Coherence and Incoherence Encyclopedia Article

Coherence and Incoherence

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

Coherence and Incoherence Encyclopedia Article.....1

Contents.....2

Coherence and Incoherence.....3

Coherence and Incoherence

Coherence is the degree to which the difference in phase between two or more **waves** is constant over some region of time or **space**.

Beams of wave **radiation** from two sources are said to be mutually coherent when the difference between the phases of the two waves is constant. Coherence is necessary for the observation of **interference**, as in Thomas Young's slit experiment. In an interference experiment, the signal **power** (square of the wave amplitude) will be constant provided the phase difference between interfering waves does not change.

Perfect self-coherence describes the case when the phase difference of all waves in some beam of radiation is constant over all time and space. Maximally incoherent radiation is the superposition of waves such that the phase difference between interfering waves is random. Then the phase of the entire signal, the superposition of waves, is ill-defined. Most **natural radiation** has intermediate coherence.

Very coherent and very incoherent signals are commonly obtained in the laboratory. Sources of thermal noise commonly produce very incoherent radiation. For example, blackbodies emit incoherent **light**; similarly, a source of acoustic white noise radiates incoherent **sound** waves, and the Johnson noise in a resistor produces incoherent electrical signals. On the other hand, slitted screens and beam splitters are used to produce multiple beams that are mutually coherent. Highly coherent (i.e. self-coherent) light is most often obtained from lasing devices (**lasers**, masers, etc.). Stimulated emission, the process by which lasers amplify a given light **frequency**, duplicates the phase and frequency of an incoming **photon** in two outgoing photons. All photons produced then share a common phase, together comprising a very coherent laser beam.

Coherence length and *coherence time* are quantities which describe the interval of length or time for which the coherence of a beam of waves is acceptably high for a given purpose. The coherence time of a beam with a bandwidth of frequencies [b.delta] is approximately equal to 1/[b.delta]f.