

## Ecological Significance of Symbiosis in the Natural World

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### DESCRIPTION

Symbiosis, a term coined by the 19<sup>th</sup>-century German mycologist Heinrich Anton de Bary, refers to the intricate and often mutually beneficial relationships that exist between different species in the natural world.

These partnerships are fundamental to the functioning of ecosystems and have evolved over millions of years. Symbiosis showcases the remarkable adaptability and interconnectedness of life on Earth. This article discusses about the world of symbiosis, its various forms, and its significance in maintaining ecological balance.

### Types of symbiosis

Symbiotic relationships can take various forms, each with its own unique set of benefits and interactions. The three most common types of symbiosis are mutualism, commensalism, and parasitism.

**Mutualism:** Mutualism is perhaps the most celebrated form of symbiosis, where both species involved benefit from the relationship. An iconic example of mutualism is the partnership between bees and flowering plants. Bees pollinate the flowers while collecting nectar for themselves, aiding in the reproduction of the plants. Similarly, nitrogen-fixing bacteria living in the roots of leguminous plants, such as peas and beans, provide the plants with essential nitrogen compounds, while receiving carbohydrates in return.

**Commensalism:** Commensalism describes a relationship where one species benefits while the other neither benefits nor is harmed. An example is the relationship between barnacles and whales. Barnacles attach themselves to the skin of whales, using the whale's movement to disperse their larvae. While the barnacles benefit from the transportation, the whales are not significantly affected by their presence.

**Parasitism:** Parasitism is a relationship where one species, the parasite, benefits at the expense of the host species, which is harmed in the process. Tapeworms in the intestines of mammals and blood-sucking parasites like ticks and fleas are classic examples of parasitic relationships. While these parasites derive

sustenance from the host, they can weaken or even kill the host in severe cases.

### Ecological significance of symbiosis

Symbiotic relationships play a crucial role in maintaining ecological balance and promoting biodiversity.

**Nutrient cycling:** Mutualistic relationships involving microorganisms, such as mycorrhizal fungi and nitrogen-fixing bacteria, facilitate the absorption of essential nutrients by plants. This nutrient cycling is essential for the growth and development of vegetation in ecosystems.

**Ecosystem services:** Symbiotic relationships contribute to the provision of ecosystem services, such as pollination, which is vital for the production of fruits and vegetables. Without the assistance of pollinators like bees, many plant species would struggle to reproduce.

**Defence mechanisms:** Some symbiotic partnerships involve one species protecting another. Acacia trees in Africa, for instance, host ants in their hollowed-out thorns. The ants protect the tree from herbivores, and in return, the tree provides shelter and nectar for the ants.

**Adaptation and evolution:** Symbiotic relationships drive adaptation and evolution in species. Coevolution occurs when two or more species exert selective pressures on each other, leading to changes in both over time. An example of this is the coevolution between predator and prey species, where each side develops strategies to outwit the other.

**Keystone species:** Certain species in symbiotic relationships can function as keystone species, meaning they have a disproportionate impact on the ecosystem. For instance, sea otters feed on sea urchins, which are herbivores that graze on kelp. Without sea otters, the kelp forests would be overgrazed, affecting the entire ecosystem.

**Human impacts on symbiosis:** Unfortunately, human activities can disrupt symbiotic relationships and harm ecosystems. Deforestation, pollution, and habitat destruction threaten the habitats of species that rely on symbiosis for survival. Climate change can also disrupt these relationships as changing

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temperatures and weather patterns affect the distribution of species. In agriculture, the use of pesticides can harm pollinators like bees and disrupt the mutualistic relationships between plants and their pollinators. Similarly, the overuse of antibiotics in medicine and agriculture can lead to the emergence of antibiotic-resistant bacteria, disrupting the balance between host organisms and their symbiotic microbes. Symbiosis is a testament to the intricate web of life on Earth. It showcases the beauty of

partnerships in nature, from the collaborative efforts of bees and flowers to the complex dance of predator and prey. Understanding and preserving these relationships is essential for maintaining ecological balance and biodiversity. As humans, we must recognize the importance of symbiosis and strive to protect the delicate bonds that underpin the health and resilience of our planet's ecosystems.