

- transmembrane glycosyltransferases that synthesise glycan strands from a Lipid II molecule
- class B penicillin-binding proteins (bPBPs), which crosslink the glycan strands into existing peptidoglycan

Cell division is like bricklayering on a moving scaffold.



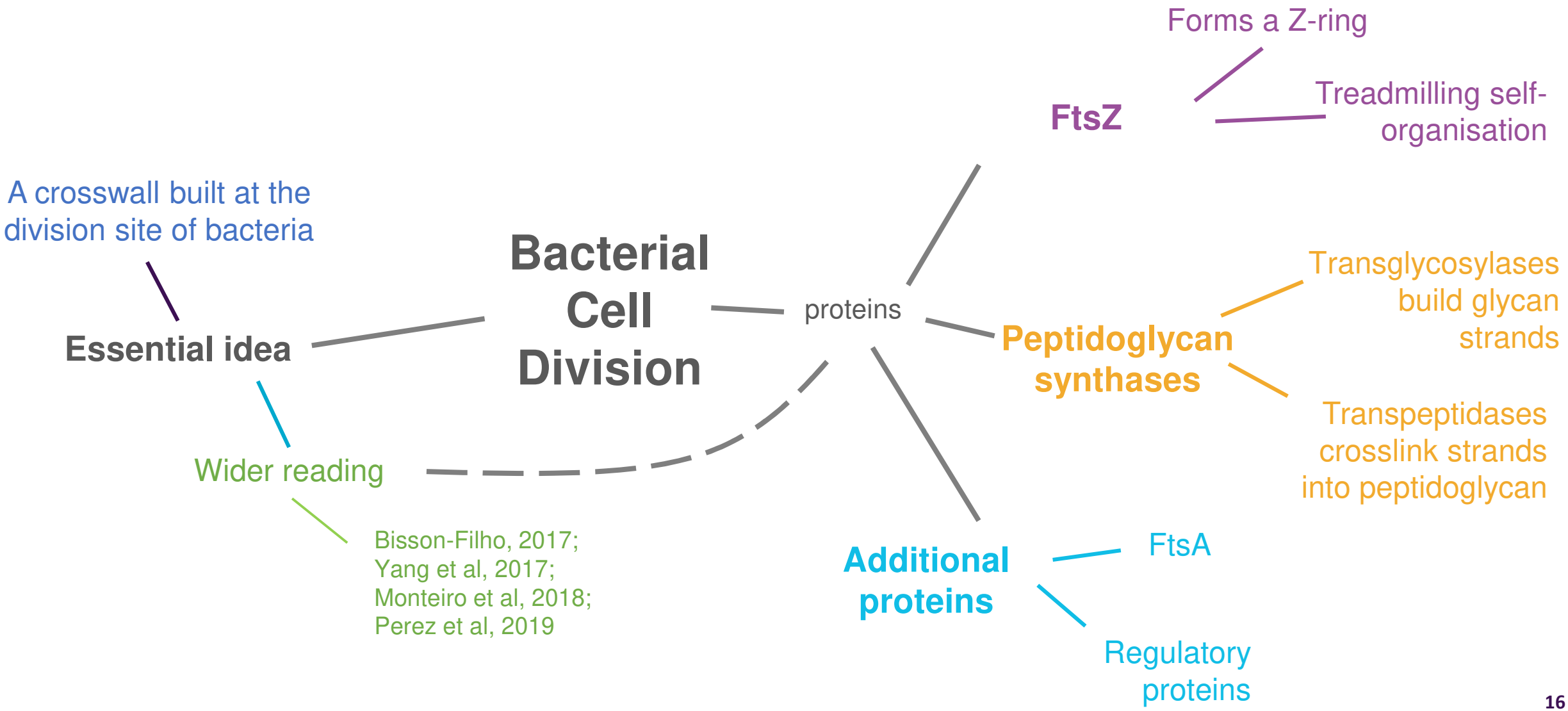
Treadmilling illustration by Claudia Flandoli. Protein subunits are constantly added and removed from each end respectively. This makes it appear as if they are moving, but most subunits are stationary (Vanhille-Campos et al, 2024).



A model of treadmilling-based cell division (Figure 4D, Bisson-Filho et al, 2017). The Z-ring contains both FtsZ and FtsA that drag the peptidoglycan synthases with them.

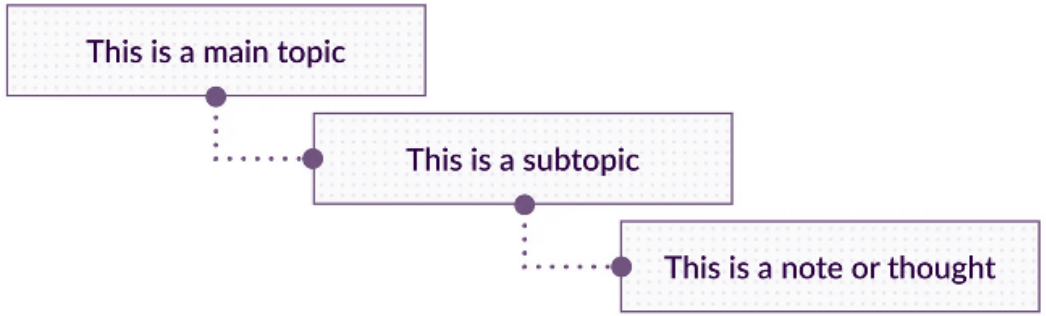
How else can you take notes?

How else can you take notes? Mind maps

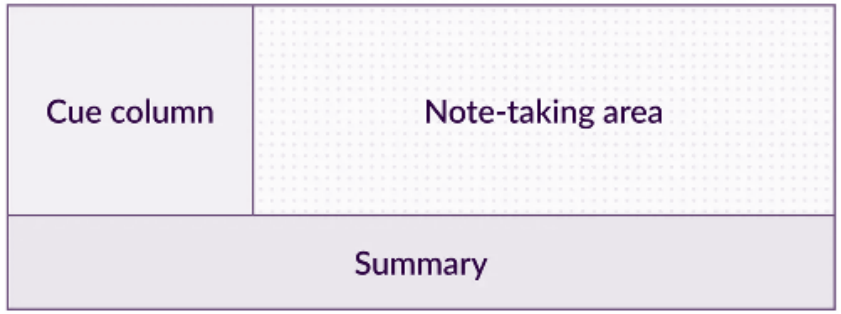


How else can you take notes?

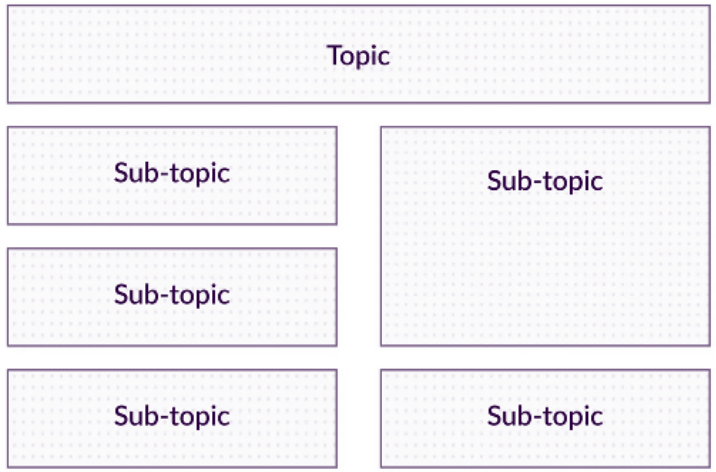
The outline method



The Cornell method

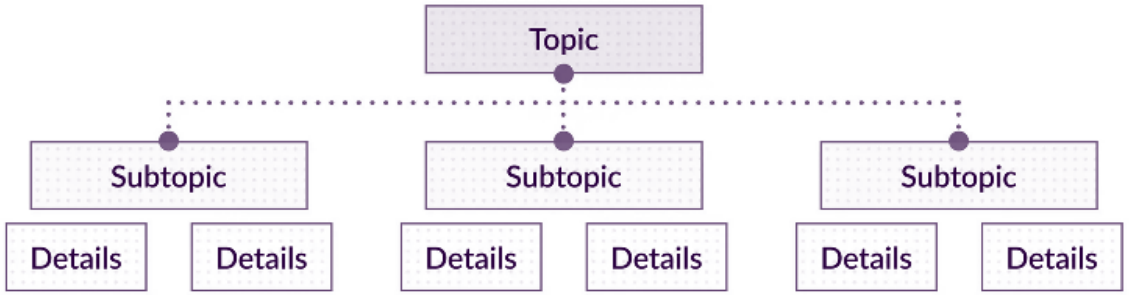


The boxing method



How else can you take notes?

The mapping method



The sentence method

Main topic

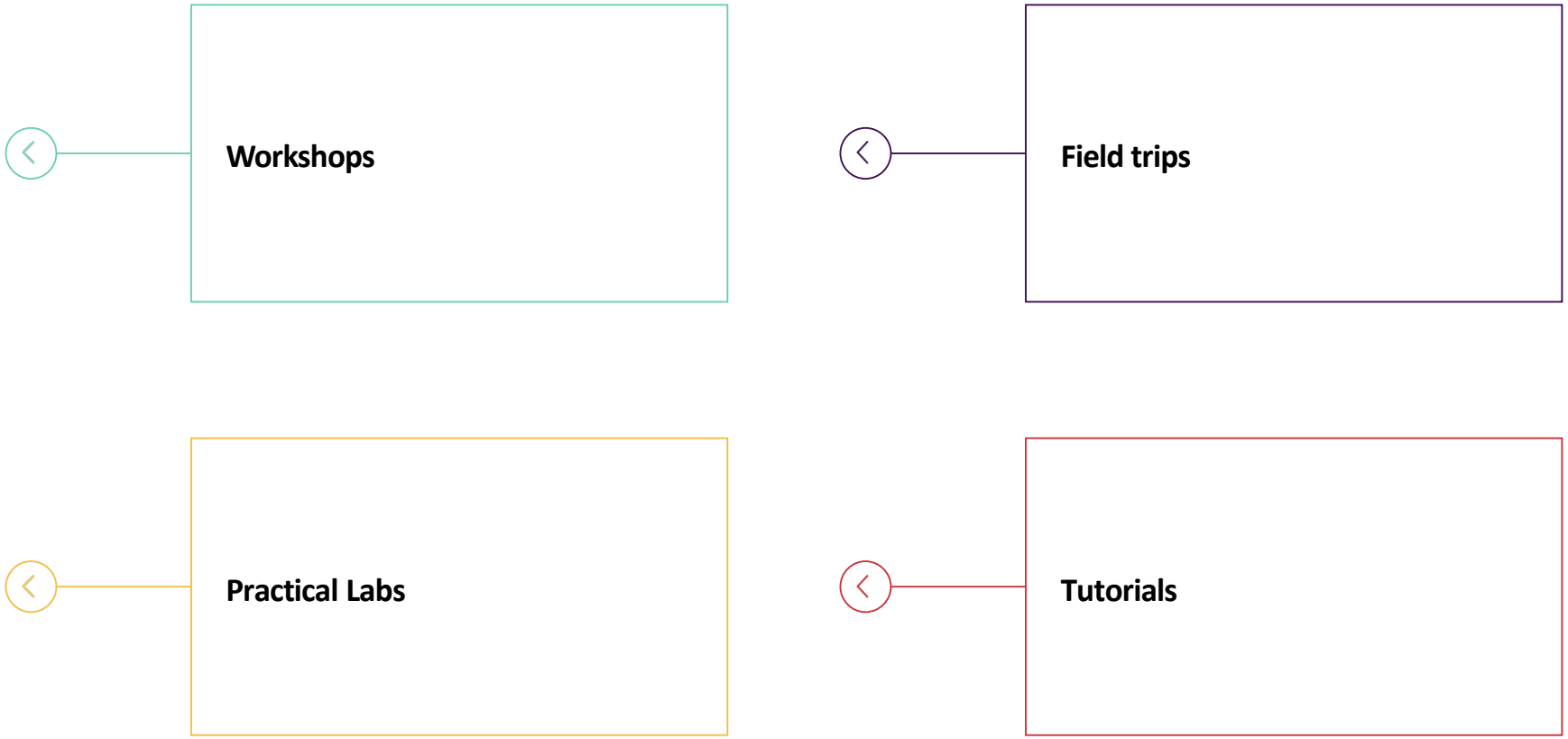
1. Sentence #1 about the topic

2. Sentence #2 about the topic

The charting method

Method	Description	Pros	Cons
Topic 1			
Topic 2			
Topic 3			

When else might you take notes?



Task 1

Read the text and figure out how you would take notes.

1. What note taking method would you use?
2. What information is important here?
3. What questions does this piece of text answer?

Take some notes – we'll share ideas in a few minutes!

THE HISTORY OF ANTIBIOTICS

MICROBIOLOGY SOCIETY

Antibiotics have been used for millennia to treat infections, although until the last century or so people did not know the infections were caused by bacteria. Various moulds and plant extracts were used to treat infections by some of the earliest civilisations – the ancient Egyptians, for example, applied mouldy bread to infected wounds. Nevertheless, until the 20th century, infections that we now consider straightforward to treat – such as pneumonia and diarrhoea – that are often caused by bacteria, were the number one cause of human death in the developed world.

It wasn't until the late 19th century that scientists began to observe antibacterial chemicals in action. Paul Ehrlich, a German physician, noted that certain chemical dyes coloured some bacterial cells but not others. He concluded that, according to this principle, it must be possible to create substances that can kill certain bacteria selectively without harming other cells. In 1909, he discovered that a chemical called arsphenamine was an effective treatment for syphilis. Ehrlich himself referred to his discovery as 'chemotherapy' – the use of a chemical to treat a disease.

The word 'antibiotics' was first used over 30 years later by the Ukrainian-American inventor and microbiologist Selman Waksman, who in his lifetime discovered over 20 antibiotics.

Alexander Fleming was, it seems, a bit disorderly in his work and accidentally discovered penicillin. Upon returning from a holiday in Suffolk in 1928, he noticed that a fungus, *Penicillium notatum*, had contaminated a culture plate of *Staphylococcus* bacteria he had accidentally left uncovered. The fungus had created bacteria-free zones wherever it grew on the plate. Fleming isolated and grew the mould in pure culture. He found that a soluble substance produced by *P. notatum* proved extremely effective even at very low concentrations, preventing *Staphylococcus* growth even when diluted 800 times, and was less toxic than the disinfectants used at the time. He purified the active agent and called it "penicillin".

After early trials in treating human wounds, collaborations with British pharmaceutical companies ensured that the mass production of penicillin was possible.

Following a fire in Boston, Massachusetts, USA, in which nearly 500 people died, many survivors received skin grafts which are liable to infection by *Staphylococcus*. Treatment with penicillin was hugely successful, and the US government began supporting the mass production of the drug.

By D-Day in 1944, penicillin was being widely used to treat troops for infections both in the field and in hospitals throughout Europe. By the end of World War II, penicillin was nicknamed 'the wonder drug' and had saved many lives.

Task 2

Practice live note-taking!

I’m going to give you a very short talk about my subject area…

You must decide what’s important to note down- writing down everything isn’t helpful and will leave you behind the lecturer.

It’s okay to not understand everything the first time around- that’s the whole point of taking notes!

This will give you an idea of the pace of lectures and prepare you for your academic talk later….

How do you build a wall? Understanding the mechanistic principles governing bacterial peptidoglycan synthesis

Saba Alhagagi, MBio
Holden and Stansfeld Labs
School of Life Sciences, University of Warwick

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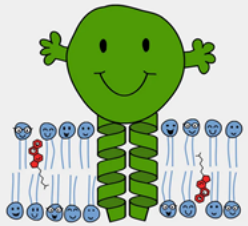
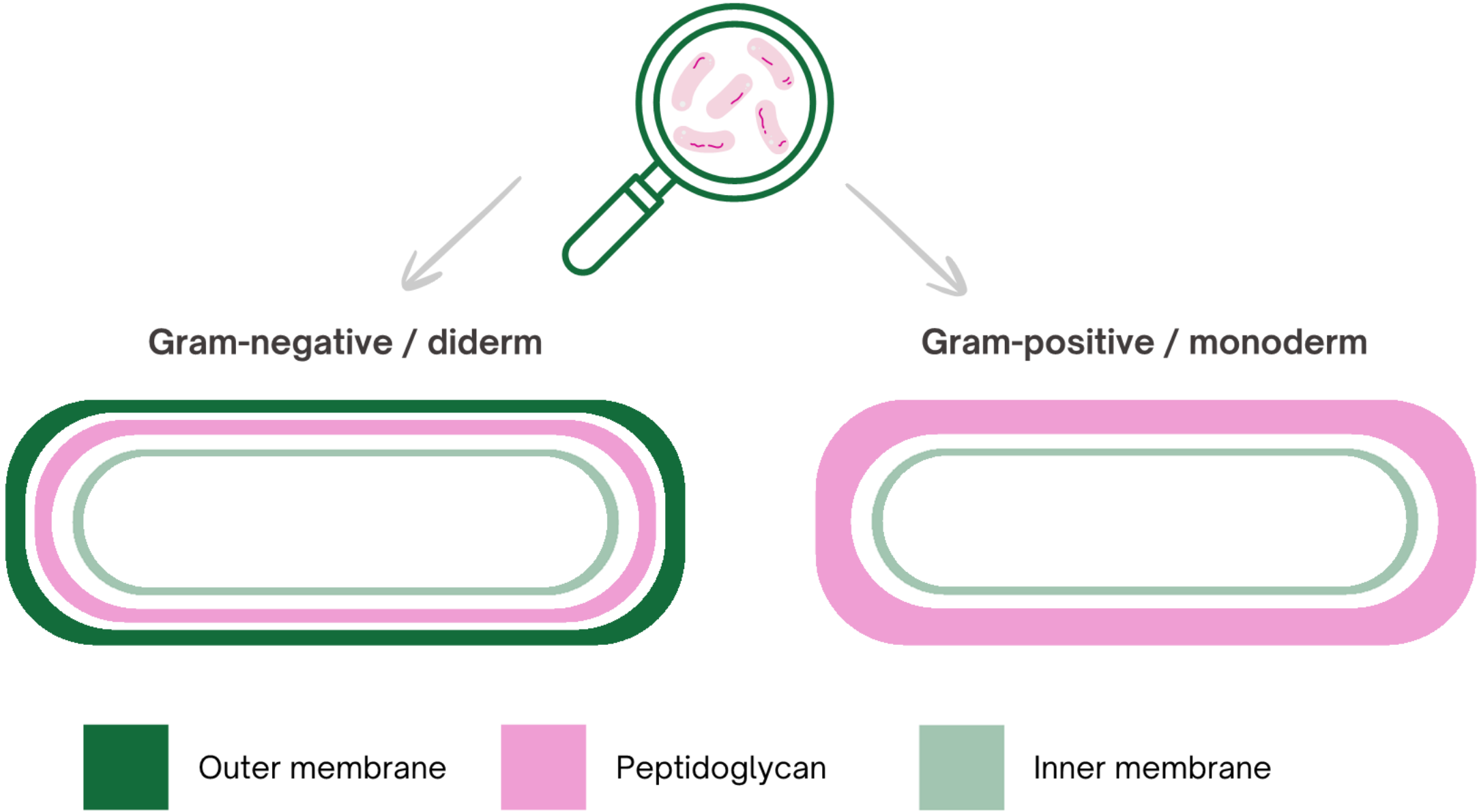


Midlands Integrative Biosciences Training Partnership

Biotechnology and Biological Sciences Research Council

Cell Wall architecture: the essence of bacterial classification



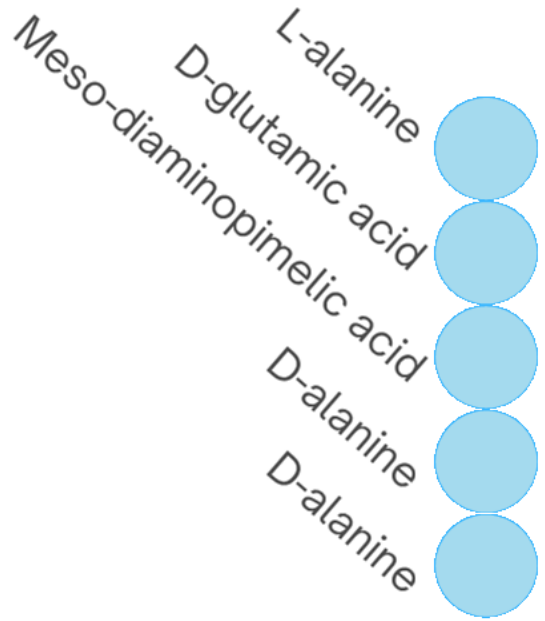
Key structural features of peptidoglycan

1) Repeating units of weird sugars!

N-acetylglucosamine

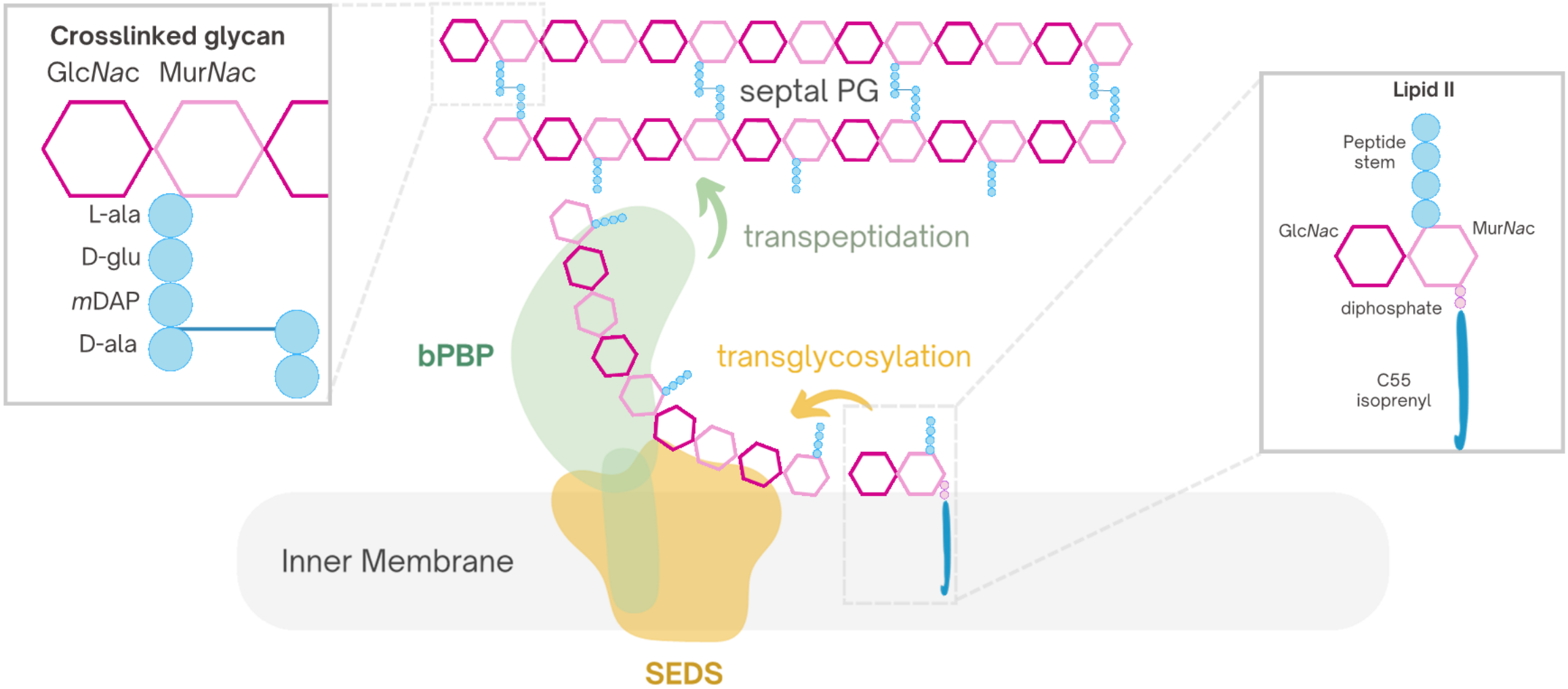
N-acetylmuramic acid

2) 2-5 random amino acids of varying chirality decorating Mur*Nac*...



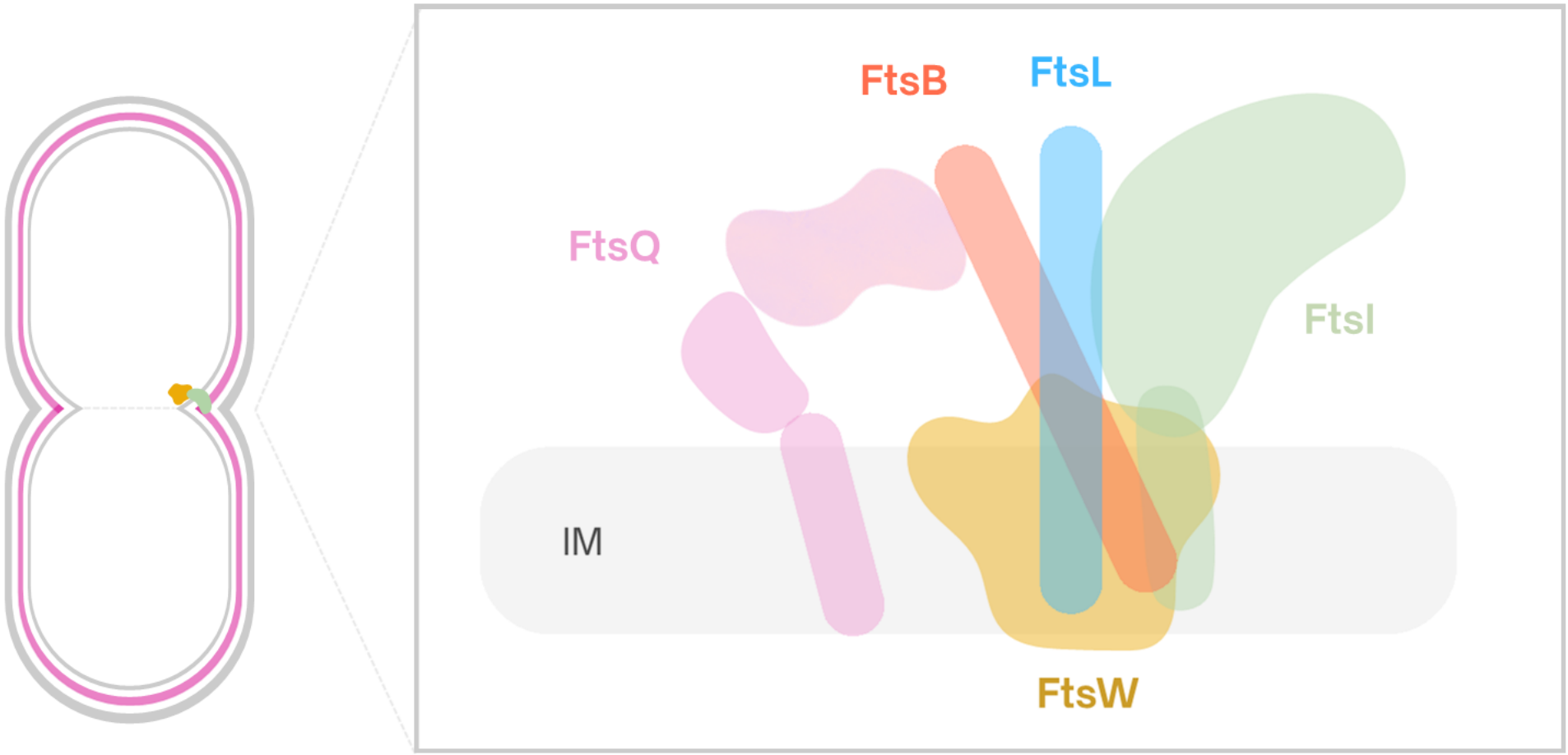
3) Peptide neighbours crosslink and form a tight-knit community!

How do you build a wall? SEDS-bPBPs drive PG synthesis



Adapted from Käshammer et al, *Nat Micro* (2023)

The divisome facilitates PG synthesis at the septum

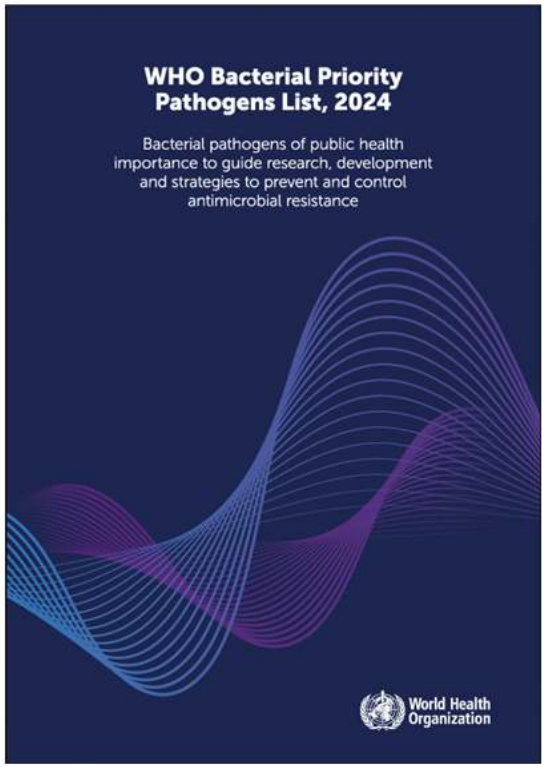


Pseudomonas aeruginosa divisome core complex

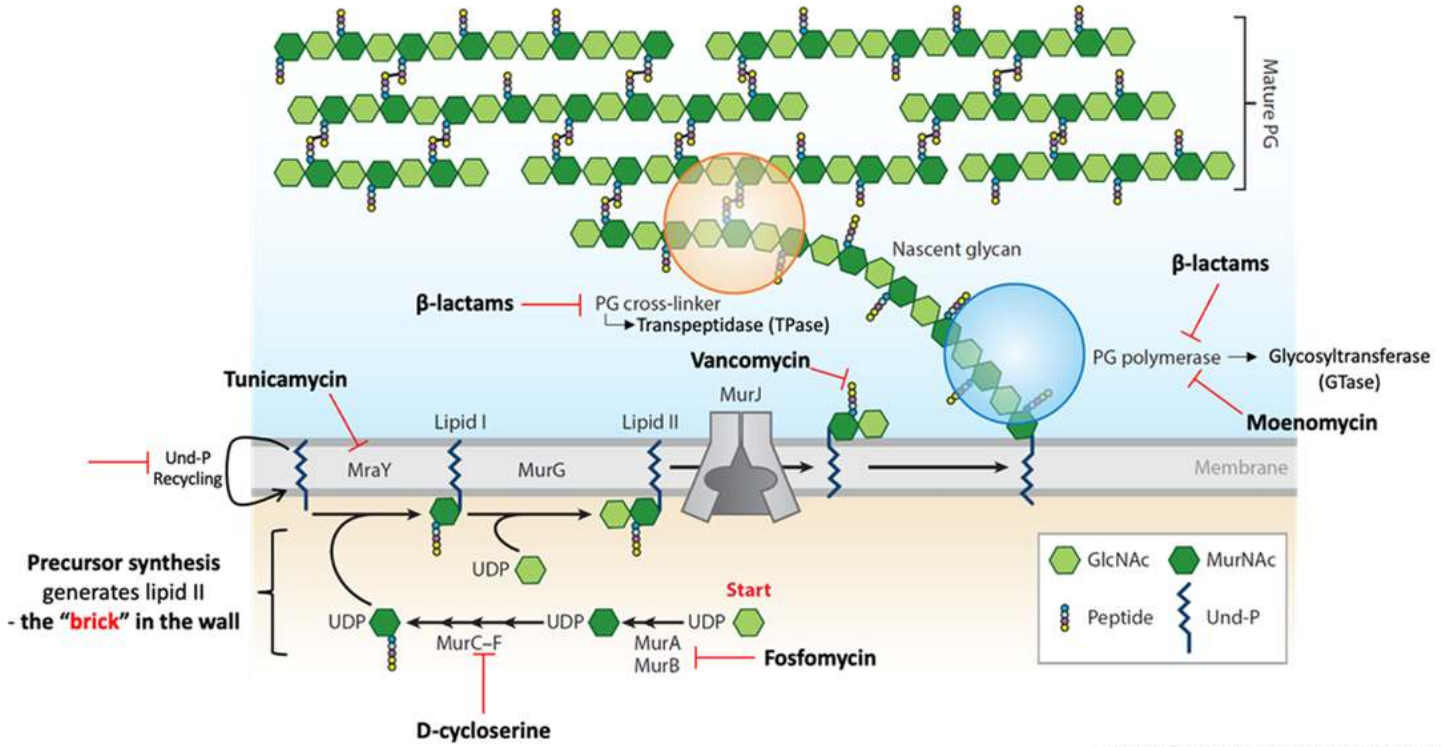
Adapted from Käshammer et al, *Nat Micro* (2023)

Why is this an important area of research?

Gram-negative pathogens like Pseudomonas aeruginosa have high levels of antimicrobial resistance to many first-line antibiotics; this contributes to significant mortality worldwide. We need new classes of drugs! The divisome is a promising target for next-generation antimicrobials and remains unexplored because we don't understand it well enough!



Pseudomonas aeruginosa is on the WHO priority list!

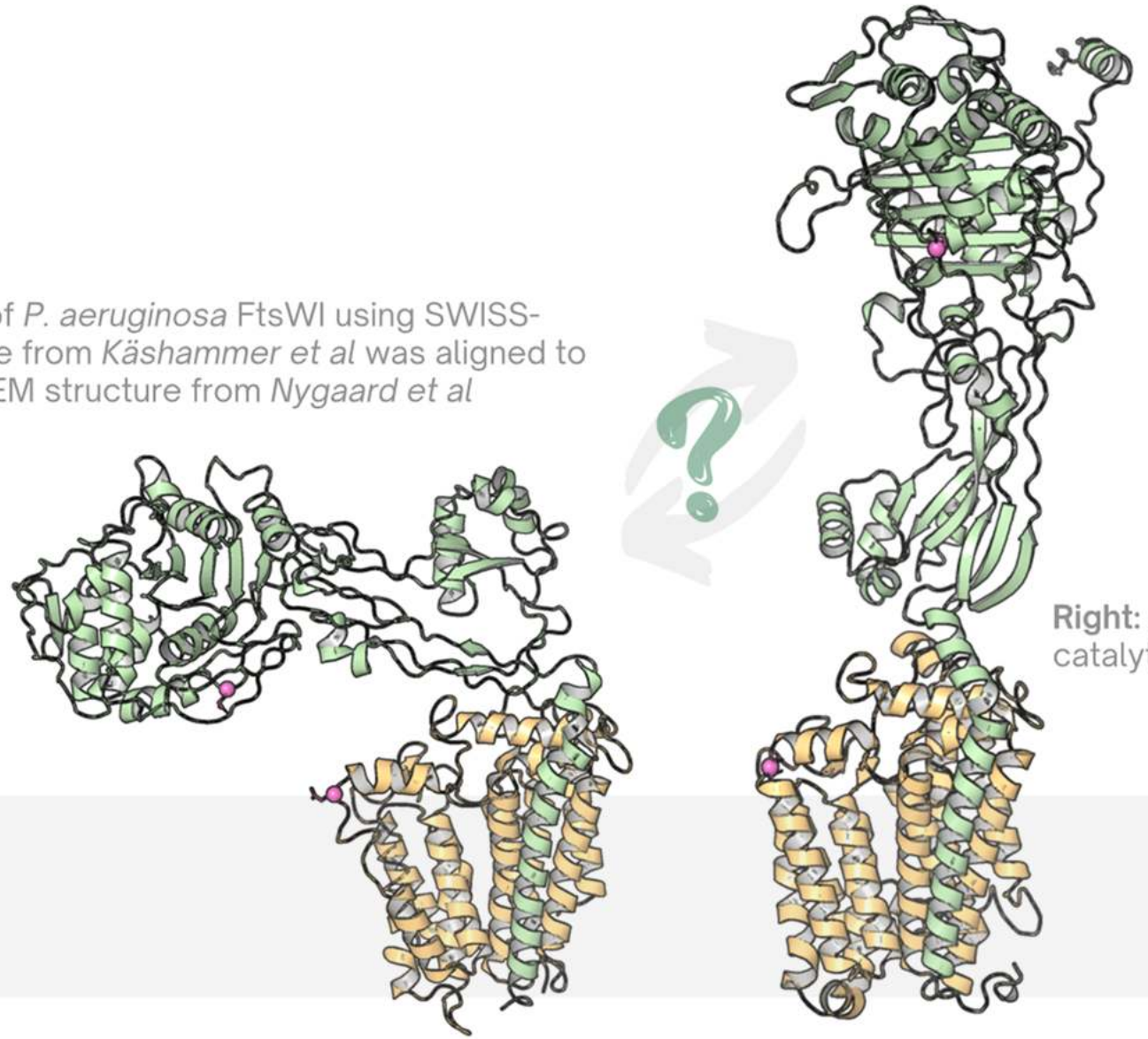


Adapted from: Rohs & Bernhardt (2021), *Annu Rev Microbiol.*

Bacteria have resistance mechanisms against many compounds that already target different stages of cell wall synthesis.

We know FtsWI builds the wall... but how does it work?

Left: Homology modelling of *P. aeruginosa* FtsWI using SWISS-MODEL. A cryo-EM structure from *Käshammer et al* was aligned to an *E. coli* RodA-PBP2 cryo-EM structure from *Nygaard et al*



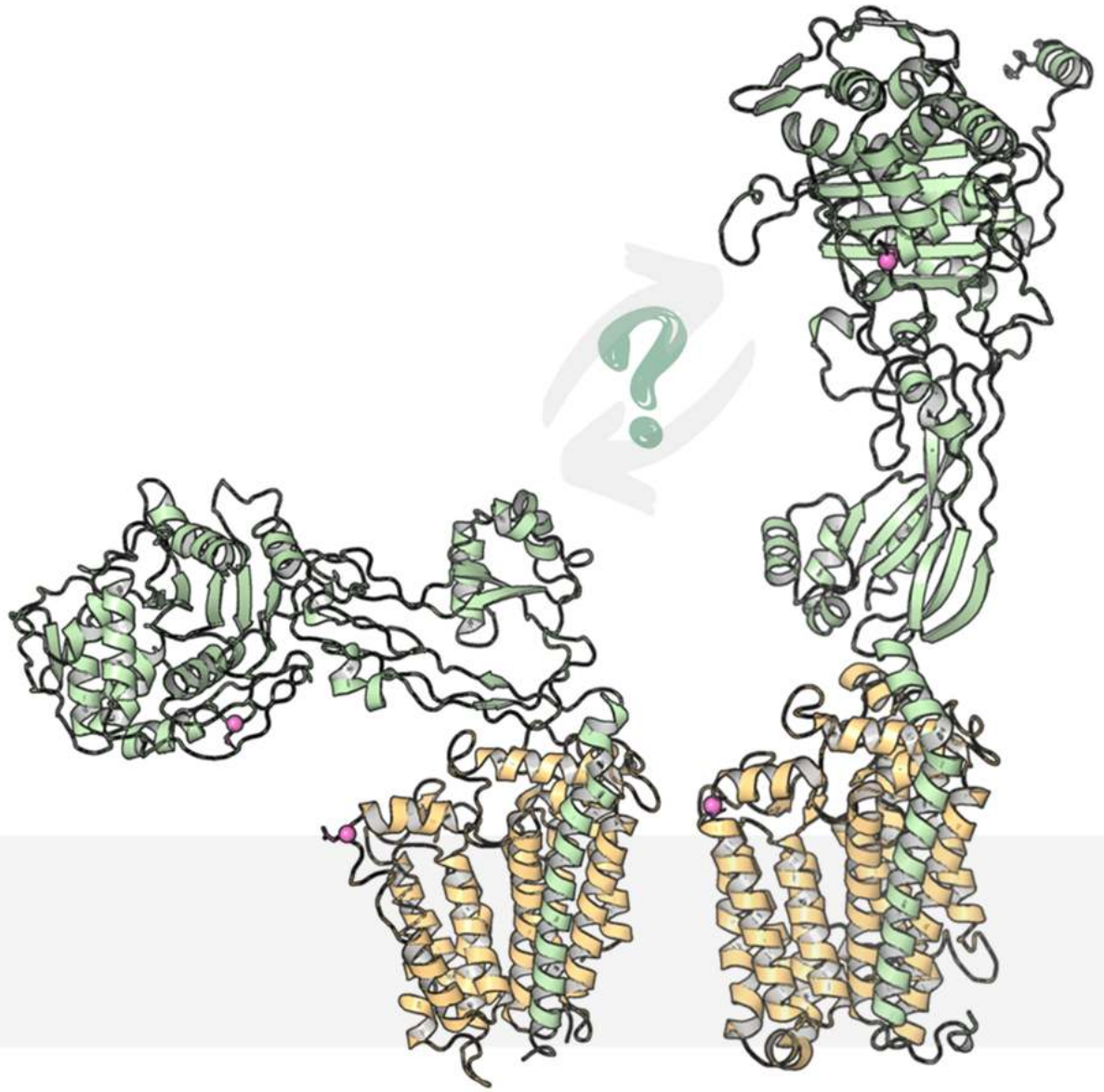
Right: Alphafold 3 prediction of FtsWI in a more catalytically competent state, rotated upwards, presumably enabling PG crosslinking

IM

My PhD: understanding conformational dynamics of FtsWI

Core Aim:
What are the mechanistic principles that govern the activation and stability of SEDS-bPBP synthases involved in bacterial cell division?

Effectively, can we learn more about what molecular interactions and movements give FtsWI the license to build cell wall material?



Remember…

Listen actively

Be selective

Paraphrase

Review notes

Sources/references for wider reading

Can you name 4 of the notetaking methods we covered today?

THANK YOU!
QUESTIONS?

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