## Theme 3: Life involves transfer and transformation of matter and energy.

Living things constantly exchange material and energy with its surrounding and other organisms. The ultimate source of energy for living organisms on the planet is the sun. Autotrophic organisms (organisms capable of making their own food), specifically photoautotrophs, converts light energy into chemical energy through the process of photosynthesis. Heterotrophs (organisms incapable of making their own food) feed on autotrophs and other heterotrophs to gain energy. The energy that organisms gain through photosynthesis or by feeding on other organisms is used to fuel biological processes such as reproduction, movement, growth and development.

The energy that the lion acquires from eating its prey will be used to fuel various physiological and physical processes. The organic matter in the carcass will be broken down and used for growth and development. The organic material comprising the lion's body will return to the environment when it dies.



One important thing to note is that the transfer of energy in the biosphere is linear while the transfer of matter is cyclic. Energy enters the biosphere in the form of light and exits the biosphere as heat. On the other hand, biological materials are recycled continuously in the biosphere.

## Theme 4: Biological systems interact

Biological interactions can be observed at all levels in the biological hierarchy. For example, movement of the human body involves the interaction between the skeletal system, the muscular system and the nervous system. Motor neurons give the commands to the muscles which contract and pull on bones to execute the motion. The control of calcium concentration of the blood involves the bones and the kidneys. If calcium concentration is too low, the body releases parathyroid hormones to stimulate the bones to release calcium. If there is too much calcium in the blood, the same hormone regulates it by stimulating calcium reabsorption in the kidneys. Biological interactions in the organismal and molecular levels involve chemical messengers and feedback systems.

Biological interactions at the ecosystem level are also evident. Plants release oxygen that animals need and also serve as habitat for may small animals. Animals, on the other hand, disperse the seeds of plants and its manure serves as organic fertilizers.