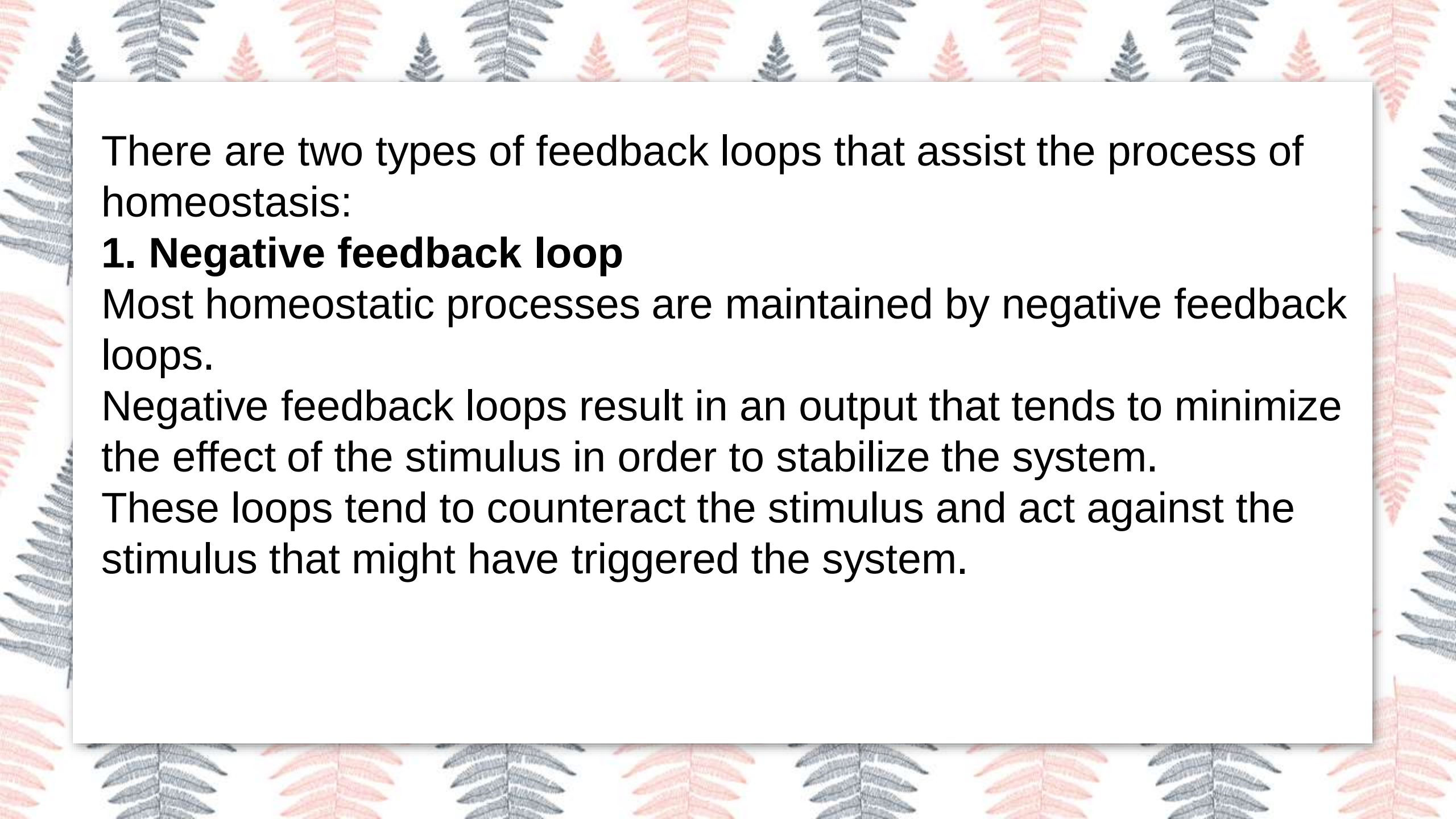




Feedback Control Systems

Introduction

Feedback control system or feedback loop is a biological system that helps to maintain homeostasis where the result of the system either enhances the system (positive feedback) or inhibits the system (negative feedback). The feedback loop is activated when a change in a system results in an alarm that triggers an output. The output either supports the change or inhibits it.



There are two types of feedback loops that assist the process of homeostasis:

1. Negative feedback loop

Most homeostatic processes are maintained by negative feedback loops.

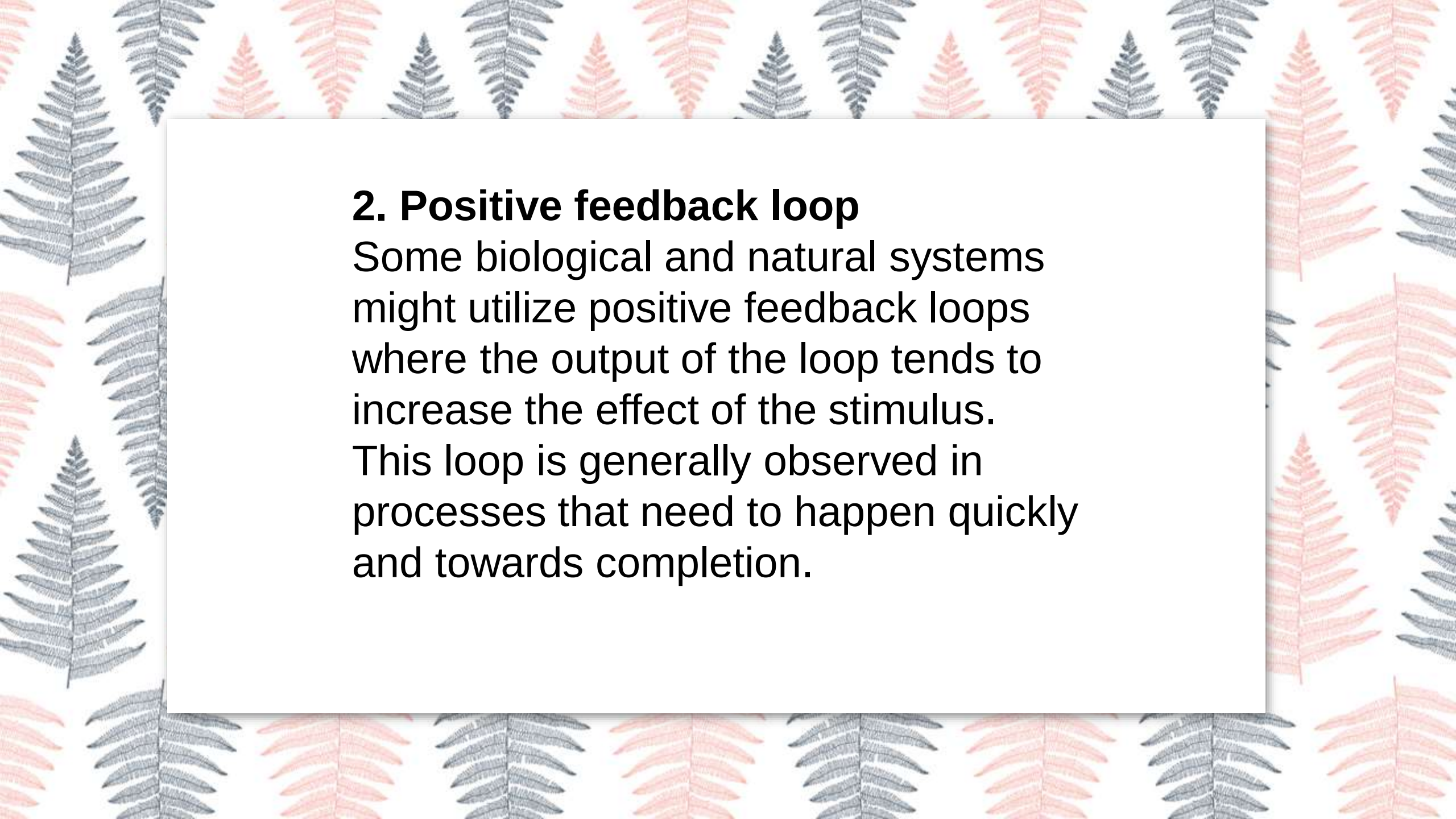
Negative feedback loops result in an output that tends to minimize the effect of the stimulus in order to stabilize the system.

These loops tend to counteract the stimulus and act against the stimulus that might have triggered the system.

Negative feedback loops are activated under two conditions; In the first case, the activation is caused when the value of a variable (like body temperature) is above its normal value and thus has to be brought back down.

Under the other conditions, the activation is caused when the value of the variable is below the normal value and thus has to be brought back up.

An example of a negative feedback loop is the production of RBCs by the kidneys when the decreased level of oxygen is sensed in the body. Negative feedback loops might occur in nature like in the case of carbon cycle where the cycle is balanced according to the concentration of carbon emission.



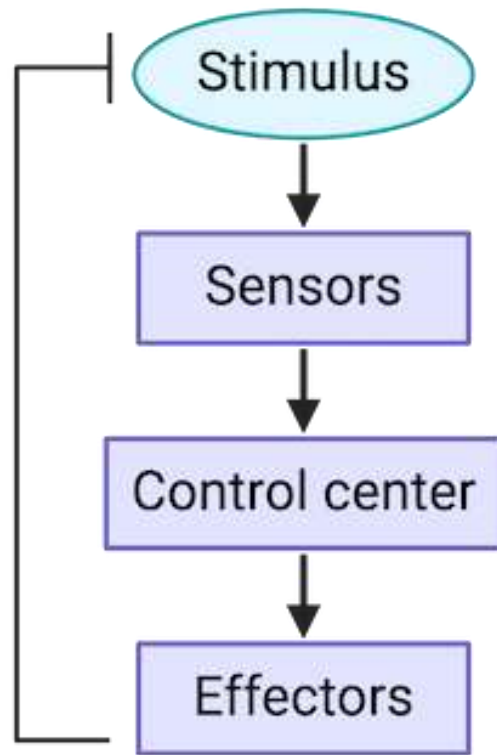
2. Positive feedback loop

Some biological and natural systems might utilize positive feedback loops where the output of the loop tends to increase the effect of the stimulus. This loop is generally observed in processes that need to happen quickly and towards completion.

Thus, positive feedback loops tend to move the process towards completion rather than towards equilibrium.

An example of a positive feedback loop in the body is the process of childbirth. In this case, as the baby's head pushes the cervix, the neurons in that region are activated. This causes the brain to send signals to produce oxytocin which further increases the uterine contractions putting more pressure on the cervix, facilitating childbirth. Positive feedback loops, like negative loops, can be observed in nature during the ripening of the fruits in trees. After the ripening of one fruit, it gives off ethylene gas that when exposed to the nearby fruits, ripens them as well.

Negative feedback loop



Positive feedback loop

