Phosphorescence Encyclopedia Article

Phosphorescence

The following sections of this BookRags Literature Study Guide is offprint from Gale's For Students Series: Presenting Analysis, Context, and Criticism on Commonly Studied Works: Introduction, Author Biography, Plot Summary, Characters, Themes, Style, Historical Context, Critical Overview, Criticism and Critical Essays, Media Adaptations, Topics for Further Study, Compare & Contrast, What Do I Read Next?, For Further Study, and Sources.

(c)1998-2002; (c)2002 by Gale. Gale is an imprint of The Gale Group, Inc., a division of Thomson Learning, Inc. Gale and Design and Thomson Learning are trademarks used herein under license.

The following sections, if they exist, are offprint from Beacham's Encyclopedia of Popular Fiction: "Social Concerns", "Thematic Overview", "Techniques", "Literary Precedents", "Key Questions", "Related Titles", "Adaptations", "Related Web Sites". (c)1994-2005, by Walton Beacham.

The following sections, if they exist, are offprint from Beacham's Guide to Literature for Young Adults: "About the Author", "Overview", "Setting", "Literary Qualities", "Social Sensitivity", "Topics for Discussion", "Ideas for Reports and Papers". (c)1994-2005, by Walton Beacham.

All other sections in this Literature Study Guide are owned and copyrighted by BookRags, Inc.

Contents

Phosphorescence Encyclopedia Article.....1

Contents.....2

Phosphorescence.....3

Phosphorescence

Phosphorescence is the extended emission of electromagnetic **radiation** (**light**) following excitation or the emission of light without the production of significant **heat** (e.g., in the bioluminescence of fireflies).

Materials that display a persistent afterglow are commonly said to exhibit phosphorescence. The term is derived from *phosphors*, a class of well-known phosphorescent materials. When a luminescent molecule or **atom** absorbs light **quanta** in the ultra-violet or visible region of the **electromagnetic spectrum**, electrons are promoted to a higher **energy** state called an excited state. The radiation absorbed can be emitted either in the form of **fluorescence** or phosphorescence or both. If the ground state is a singlet state, and emission occurs from an excited singlet state, the emission is referred to as fluorescence. But if the emission occurs from an excited electronic state which undergoes a change of spin to a triplet state, the process is called phosphorescence. Singlet to triplet transitions are forbidden under quantum mechanical selection rules and electrons achieve this triplet state via intersystem crossing. This is why phosphorescence occurs on a much slower timescale than fluorescence, ranging between 10 ~~-4~~ seconds to hours.

The following Jablonski diagram illustrates the processes involved in phosphorescence.

Many aquatic organisms exhibit marine phosphorescence, from bacteria to phytoplankton to jellyfish and deep-sea organisms. Most emit a blue-green phosphorescence in a region of the electromagnetic spectrum which is highly visible in deep and dark waters. Marine phosphorescence is an almost ubiquitous phenomenon in the oceans, it helps marine organisms survive by providing them with a means to search for nutrients and defend themselves against predators. The study of marine luminescent organisms is a very active field of research, providing valuable insights on marine ecology, since it can be used as a tool to determine how these organisms live and how they are affected by factors such as light, pollution and salinity of the ocean.

In contrast, very few land species are phosphorescent, a well-known example is the common firefly, *Photinus pyralis*, which emits a yellow-green light (at a **wavelength** of 562 nm) that scientists assert provides the insect with a means of communication.