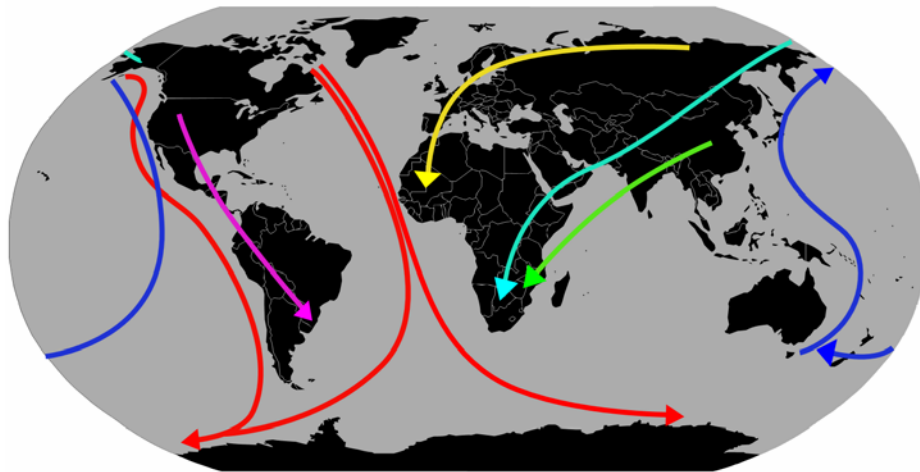


## Migration

- This is the regular (repeated) movement of animals from their breeding grounds to another area and back.
- Migration is carried out for a specific reason e.g.
  - to find a more favourable breeding area with more food
  - for better protection from predators
  - to avoid extremes in climate.
- Migration requires the use of a lot of energy over a long distance and because of this it must have significant advantages to the species.
- Migration usually involves a large number of organisms at once.
- Migration is genetically controlled (instinctive/ endogenous) but initiated by the environment (day length, lack of food, population size etc.).
- Often organisms migrate between the different hemispheres so they are always in summer when food is more readily available.



<i>Oenanthe oenanthe</i>	—	Northern Wheatear
<i>Sterna paradisaea</i>	—	Arctic Tern
<i>Falco amurensis</i>	—	Amur Falcon
<i>Puffinus tenuirostris</i>	—	Short-tailed Shearwater
<i>Philomachus pugnax</i>	—	Ruff
<i>Buteo swainsoni</i>	—	Swainson's Hawk

### Advantages of Migration

- Animals remain in favourable conditions e.g. avoid cold/ extremes
- Parents and offspring grow larger and therefore have a high survival rate; they leave more offspring.
- The population have a constant supply of food
- Migration may lead to the colonisation of a new area.
- Reduces diseases as the disease doesn't always have a host in the area.
- Reduces effect of predation; habitats that have abundant food sources year-round also attract a greater number of predators that can threaten nests. Birds that migrate to different habitats can avoid that onslaught of predators, giving their young a better chance of reaching maturity.
- Because many different populations often meet at the "breeding grounds" migration increases genetic diversity as they often breed with individuals from a different population.

**Remember that migration is linked to the survival of the species, so it always links to maximising breeding opportunities leading to greater reproductive success.**

### Disadvantages of migration

- They may get lost or caught up in a storm and blown off course.
- They may get eaten by predators during the journey.
- During the migration they may use up too much energy therefore when they arrive at their destination they may not have the energy to successfully complete the breeding process.
- During the journey they may starve and die.

**Migration is a huge investment in energy so there has to be a survival advantage otherwise it would be pointless for the organism to migrate.**

### Triggers of migration

There are a number of triggers for migration

- Environmental changes most importantly the **shortening of the day length** trigger “migration restlessness” (zugunruhe). This is better than a change in temperature as it is much more reliable as you can get hot days in the middle of winter.
- When an animal reaches sexual maturity they develop the desire to breed and this is animals such as eels and salmon triggers migration
- Migration is also triggered by a genetic drive (innate) and is often thought that it is partly controlled by an endogenous circadian rhythm (biological clock).

### Methods used to navigate

The main methods which organisms use for navigation depends on where they live and what time of day or night the organism is navigating. Remember to use common sense and to think about the specific organism being asked about in the question e.g. fish that live in the bottom of the ocean can't see the stars so they will not use stellar navigation. Also many organisms will use more than one method of navigation.

Main methods include:

- **Mental maps** — rather than a paper map, a mental map is carried in the mind and includes known landmarks, such as rivers, trees, and mountains
- **Sun and Moon** — some animals follow the sun as it crosses the sky from east to west. Starlings orientate themselves using the path of the sun. Clouds, time of year, and moving at night can make it impractical to use the sun as the only cue for direction.
- **Stars** — many animals use stars and specific constellations, such as Southern Cross and the North Star, most likely because those stars are very bright and often visible.

When using stars, sun and moon they must also be able to make modifications to account for the changing position of these throughout the day and month.

- **Magnetic field** — the Earth has a magnetic field, and although humans usually cannot detect it without a compass, some animals have the ability to detect and use it for their migrations. It helps them know which way is North.
- **Ocean currents** — some animals can use ocean currents to navigate to and from breeding or feeding grounds. Some eggs, larvae, and young fish drift passively with ocean currents. Some adult fish migrate to breeding grounds by deliberately moving against ocean currents.

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- **Smell** — over small distances or at specific locations on a migratory path, scents can help animals find their way. For example, salmon use scents in rivers to find spawning areas to lay their own eggs—in the same area where they were hatched.
- **Instinct** — instinct also helps animals with simple migrations. For example, gray whales mostly follow the West coast of Canada and the United States as they migrate between Alaska and Baja, Mexico. Dolphins follow the topography of the ocean floor.
- **Genetics** — some scientists believe that migratory animals genetically inherit migratory routes from their parents.
- **Communication and signaling among individuals** — some animals that migrate in groups communicate as they travel to help with navigation. For example, whales use sound to tell each other where they are and where they are headed.

**Hibernation**

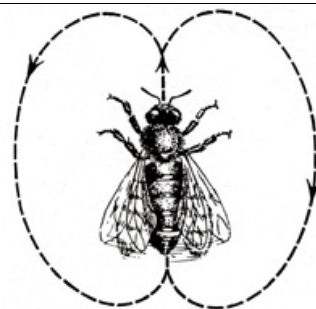
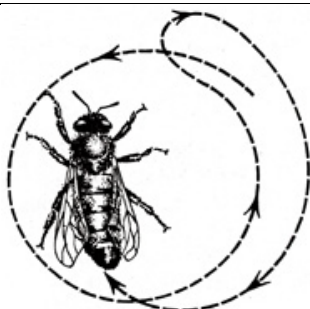
- Hibernation is another type of annual rhythm. Hibernation is the dropping of an animal's body temperature on a seasonal basis to conserve energy. The animal's heart rate and breathing rate slow down. It allows the animal to avoid winter weather and extreme food shortages.
- Small animals are particularly at risk over winter as they lose heat quickly, and cold-blooded animals have no way of warming themselves during this time. When conditions are correct, possibly the day length, the animal goes into hibernation and it's body temperature drops to within a few degrees above **ambient temperature**.
- In preparation, most hibernators lay down lots of fat including a special store of brown fat (used to warm up quickly when they awake).
- The hedgehog is a mammal which hibernates. In winter its breathing rate falls to as low as 10 breaths per minute. The normal pulse rate for the hedgehog is about 100 beats per minute, during hibernation this slows down to only 10 beats per minute.

**Examples of a sun compass**

Honeybees are often used as an example of a sun compass because they use different dances to tell other bees where to look for honey. The “scout bees” returns to the hive and does either the “round dance” or the “waggle dance”.

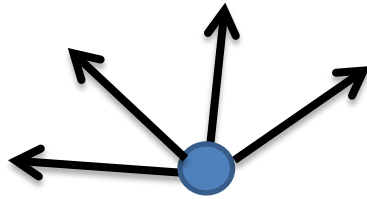
Round dance: this is used if the nectar is close (less than 50m away) from the hive.  
The bee dances in a circular motion, dropping a little nectar to tell the bees what type of flower to look for.  
It doesn't tell them direction.

Waggle dance: this is used to indicate when nectar is much further away. The bee makes a figure of eight with a few waggles. The speed of the waggles indicates how close the nectar is and the direction of the straight run indicates the position of the nectar in relation to the sun. Lots of waggles, with the straight part of the run pointing up means the nectar is close and in the direction of the sun.

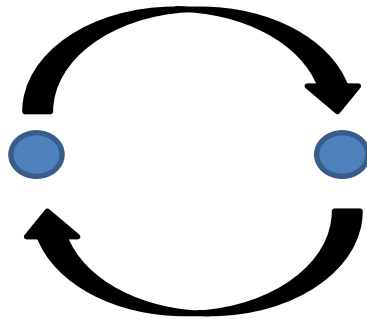


### Migration patterns

- **Dispersal:** this occurs when organisms move out from one point



- **Return migration:** this occurs when organism moves out from on site to breed and then later returns via the same route or by a different route



- **Nomadic migration:** this is just the random moving around of a population

