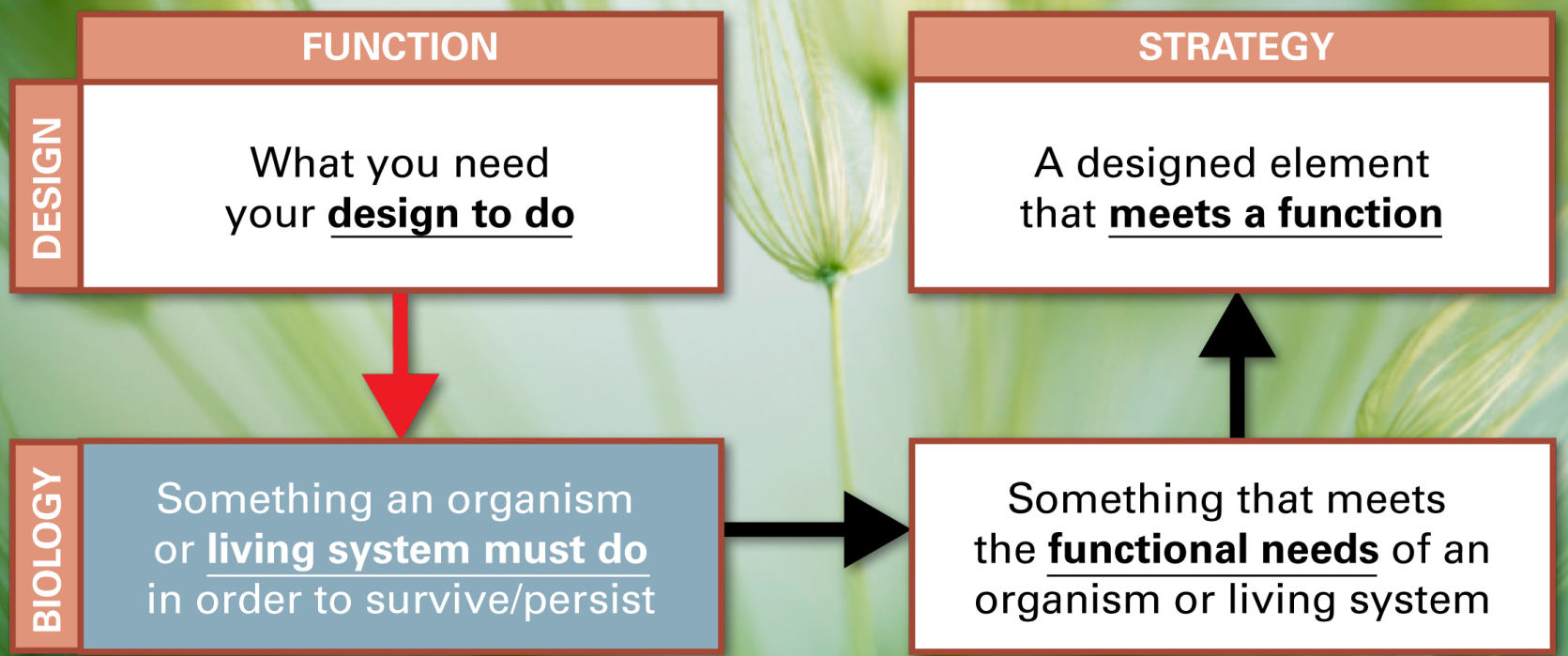
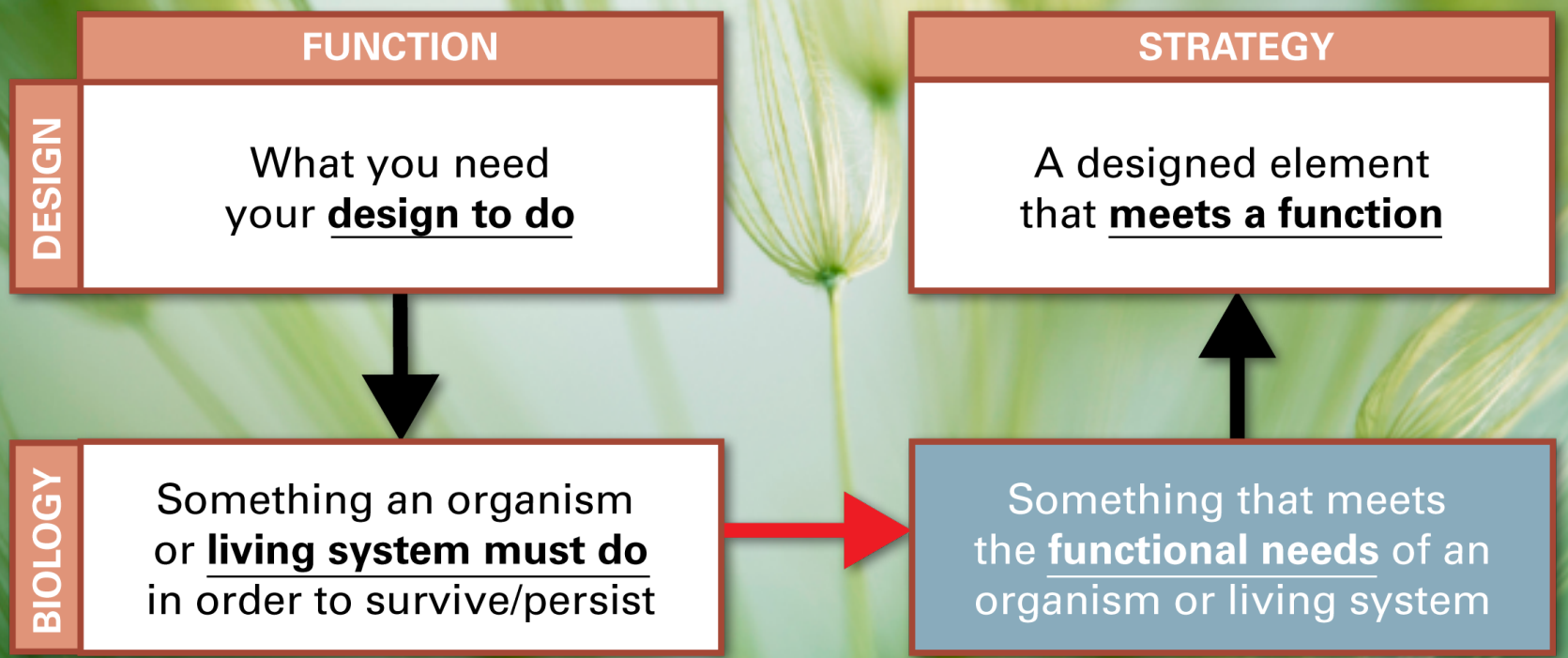
CREATE: From Inspiration to Application

Biomimicry and Science: Applying Nature's Strategies

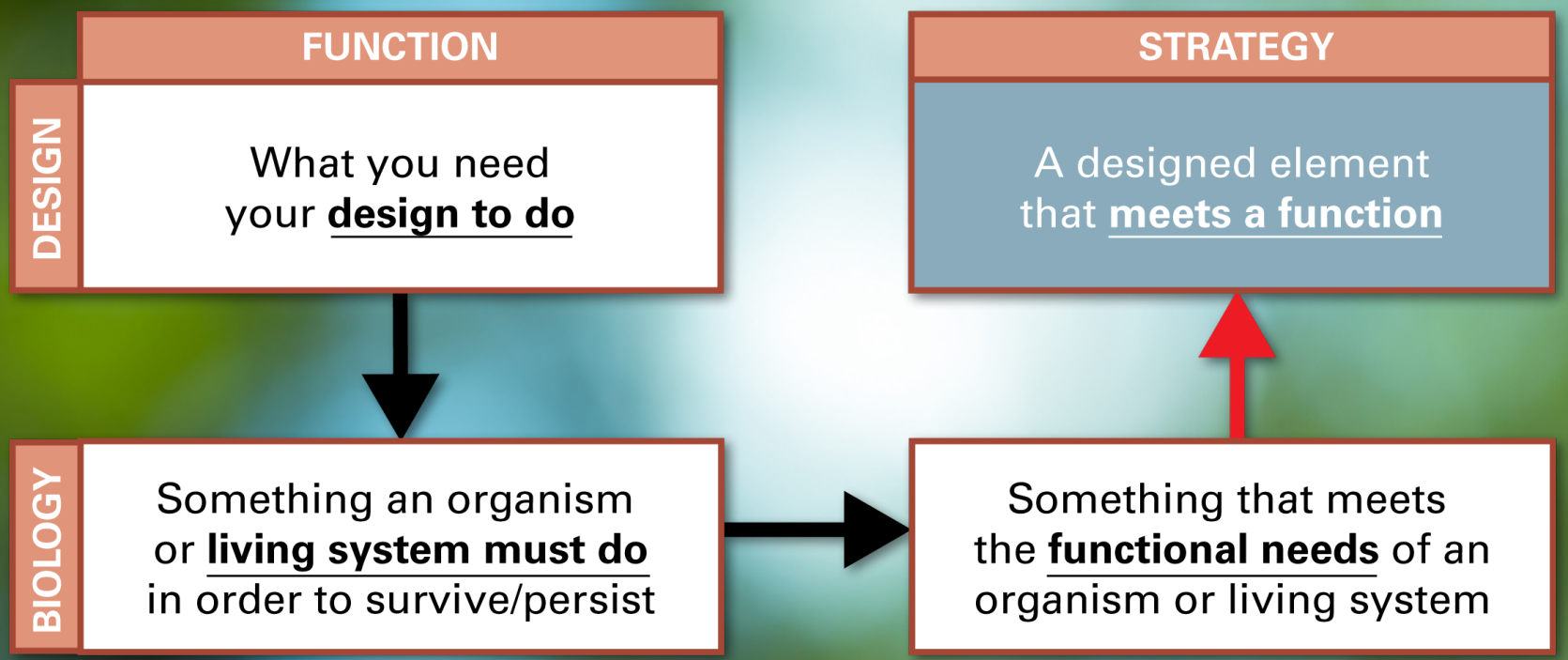
Linking Biology and Design



Linking Biology and Design



Design-ifying Biology



Design Strategy

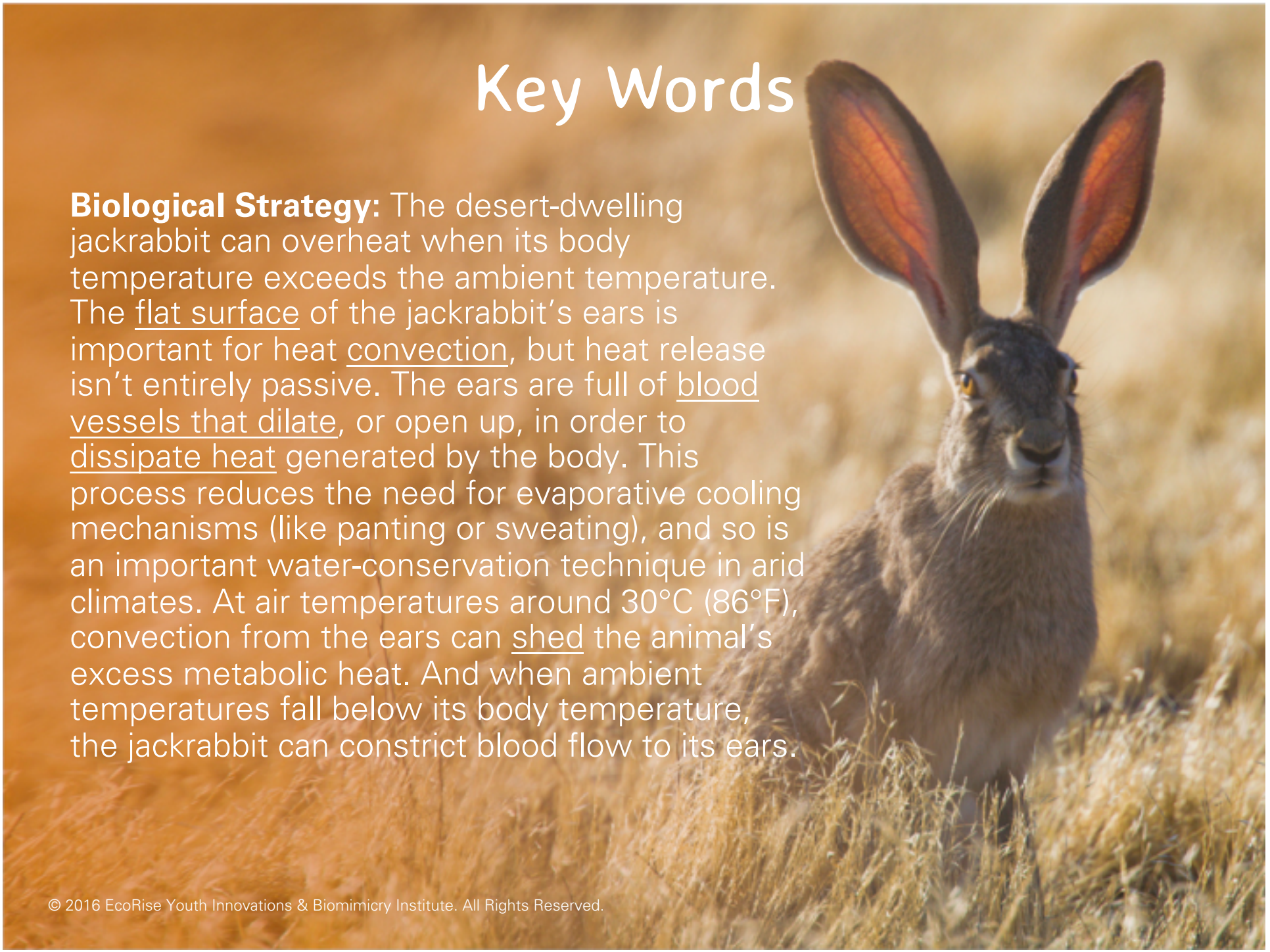
Design Strategy

A roof keeps rainwater out by having a slanted structure covered with pieces of flat, waterproof material overlapping top-to-bottom and side-to-side so water doesn't seep into spaces between the pieces.

Summarize

Biological Strategy: The desert-dwelling jackrabbit can overheat when its body temperature exceeds the ambient temperature. The flat surface of the jackrabbit's ears is important for heat convection, but heat release isn't entirely passive. The ears are full of blood vessels that dilate, or open up, in order to dissipate heat generated by the body. This process reduces the need for evaporative cooling mechanisms (like panting or sweating), and so is an important water-conservation technique in arid climates. At air temperatures around 30°C (86°F), convection from the ears can shed the animal's excess metabolic heat. And when ambient temperatures fall below its body temperature, the jackrabbit can constrict blood flow to its ears.

Key Words



Biological Strategy: The desert-dwelling jackrabbit can overheat when its body temperature exceeds the ambient temperature. The flat surface of the jackrabbit's ears is important for heat convection, but heat release isn't entirely passive. The ears are full of blood vessels that dilate, or open up, in order to dissipate heat generated by the body. This process reduces the need for evaporative cooling mechanisms (like panting or sweating), and so is an important water-conservation technique in arid climates. At air temperatures around 30°C (86°F), convection from the ears can shed the animal's excess metabolic heat. And when ambient temperatures fall below its body temperature, the jackrabbit can constrict blood flow to its ears.

Key Concepts

Heat convection

Flat surface full of blood vessels

Vessels that dilate to dissipate heat

Vessels that constrict to conserve heat

Translate Key Concepts

BIOLOGY

Heat convection →

Flat surface full of blood vessels →

Vessels that dilate to dissipate heat →

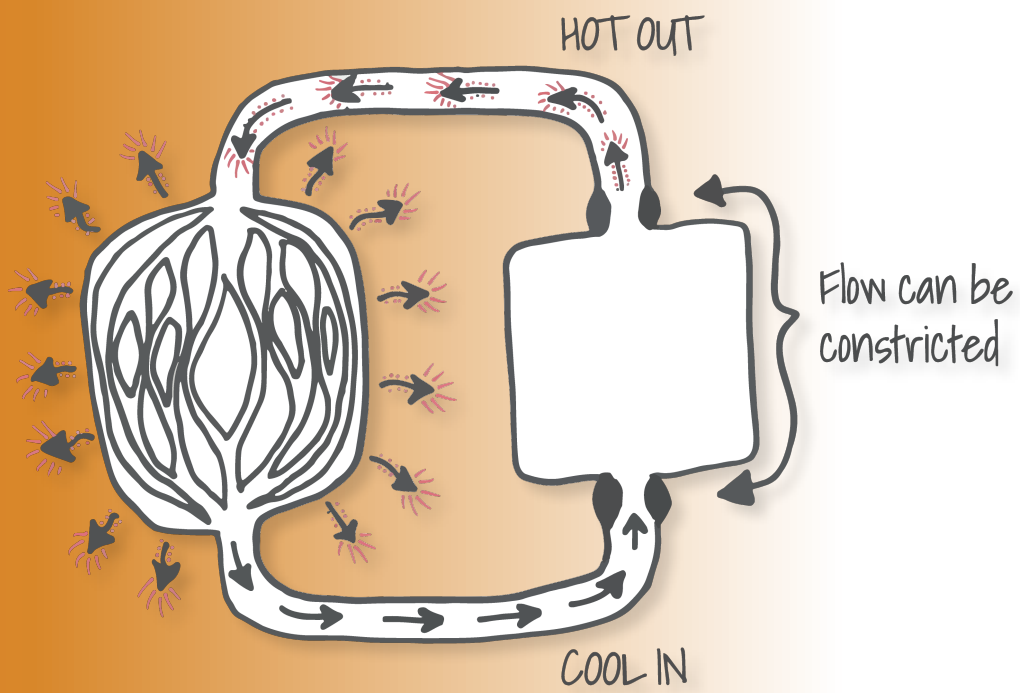
Vessels that constrict to conserve heat →

Translate Key Concepts

BIOLOGY		DESIGN
Heat convection	→	Heat convection
Flat surface full of blood vessels	→	Thin membrane with small tubes full of liquid
Vessels that dilate to dissipate heat	→	Tubes that open to dissipate heat
Vessels that constrict to conserve heat	→	Tubes that close to conserve heat

Design Strategy

The temperature of an object can be regulated using heat convection by having a system of small tubes that carry liquid from the object through a thin membrane. When the object is hot, the tubes allow the heat to dissipate from the liquid into the cooler air. When the object is cold, these tubes can close to prevent heat loss.



Biological Strategy > Design Strategy

Version 1:
The desert-dwelling jackrabbit can overheat when its body temperature exceeds the ambient temperature. The flat surface of the jackrabbit's ears is important for heat convection, but heat release isn't entirely passive. The ears are full of blood vessels that dilate, or open up, in order to dissipate heat generated by the body. This process reduces the need for evaporative cooling mechanisms (like panting or sweating), and so is an important water-conservation technique in arid climates. At air temperatures around 30°C (86°F), convection from the ears can shed the animal's excess metabolic heat. And when ambient temperatures fall below its body temperature, the jackrabbit can constrict blood flow to its ears.

Version 2:
The temperature of an object can be regulated using heat convection by having a system of small tubes that carry liquid from the object through a thin membrane. When the object is hot, the tubes allow the heat to dissipate from the liquid into the cooler air. When the object is cold, these tubes can close to prevent heat loss.