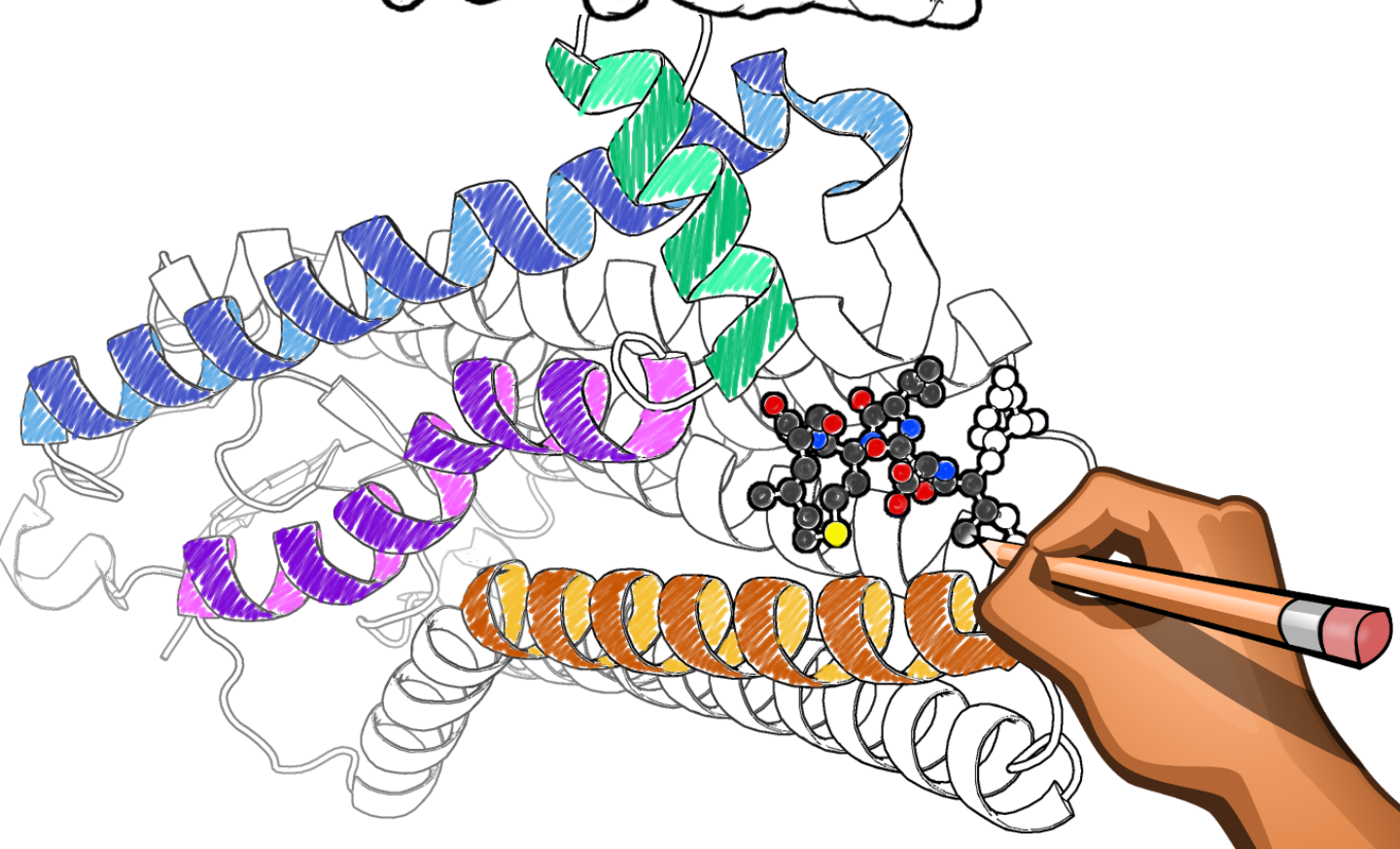
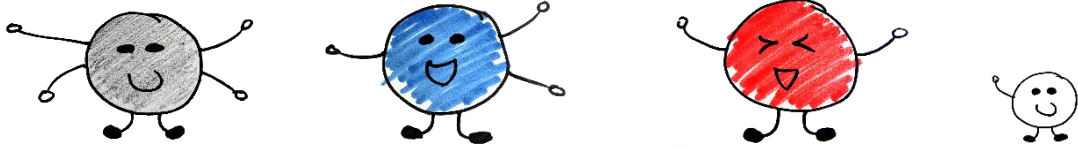


# My book of protein colouring



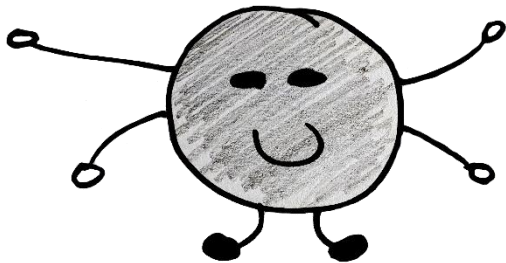
Name: .....

# Meet the atoms!



Atoms are friendly and like to hold hands with each other!

## Carbon



Holds hands with  
4 other atoms

## Nitrogen



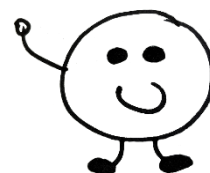
Holds hands with  
3 other atoms

## Oxygen



Holds hands with  
2 other atoms

## Hydrogen

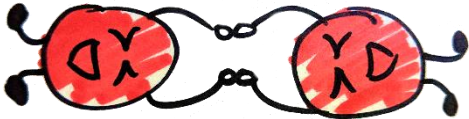


Holds hands with  
1 other atom

# Making molecules

When atoms hold hands, they make things called molecules

Oxygen gas



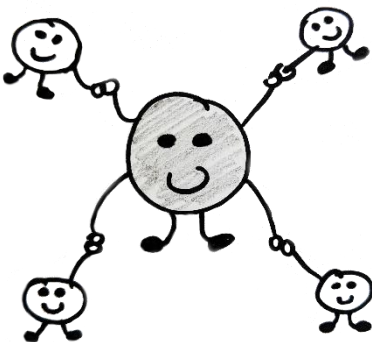
You need to breathe this to survive

Nitrogen gas



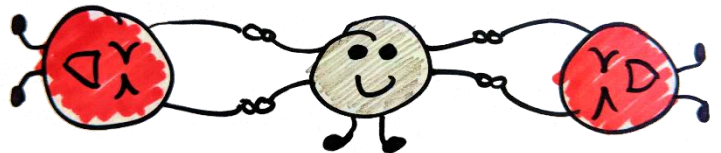
This is the main thing in air

Methane



We burn this to make **HEAT!**

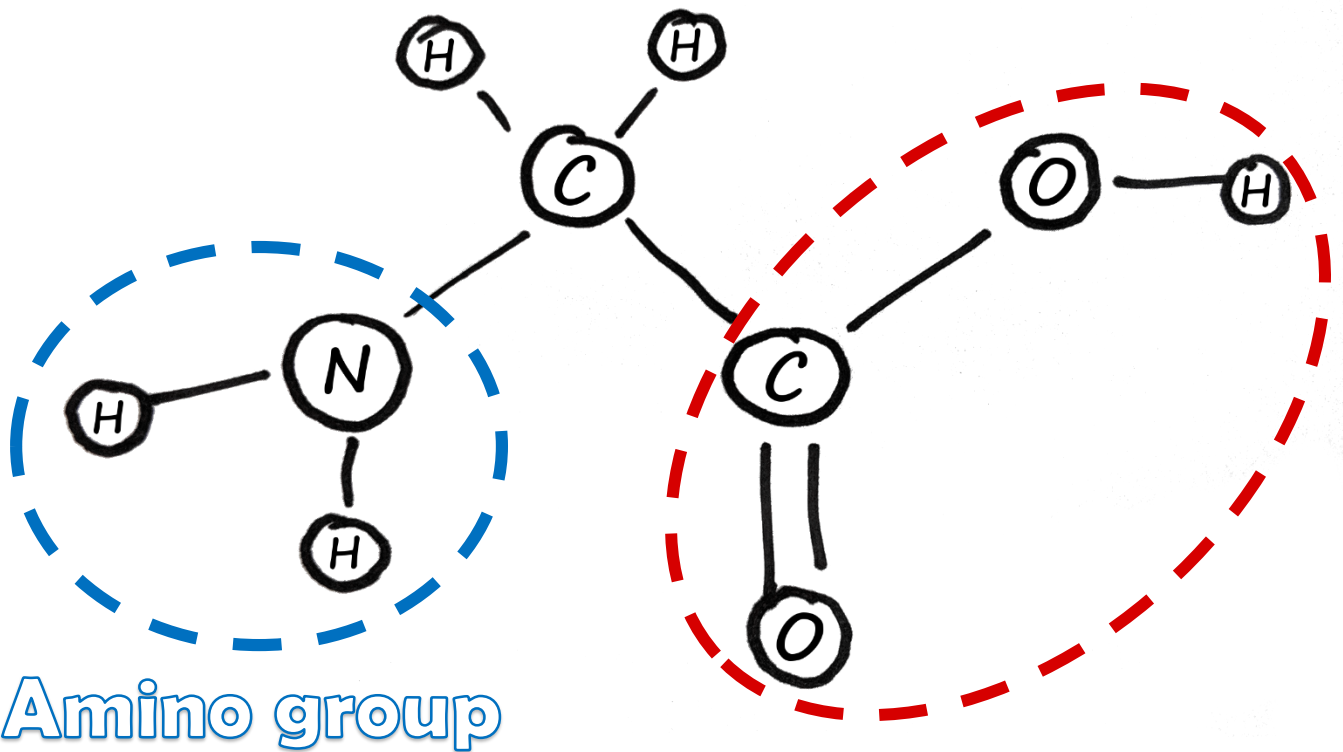
Carbon Dioxide



Plants 'breathe' this in and we breathe it out

# Amino acids

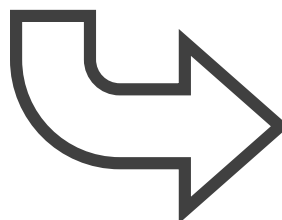
When atoms join up into molecules like this, they are called amino acids



Amino group

Acid group

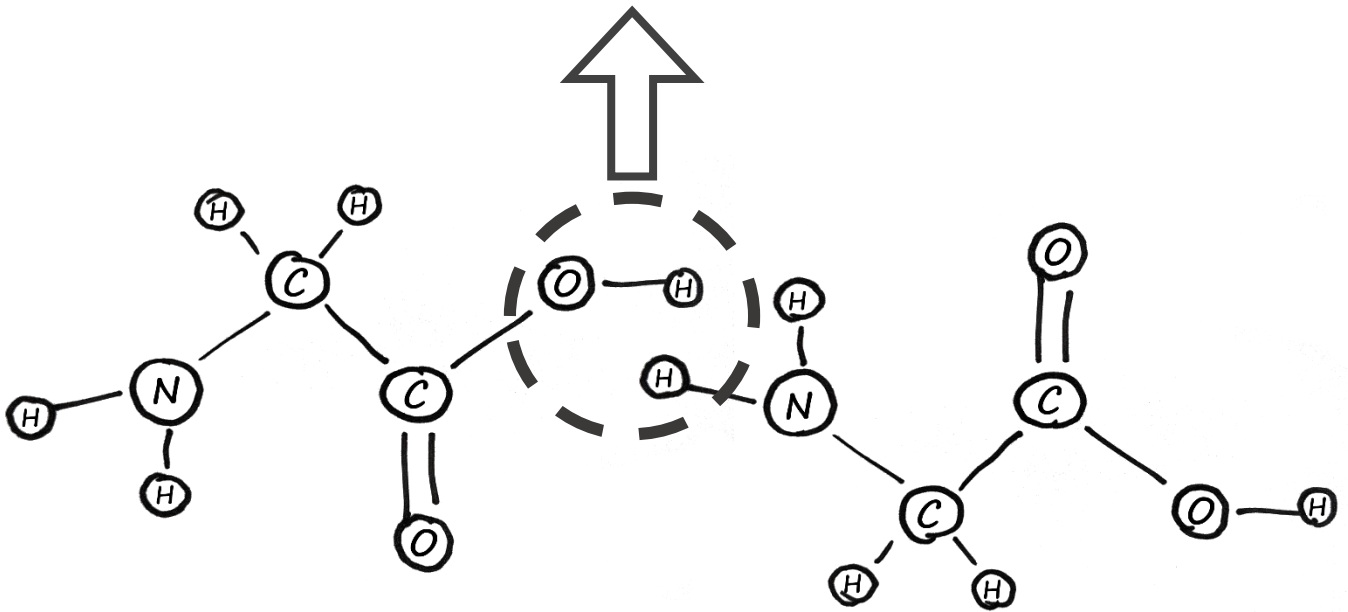
Can you colour the atoms in so that they match these colours?



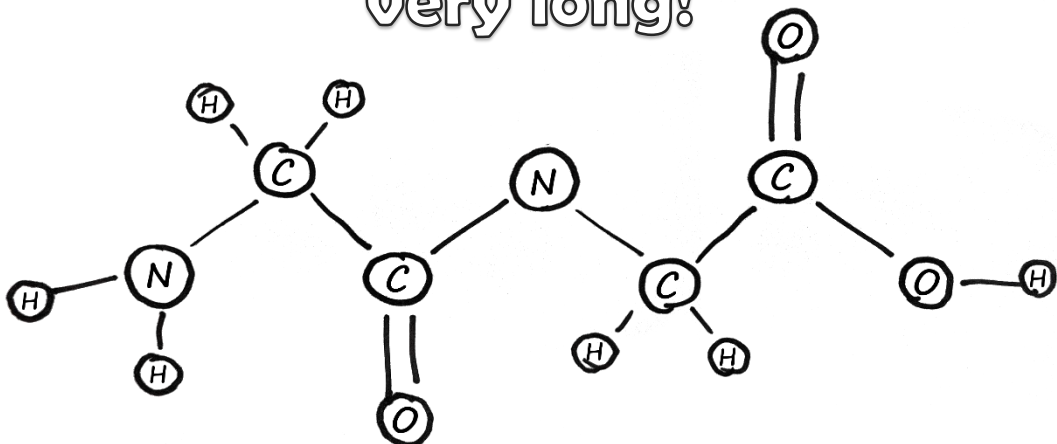
- C = ●
- O = ●
- N = ●
- H = ○

# Making peptides

Amino acids can also join up together by their amino groups 'reacting' with their acid groups

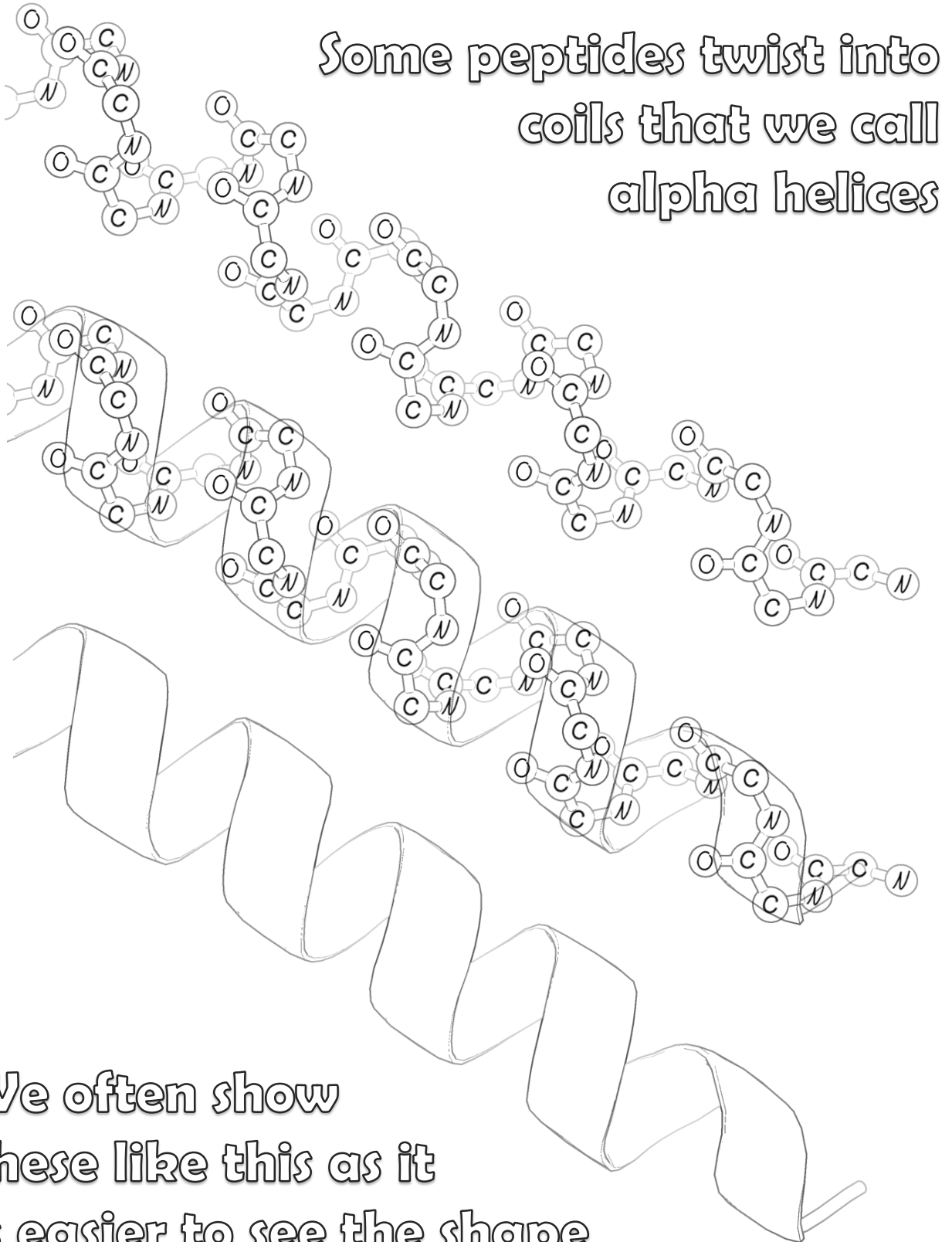


Lots of amino acids joined up together make up a peptide - which can be very long!



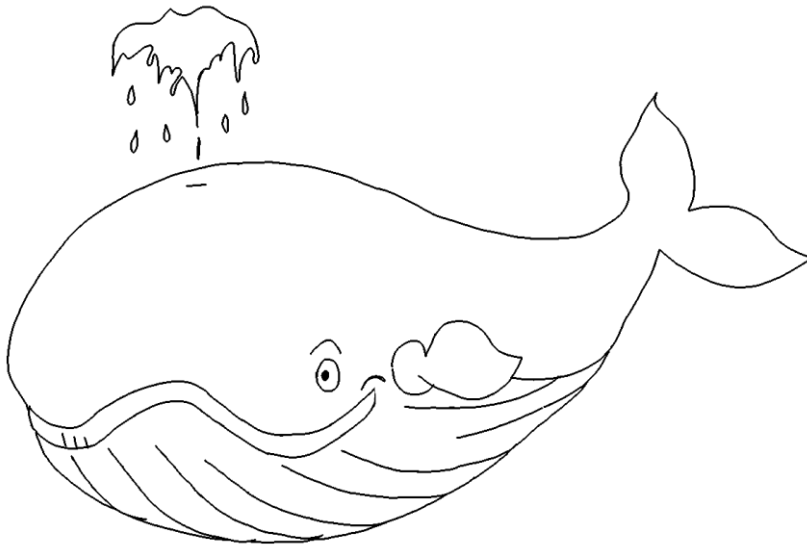


# Alpha helices



# Helices - Myoglobin

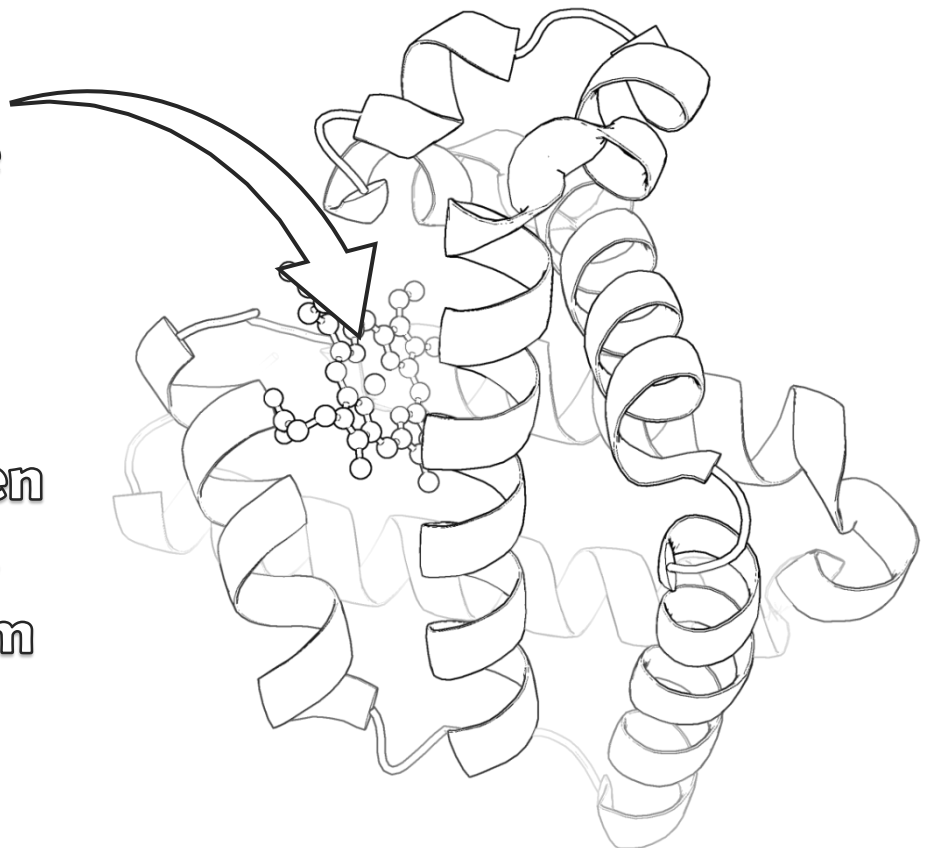
Myoglobin is a protein that is made up of just alpha helices



It helps whales stay under water for longer

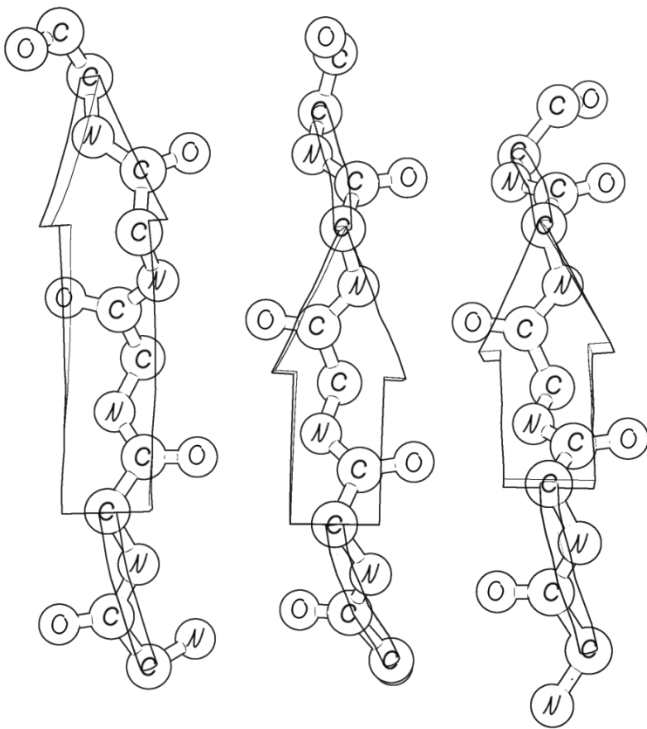
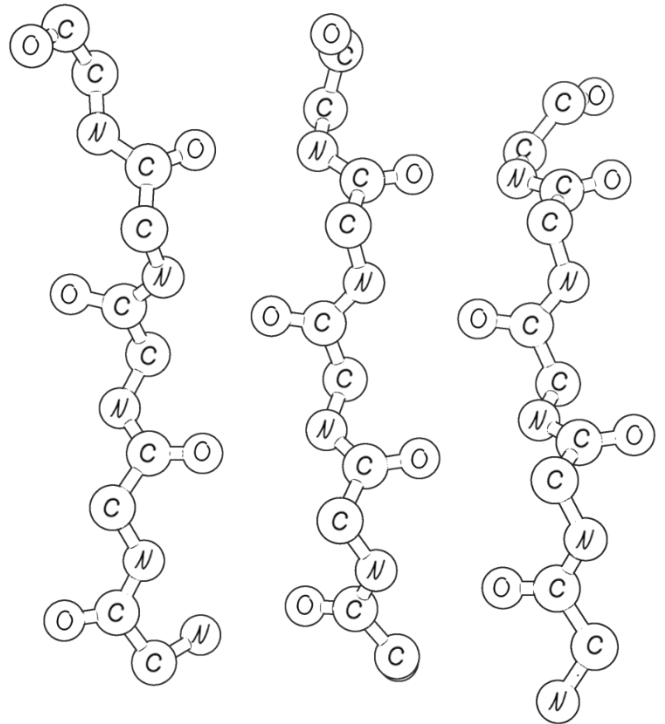
Oxygen is held in here

Myoglobin brings oxygen to muscles, helping them work hard



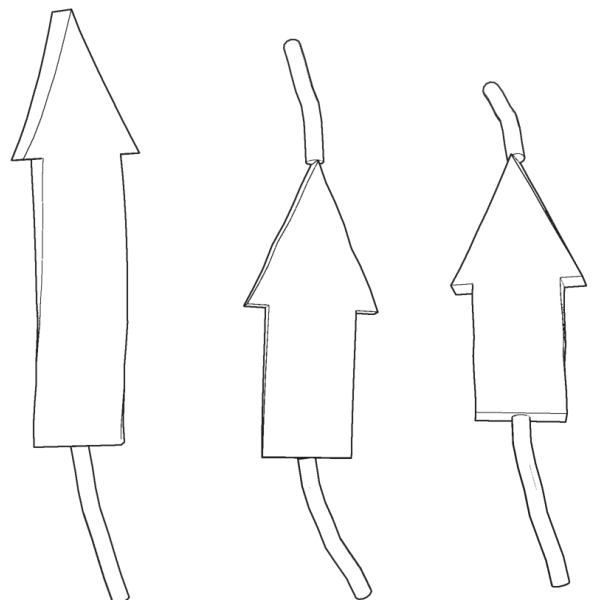
# Beta sheets

Other peptides line up in zig-zag lines that we call beta strands



We show these as arrows so we can see the direction

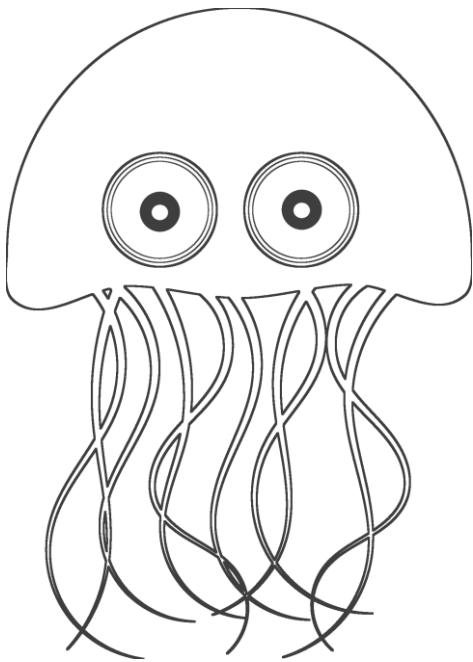
These beta strands are parallel and together they form a beta sheet





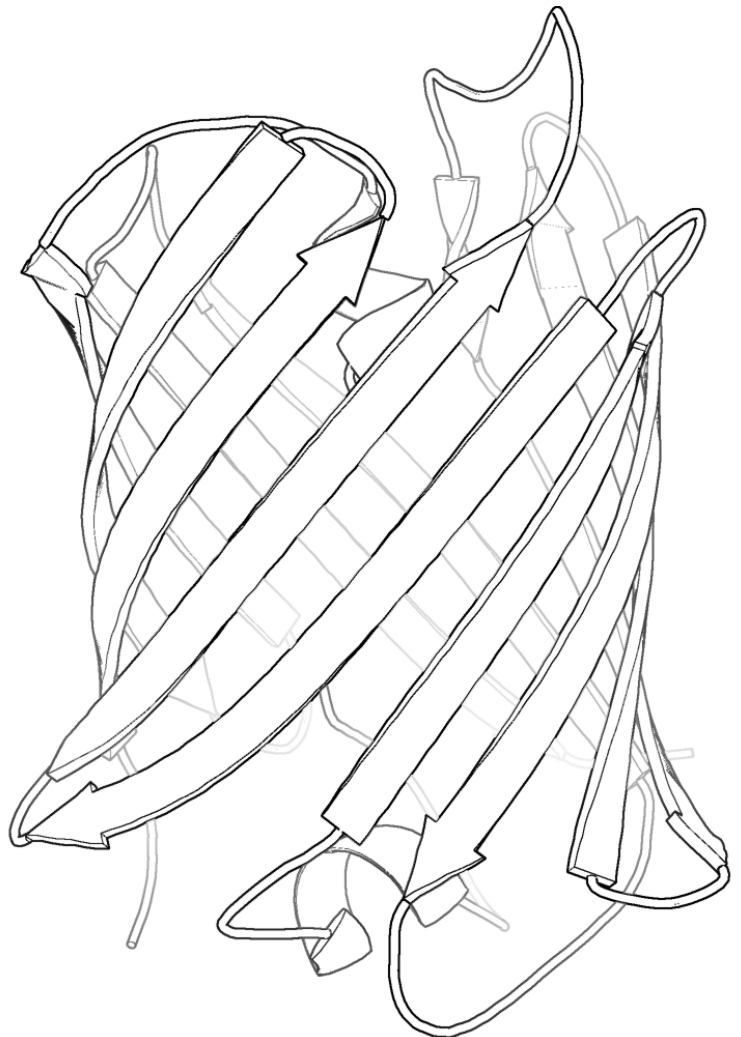
# Beta sheets - GFP

Green Fluorescent Protein (GFP) is made up of mainly beta sheets



GFP is found in jellyfish and makes them glow in the dark.

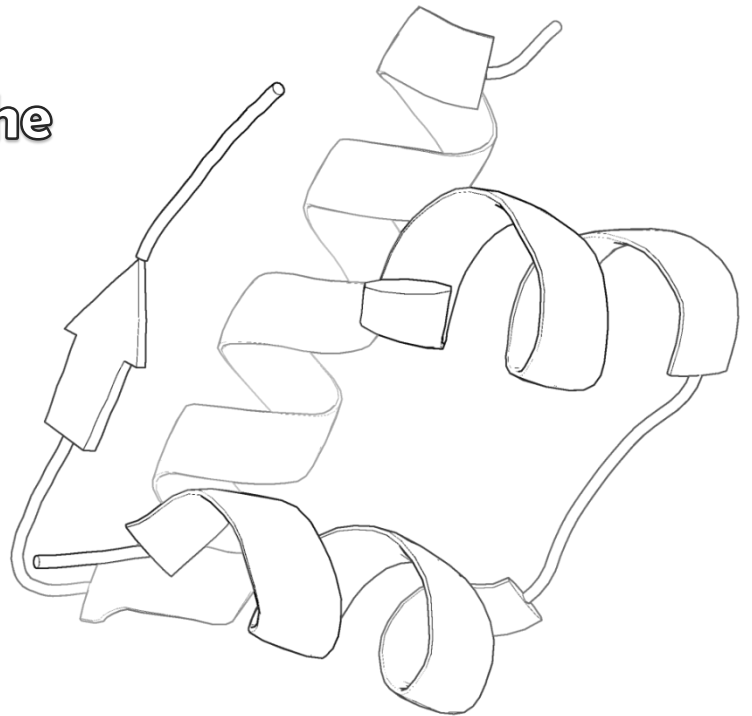
The beta sheets fold up to make GFP look like a barrel.



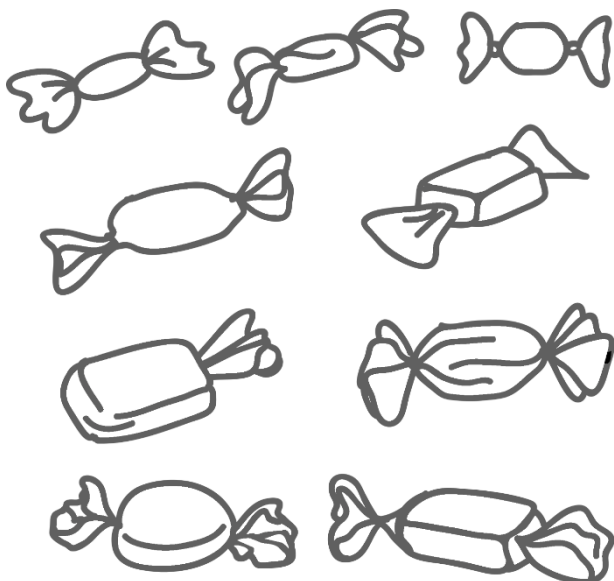
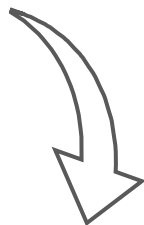
# Little proteins

Some proteins are very small, such as the protein hormone insulin

Insulin controls the level of glucose (sugar) in your blood



Sweets!



If you eat lots of sugar then insulin makes sure you don't feel ill!

People who are diabetic need to take insulin for this

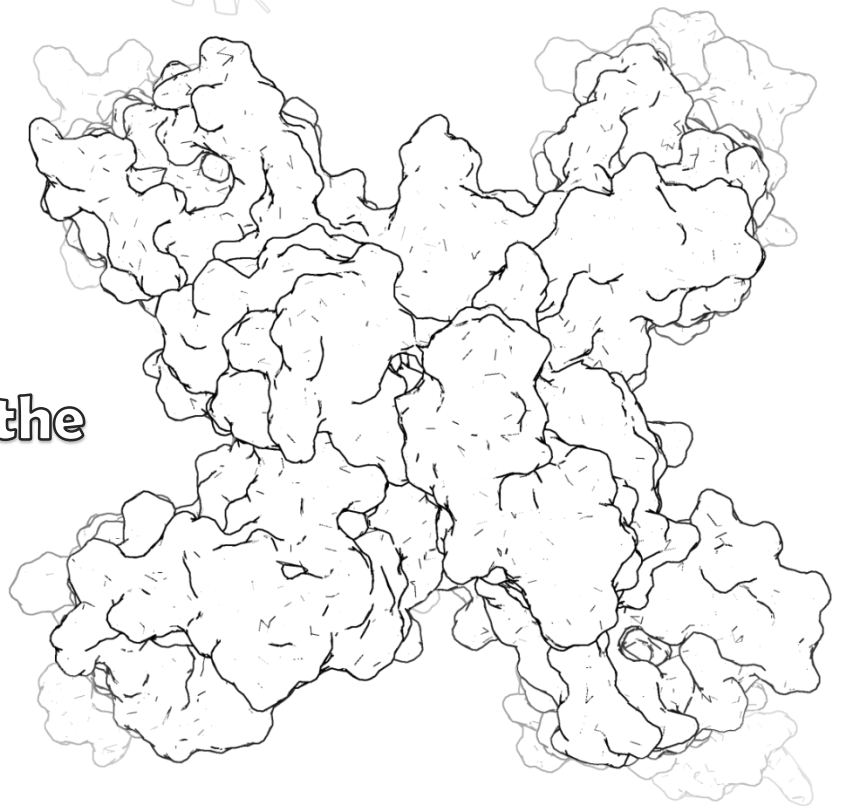
# Bigger proteins

Some proteins are much bigger, such as this calcium channel structure



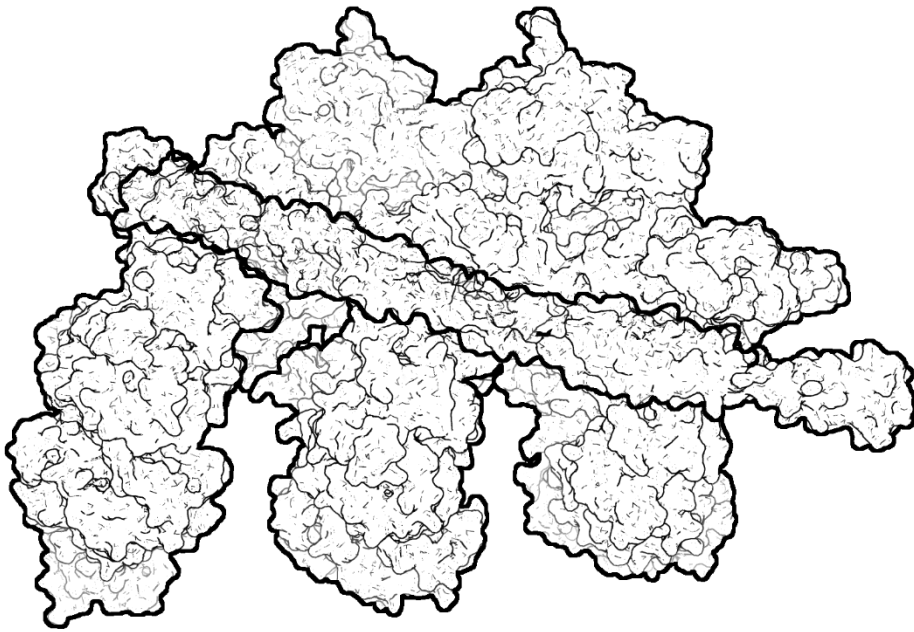
Showing bigger proteins in this detail can be very complicated.

Instead, we can show just the outline and see the shape of the protein

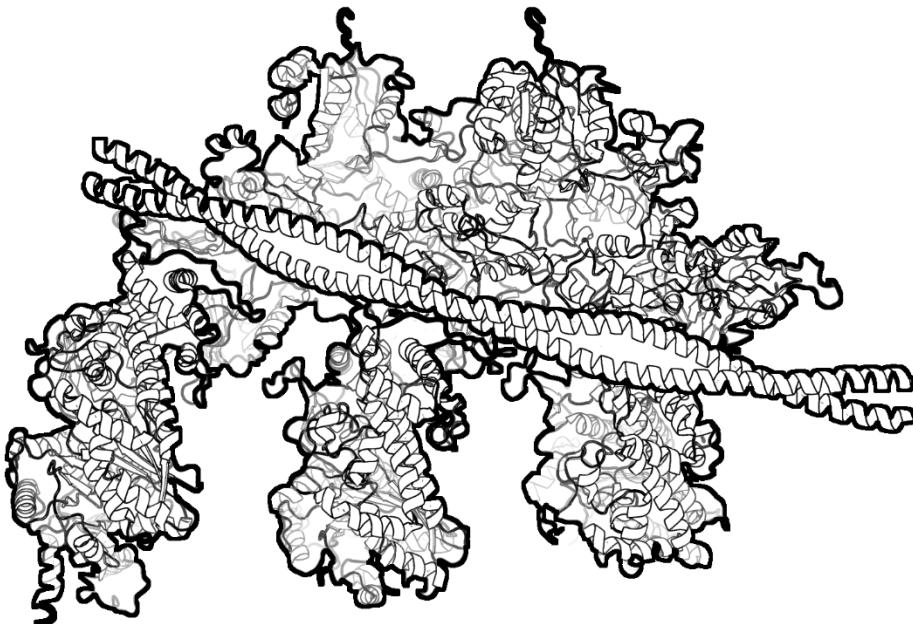


# Proteins work together

Some proteins form big groups with other proteins to do their job



Actin and myosin form a team and 'walk' along a long helix, making your muscles move



# Opsin

Opsin is a protein that senses light in the back of your eye, helping you see!



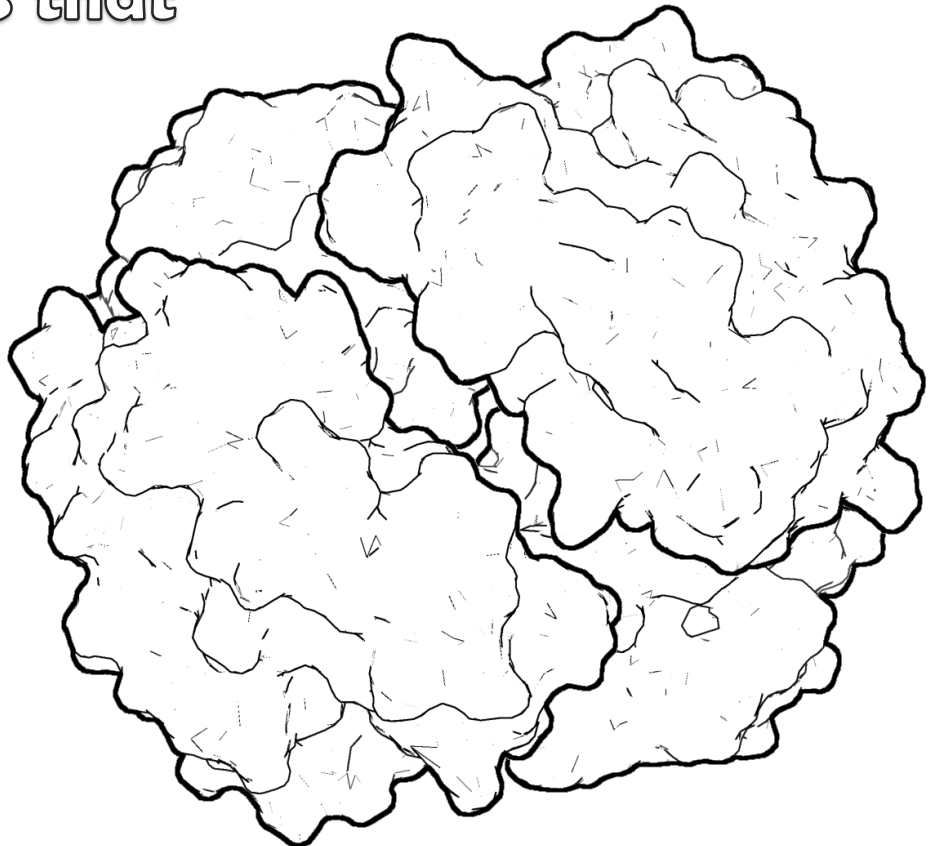
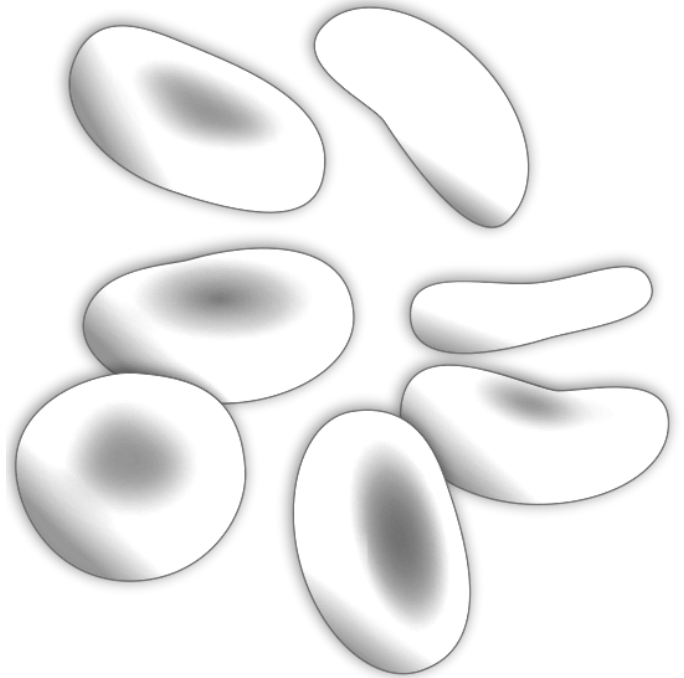
Light hits the protein, causing a signal to be sent to the brain



# Haemoglobin

Hemoglobin is a protein found in red blood cells

It transports oxygen around your body to the parts that need it!



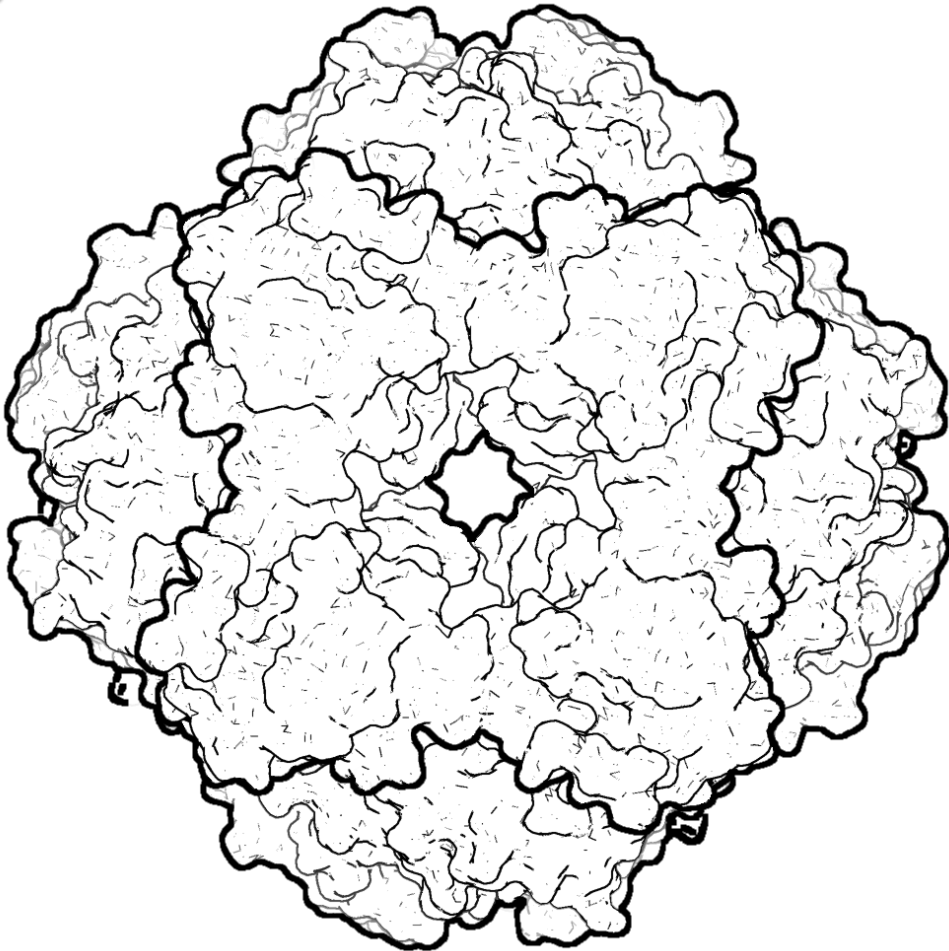


# RuBisCO

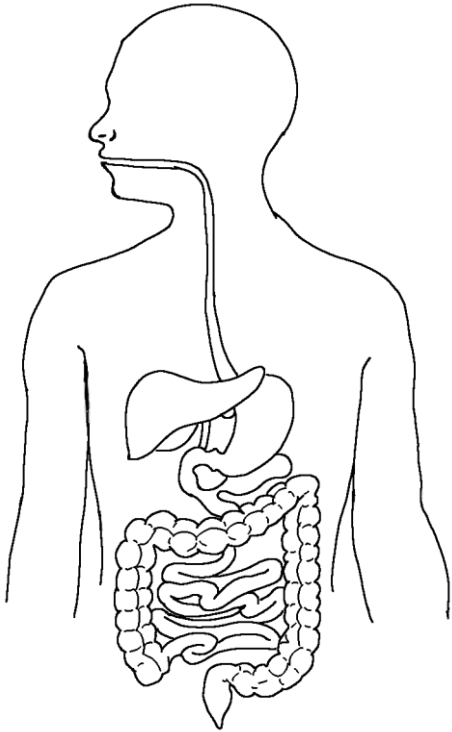
RuBisCO helps  
convert carbon  
dioxide into sugar  
in plants



Without this process we  
would have nothing to  
eat!

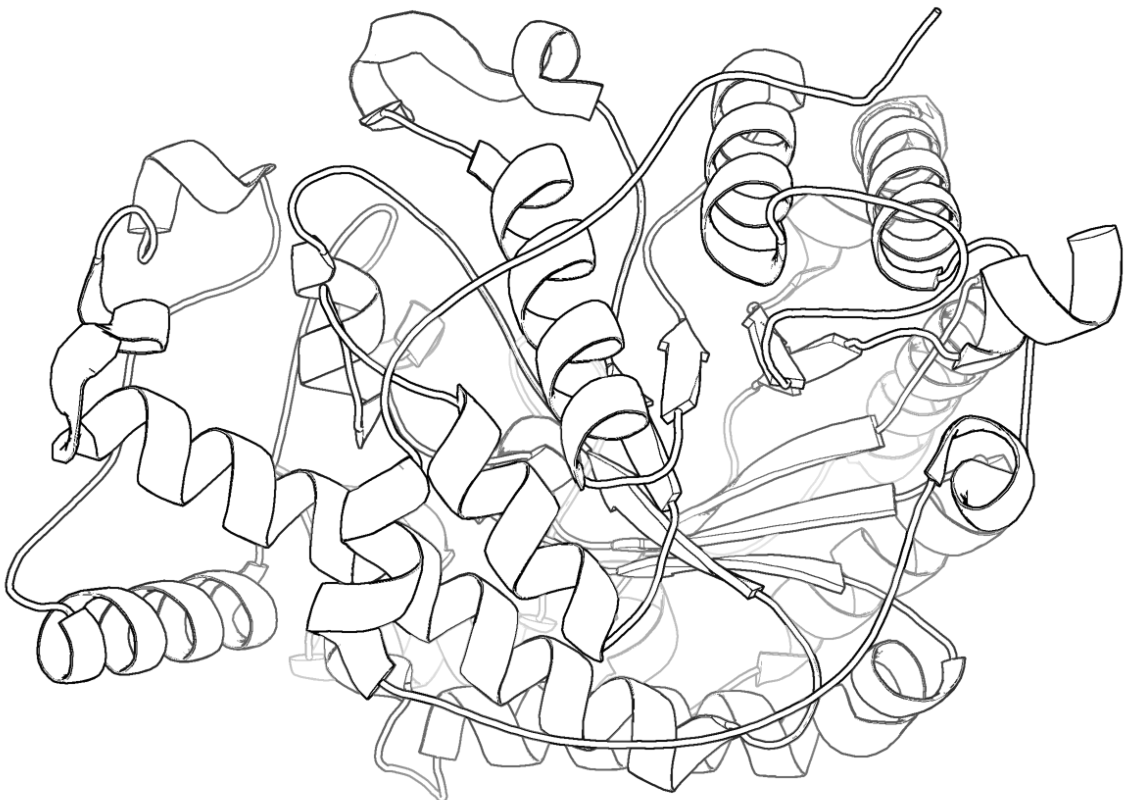


# Amylase

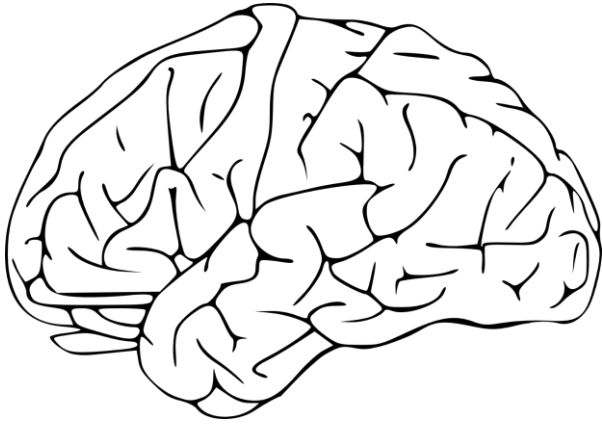


Amylase is a type  
of protein called  
an 'enzyme'

It helps you to  
digest your food  
into smaller pieces  
that make energy

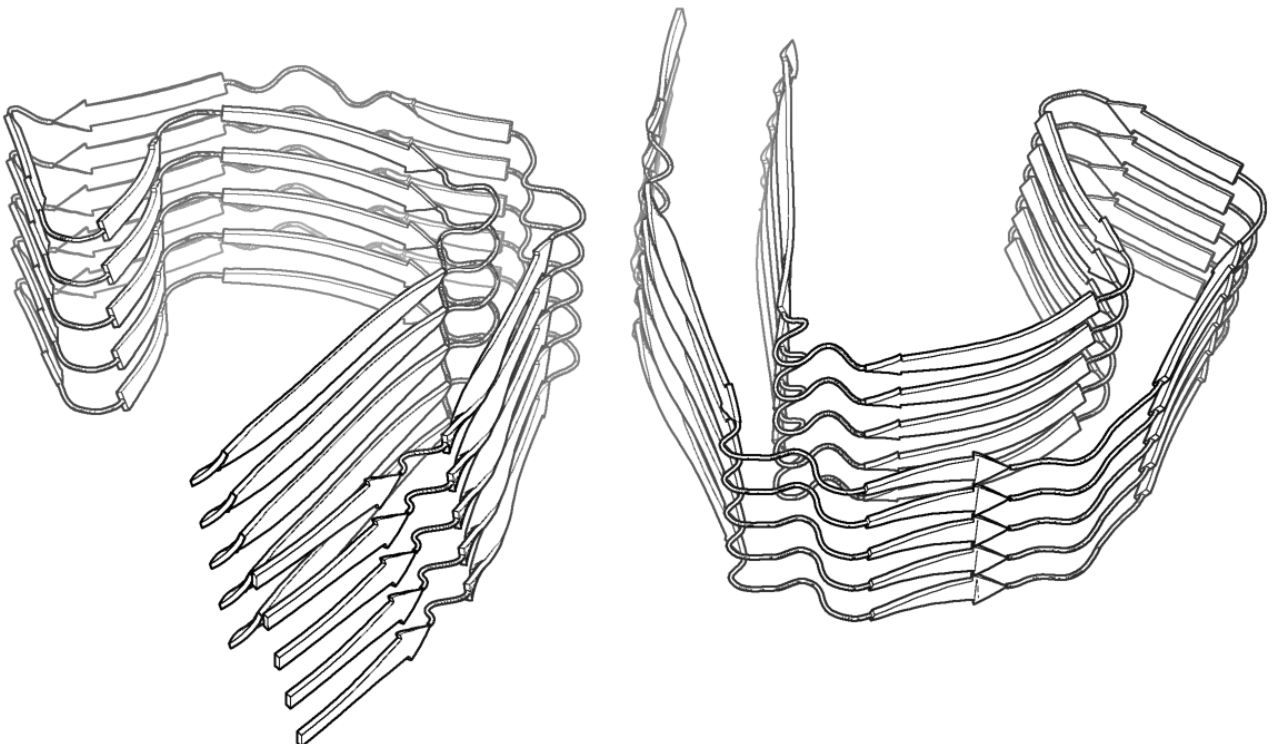


# Alzheimer's fibrils



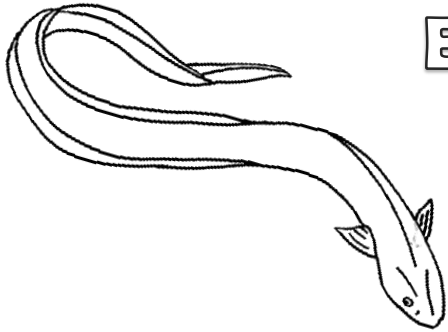
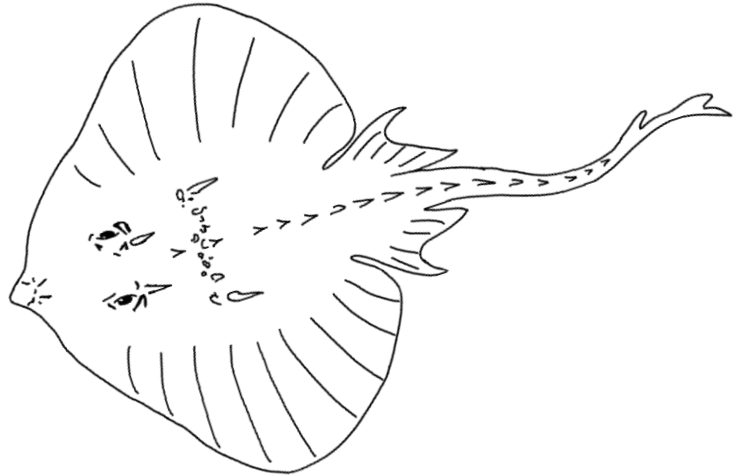
Alzheimer's disease  
affects how well  
your brain works

Sometimes proteins go wrong and  
form long fibres, called 'tangles,'  
which build up in the brain

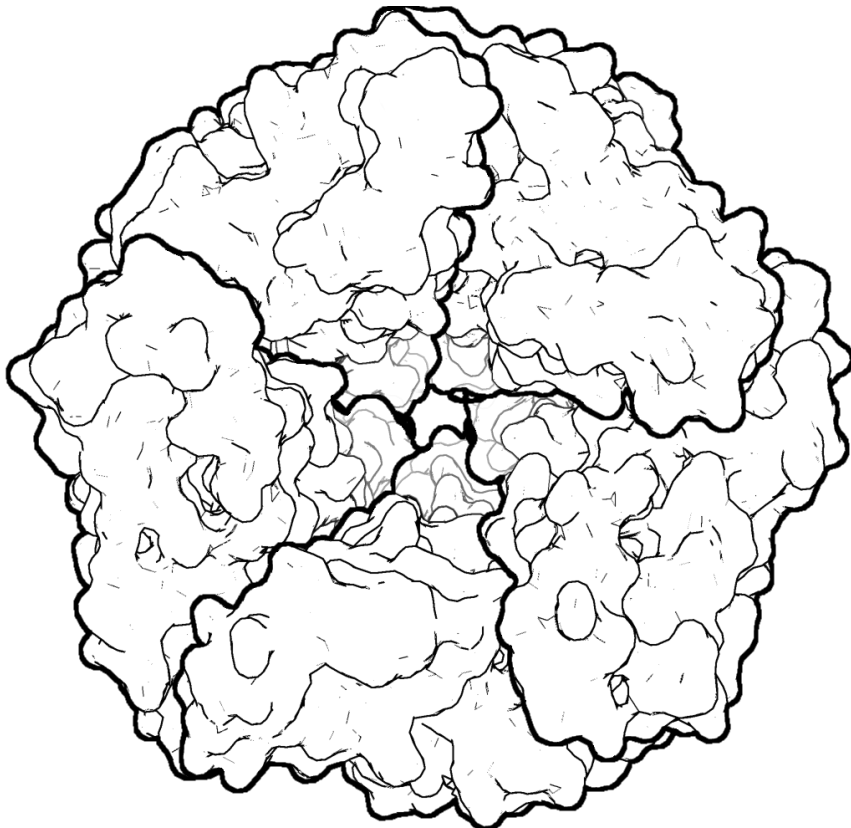


# Acetylcholine receptor

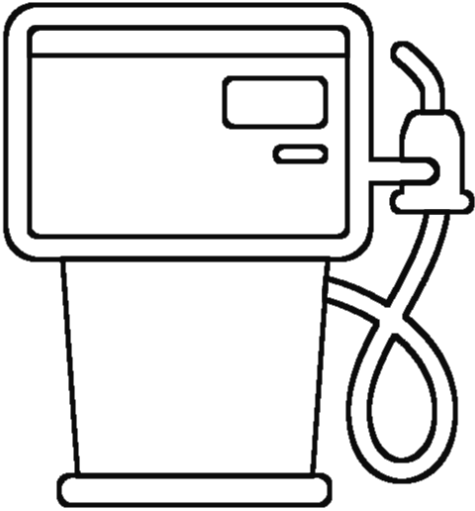
Acetylcholine receptors pass signals along your nerves



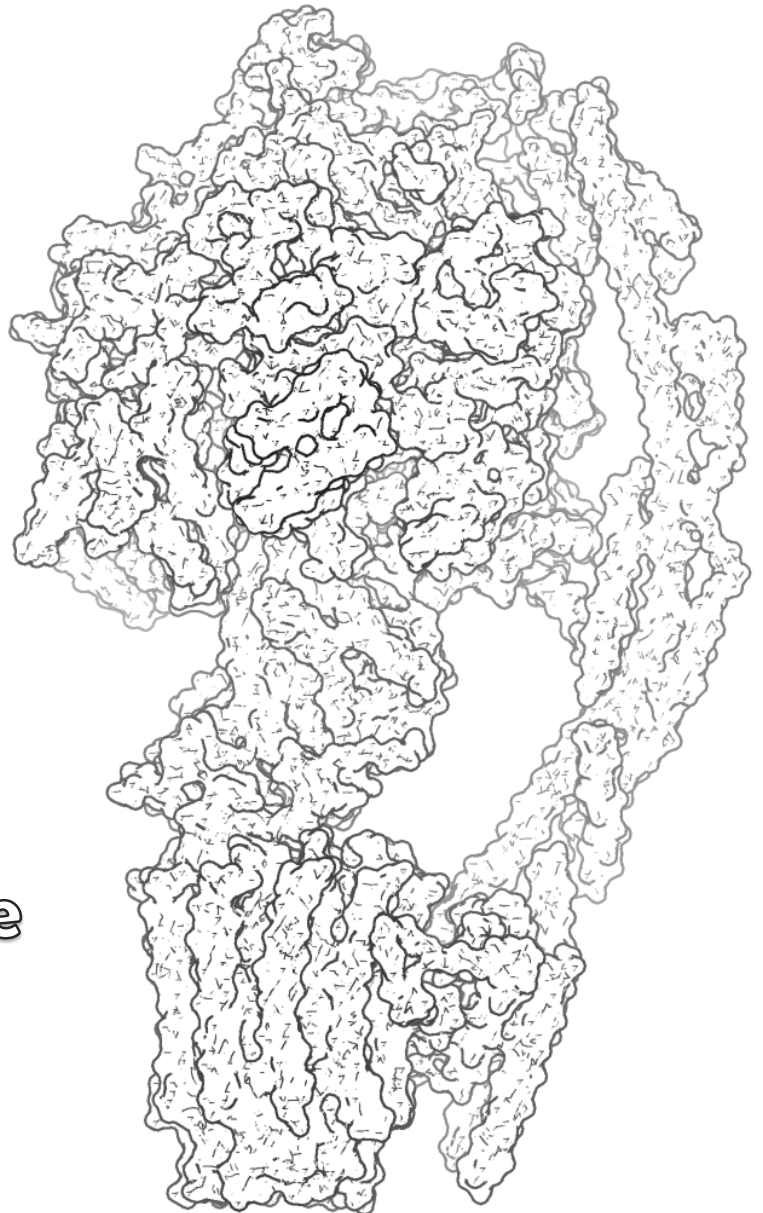
Electric eels and rays use lots of these to create a large electric shock



# ATP synthase



ATP synthase  
'pumps out' the  
molecule ATP



ATP is used in  
our cells to  
create energy  
and make sure  
that we can  
keep going!

# Explore and view molecules in 3D

[PDBe.org](https://www.pdbe.org)

