

Chapter 7: Energy for Life





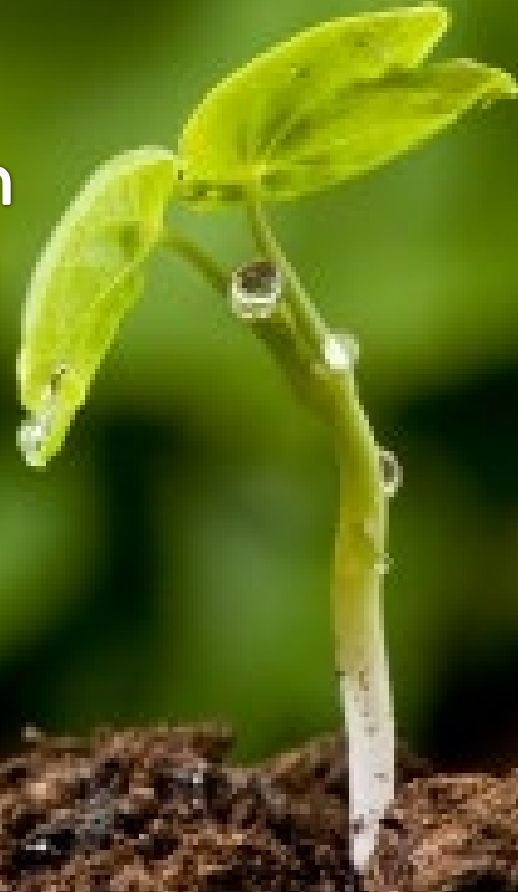
Nature's Energy Conversions

- We've learned how homes and machines get their energy but do we know how humans and plants get their energy?



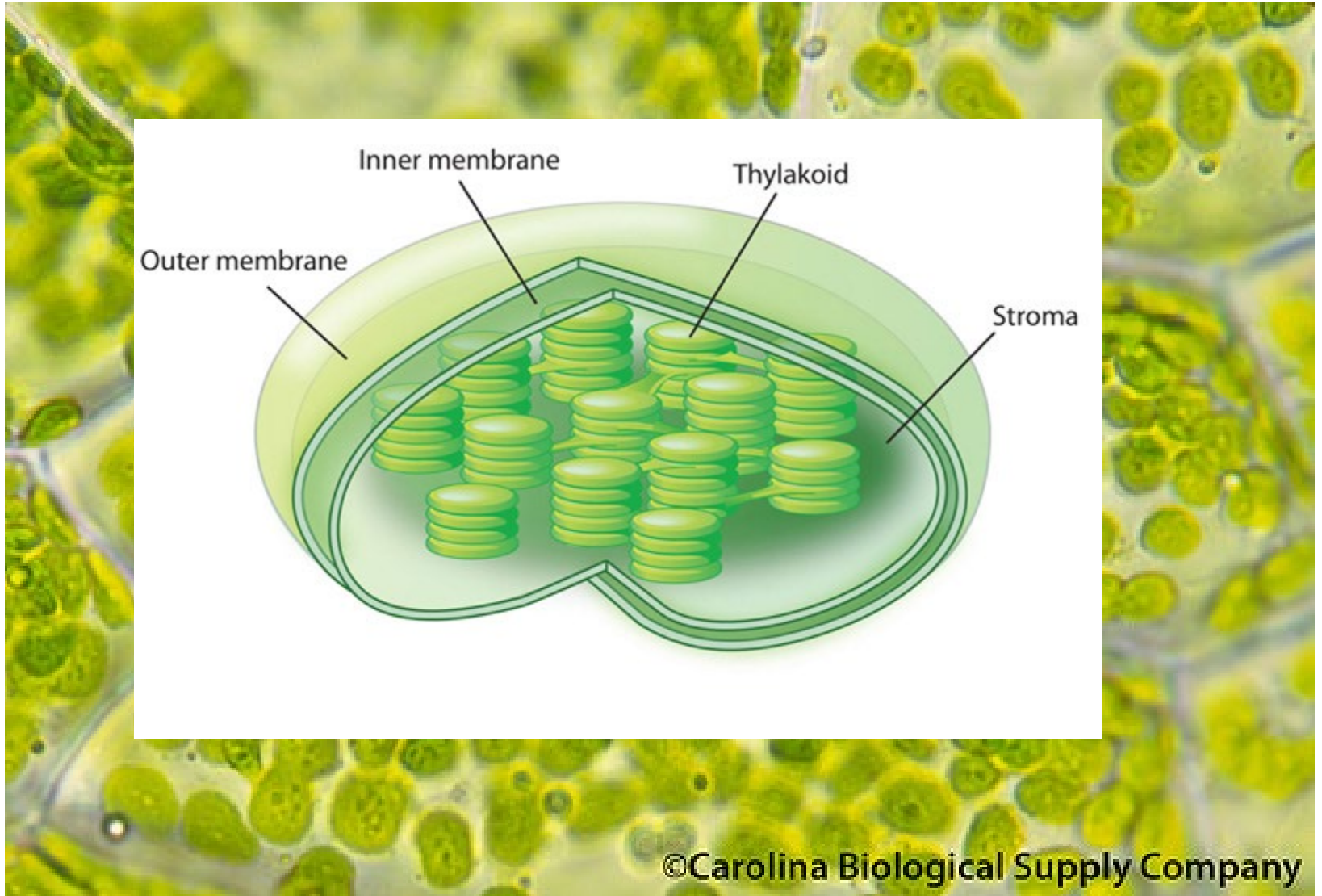
Plants

- ⦿ Without plants nothing could survive on earth
- ⦿ Plants provide food (directly/indirectly) and oxygen to almost every living thing on the planet
- ⦿ Use the sun's energy as their input energy

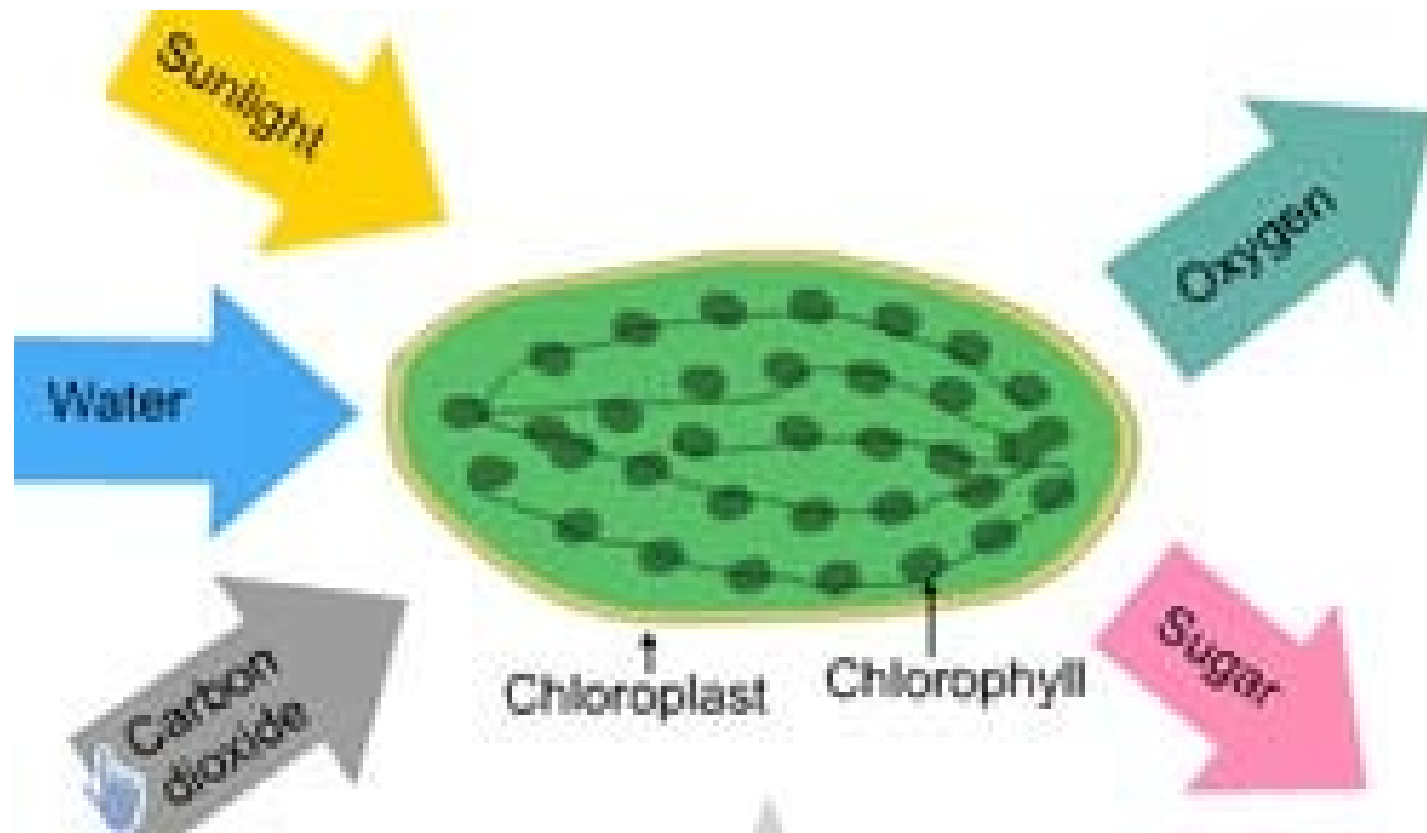


Plants

- The cells of green plants have special parts that capture solar energy and convert it to useful energy
- The parts are **chloroplasts** and they contain pigments called **chlorophyll**
- **Chlorophyll** is a green coloured chemical that assists in converting CO₂ and H₂O into glucose and O₂ – photosynthesis

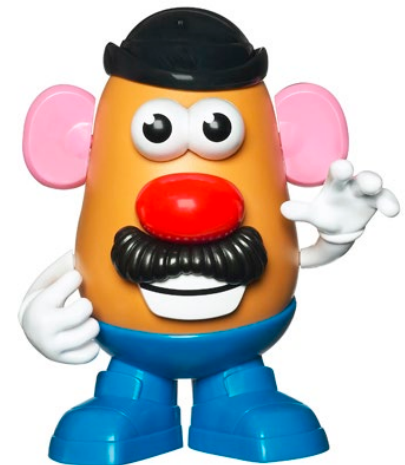
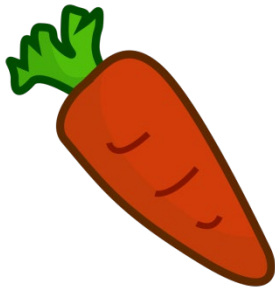


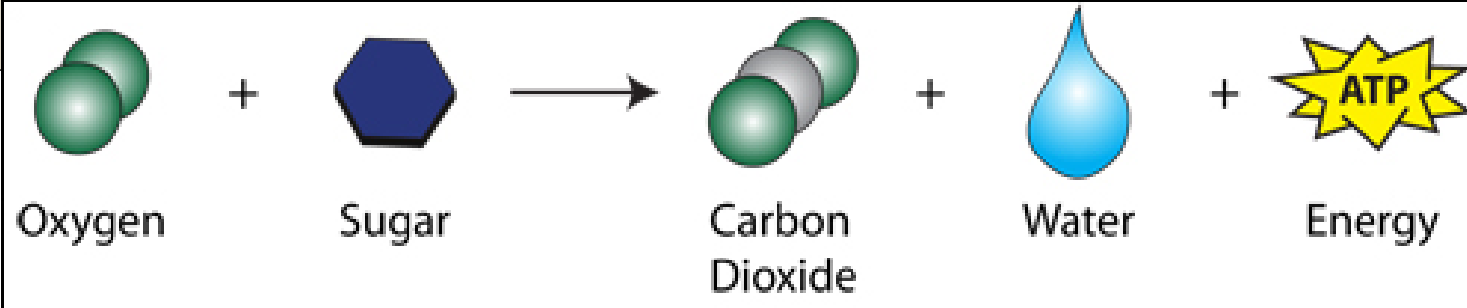
Photosynthesis



Use for Glucose

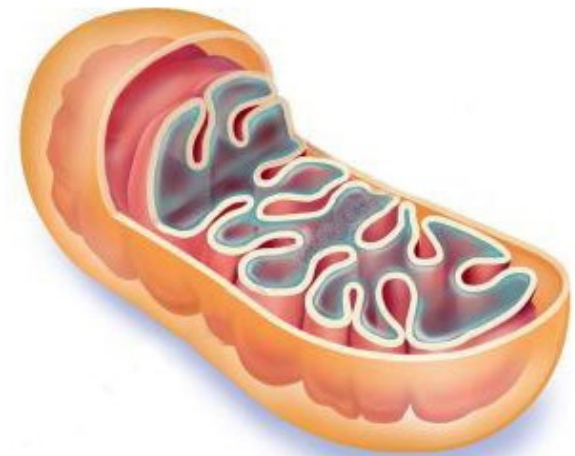
- Glucose is a simple carbohydrate
- Like animals plants use this energy to perform life functions
- If unused it will be stored in the stems, leaves, or roots





Cellular Respiration

- Process used by all plants and animals to obtain energy from food
- All cells use this process to maintain life functions
- Performed in specialized organelles called **Mitochondria**



Energy Conversions

- How does the sun's energy get to you?
- **Input energy → Converter → Output Energy**

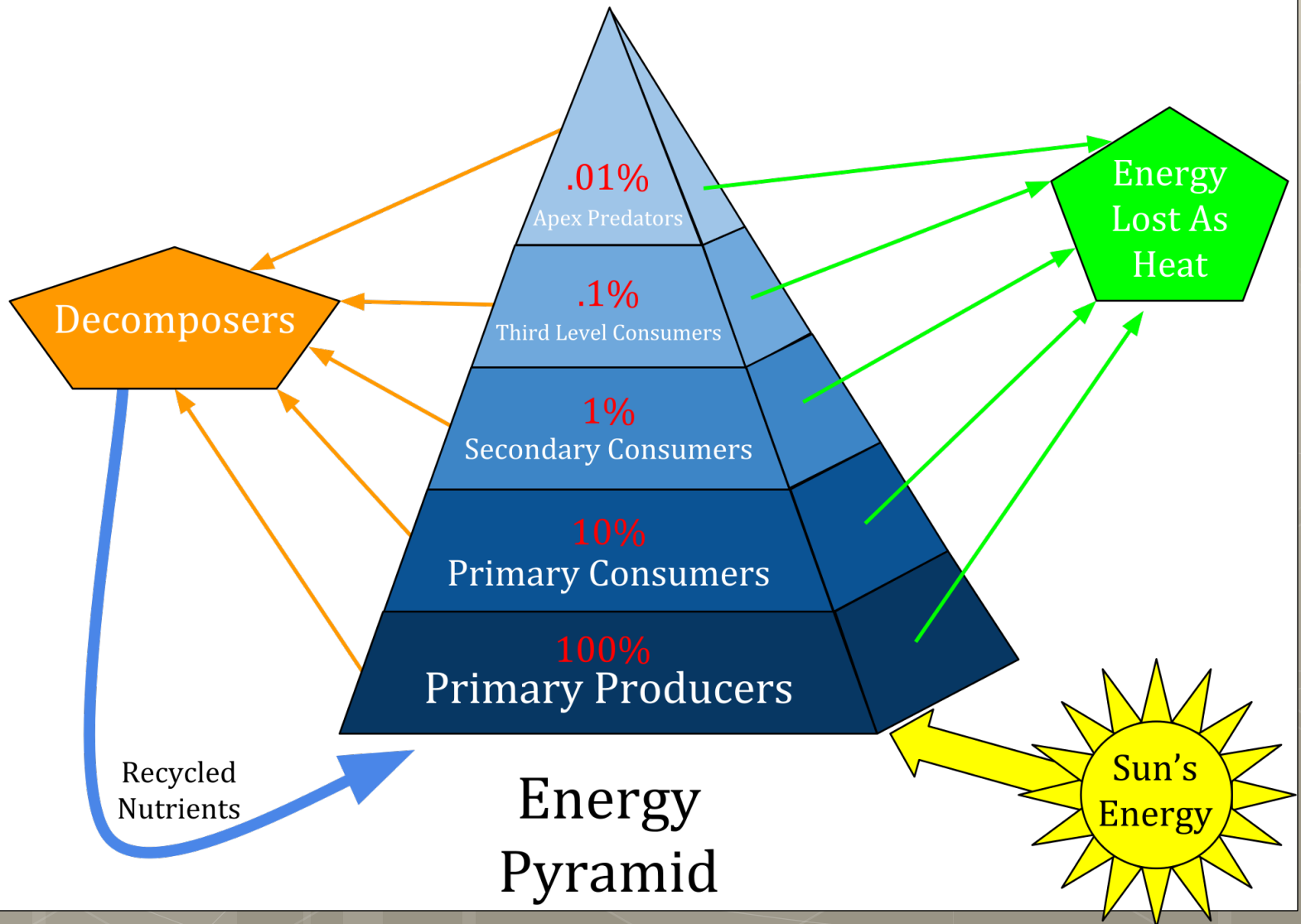
Process	Input Energy	Converter	Output Energy
1	2	3	4
5	6	7	8

Plants to Animals

- During all energy conversions a certain amount of energy is lost as waste energy
- The most common type of waste energy is **heat/thermal energy**
- Some of this energy is used to keep us warm

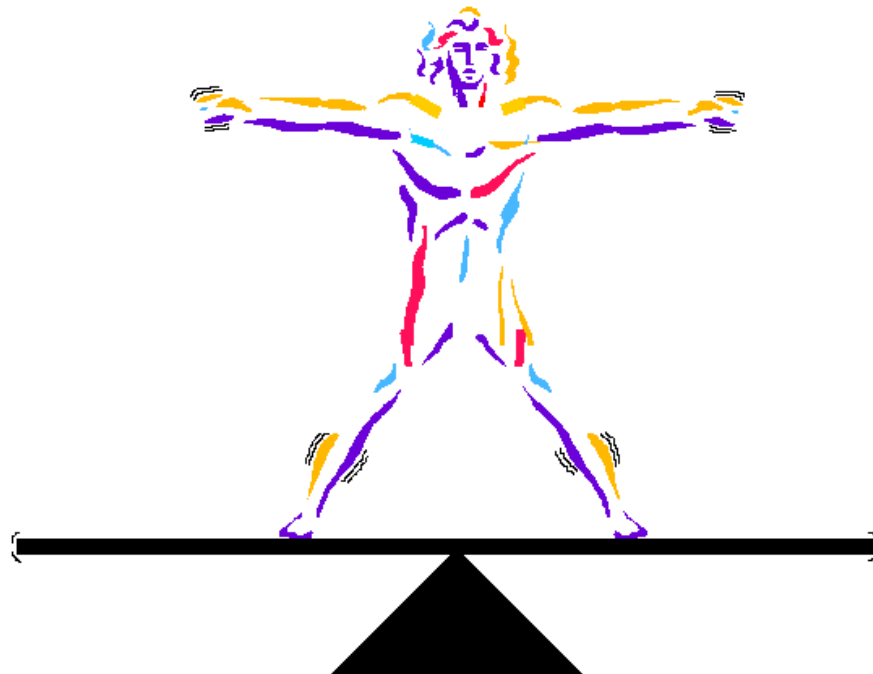


The Energy Pyramid



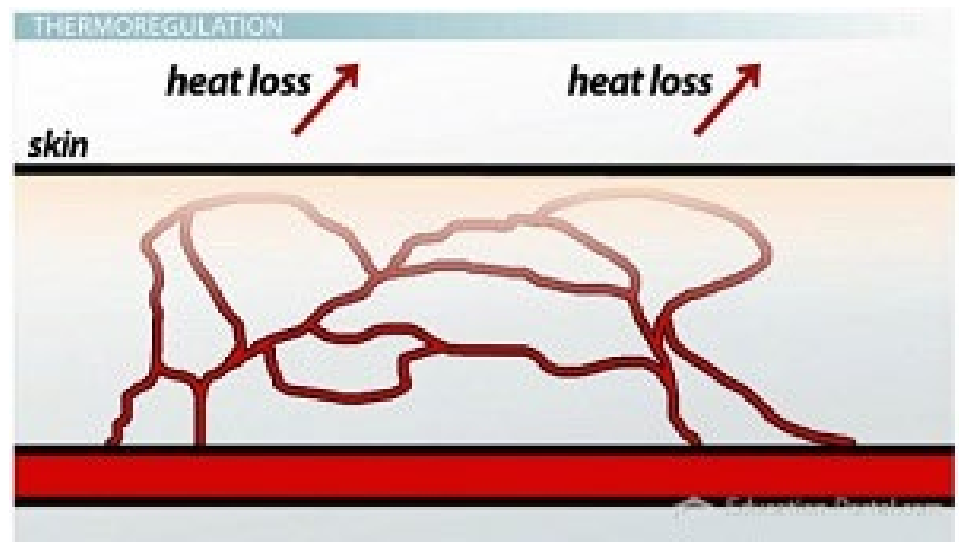
Need for Energy

- Use energy to maintain **homeostasis**
- **Homeostasis is the maintaining of a body's internal environment**
- Tries to hold a steady temperature of 37c



Too Hot!

- Blood vessels are brought closer to the surface so heat can be transferred out
- Perspiration – as moisture is moved out of the body and evaporates



Too Cold

- Shivering – vibrating muscles burn energy and release heat
- The body can direct less blood to the limbs and more to the core.
- Blood vessels near the surface constrict and less heat is lost through them



Metabolism

- The rate at which our bodies use energy
- Higher metabolism = higher energy needs
- Energy used in digestion, activity, growth, or excretion





01

EAT MORE

02

DRINK MORE

03

LIFT MORE

04

SLEEP MORE

05

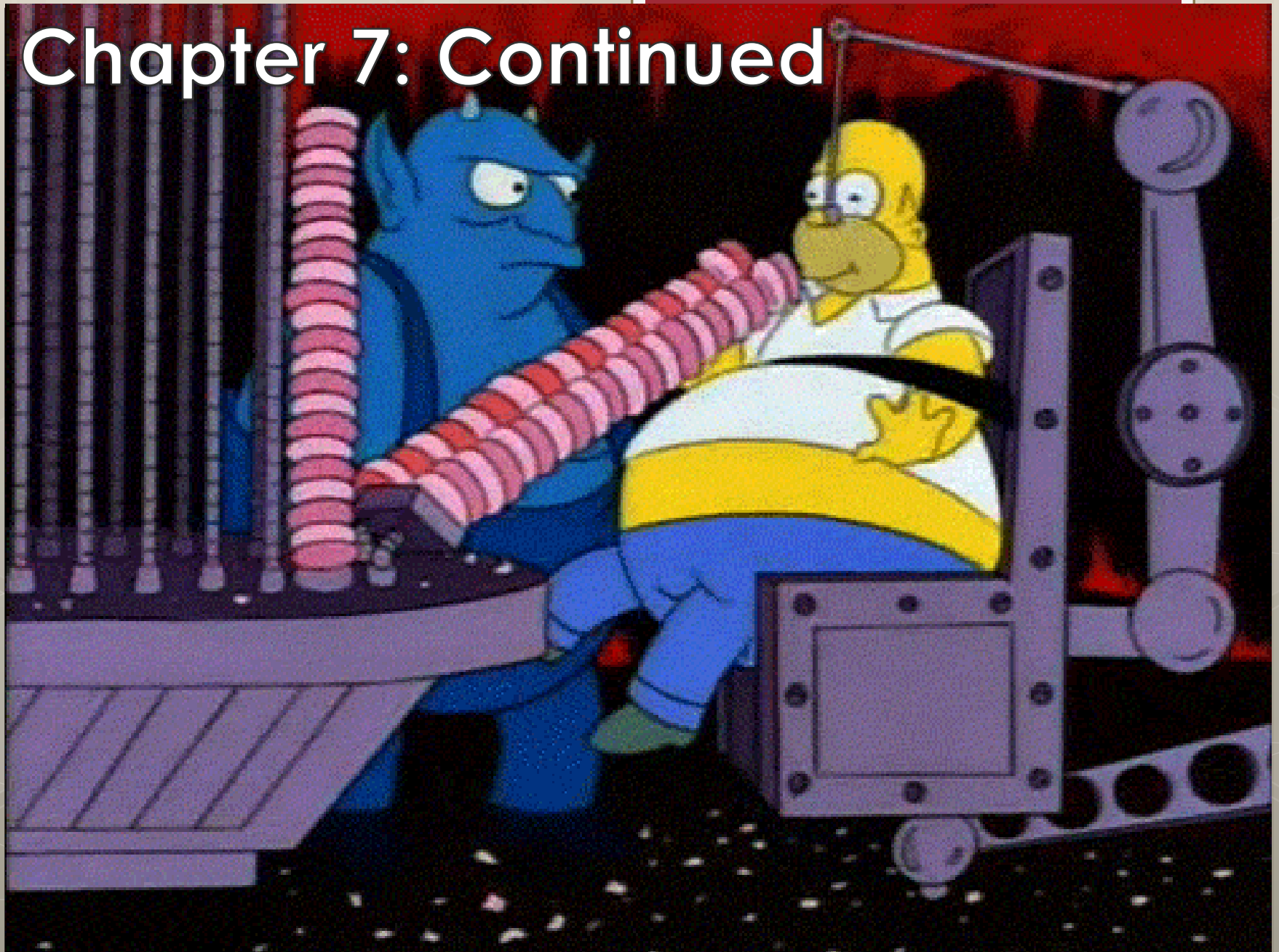
SPRINT MORE

5
Ways
to
Boost
Your
Metabolism

To be continued...



Chapter 7: Continued



Sources of Energy

- Food is the fuel that keeps humans warm, active, and alive
- Main source of energy are simple **carbohydrates** - sugars
- Cellular respiration takes these simple carbs (glucose) and converts it to energy



Storage of Energy

- If more energy is taken in than needed, the extra is converted to **glycogen** – a starch like substance
- It is stored in the liver and muscles and converted to glucose when needed

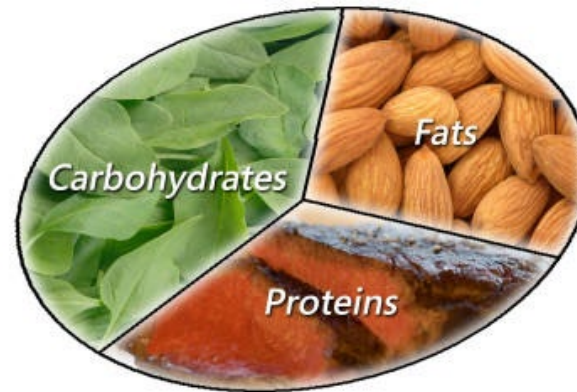


Storing Glycogen

- Many athletes will undergo the process of 'carbo loading'
- Eating a large amount of carbohydrates a certain time before an event
- This stored energy can be released in time of need
- Experts recommend we take in 55-65% of our calories through carbohydrates

What We Get Energy From

- Our body gets its energy from 3 primary sources:
- **1. Carbohydrates**
- **2. Fats**
- **3. Proteins**
- Body seeks to use carbohydrates first, then fats, then finally proteins



Fats

- Needed for insulation, to conserve energy, and as a source of energy
- Used once carbs run low
- Actually provide 2x the amount of energy as carbs
- Should be 30% of our daily diet
- 2 types of fats: **Saturated** and **Unsaturated**



Fats

- **Saturated** – come from animal plants and some oils
- Associated with increase in heart disease
- **Unsaturated** – most vegetable oils, such as Canola and Olive
- Reduce heart disease



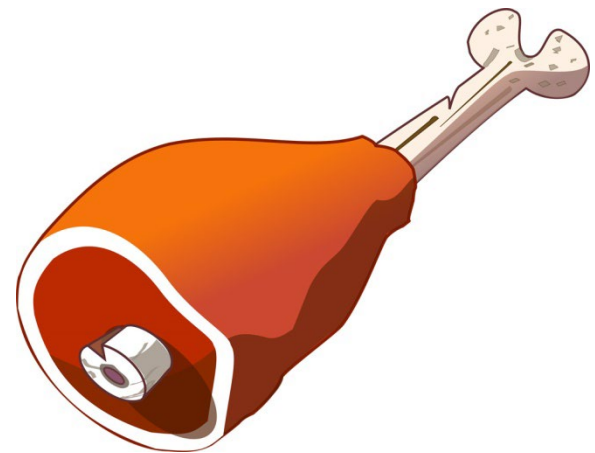
Protein

- Last resort for energy
- Contain as much energy as carbs, but take a longer time to break down
- Important for other body functions
- Help build and maintain body tissue
- So when protein is used as energy it is unable to build tissue
- Should be 10% of our daily diet



Building Blocks

- Proteins are the building blocks of our body
- Most people get their protein by eating meat
- Vegetarians must find alternative methods to get protein





Extreme Diets

- Some individuals chose to steer away from these 3 nutrients in an attempt to lose weight or may have an eating disorder
- Often causes health problems
- Common in modelling and sports like gymnastics or figure skating
- Also there are people who don't have access to the proper nutrients as well

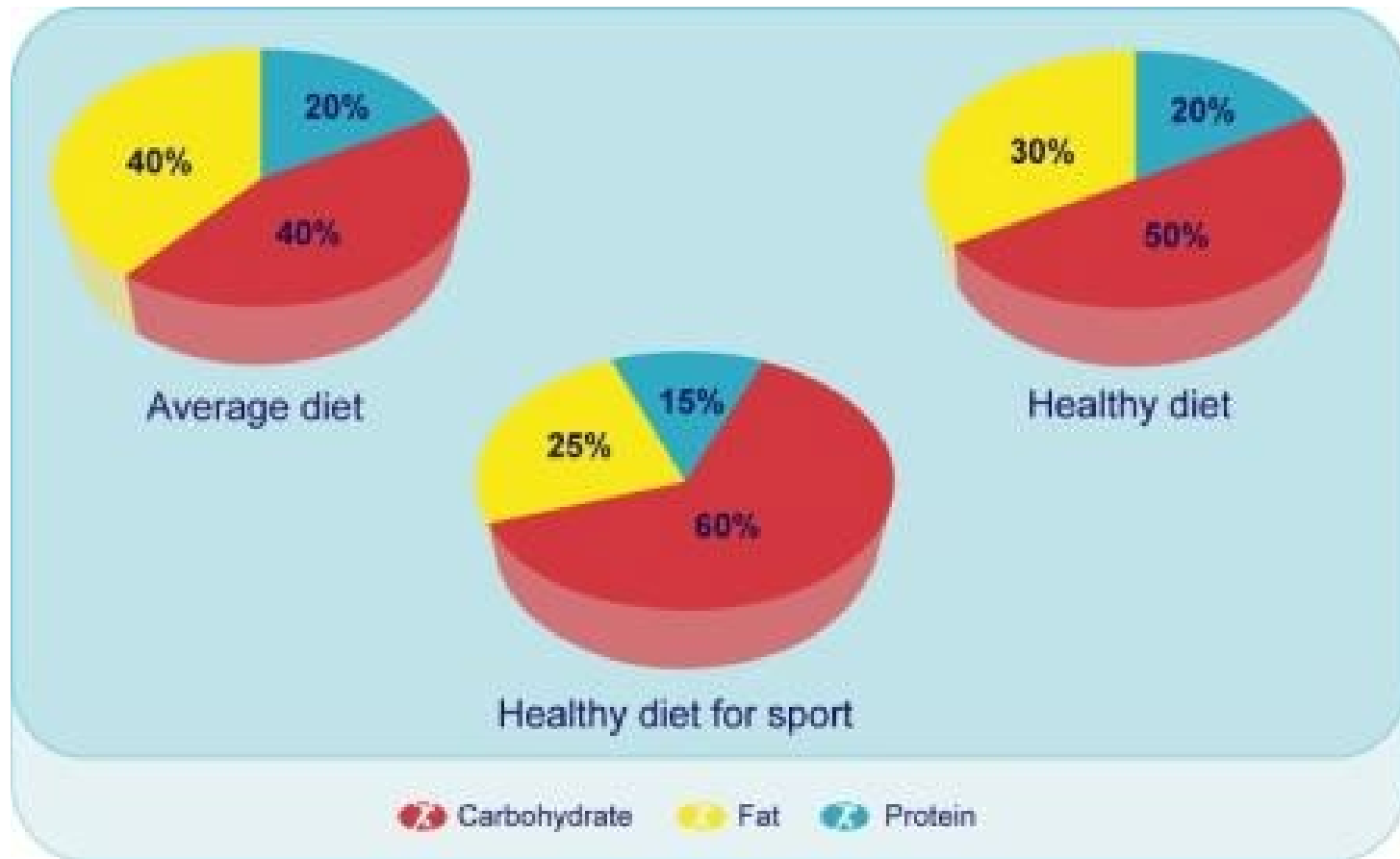


Energy of Carbs, Fats, and Proteins

- Each type provides us with calories
- Carbs – 4 calories/gram
- Fats – 9 calories/gram
- Proteins – 4 calories/gram
- Bomb calorimeter – measures calories burned



Differing Diets



Need for Energy

- Our body's demand for energy changes as we go through different stages of life
- Infancy → puberty → adulthood → old age

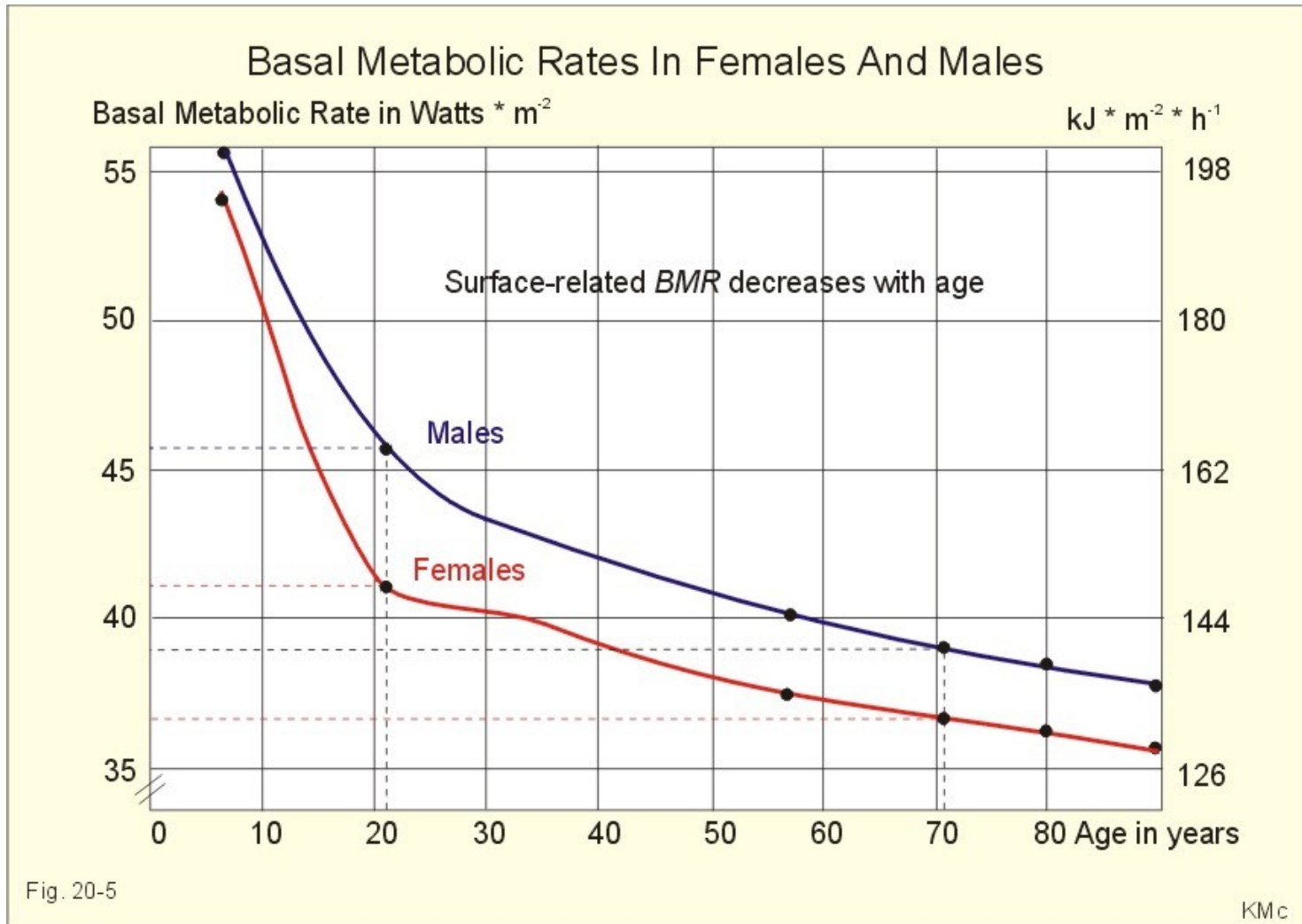


Need for Energy

- As people age their **metabolic rate** changes – need for energy
- Every growth spurt or development has it's own demand for energy
- Pregnant and breast feeding mothers have high metabolic rates
- As their child is dependent on them for energy and nutrients



Men vs. Women



What Affects Metabolism

- **Age** – developing fetuses and young children have higher rates
- **Time of Day** – metabolism is higher in the morning and usually peaks around 10am
- **Exercise** – activities raise metabolism. As we need to burn more energy
- **Level of Fitness** – Those in better shape have higher rates

Weight Management

- 2 biggest factors are proper diet and exercise
- Could be not necessarily eating less, but making better decisions
- Don't need to be extremely active, only 30-60 min a day!



The End

