Journal of Advances in Science and Technology

Vol. 10, Issue No. 21, February-2016, ISSN 2230-9659

PHOTONS (LIGHT) AND THEIR PSYCHOLOGICAL IMPACT

AN INTERNATIONALLY INDEXED PEER REVIEWED & REFEREED JOURNAL

www.ignited.in

Journal of Advances in Science and Technology
Vol. 10, Issue No. 21, February-2016, ISSN 2230-9659

Photons (Light) and Their Psychological Impact

Dr. Pratibha Shrivastava

Department of Psychology, Govt. Girls P.G. College, Ujjain, M.P., India

Abstract – Although interference is intrinsically a classical wave phenomenon, the superposition principle which underlies all interference is also at the heart of quantum mechanics. Feynman has referred to interference as really "the only mystery" of quantum mechanics. Furthermore, in some interference experiments we encounter the idea of quantum entanglement, which has also been described as really the only quantum mystery. Clearly interference confronts us with some quite basic questions of interpretation. Despite its long history, going back to Thomas Young at the beginning of the 19th century, optical interference still challenges our understanding, and the last word on the subject probably has not yet been written. With the development of experimental techniques for fast and sensitive measurements of light, it has become possible to carry out many of the Gedanken experiments whose interpretation was widely debated in the 1920s and 1930s in the course of the development of quantum mechanics. Although this article focuses entirely on experiments with light, interference has also been observed with many kinds of material particles like electrons, neutrons, and atoms. For a given metal, there exists a certain minimum frequency of incident radiation below which no photoelectrons are emitted. This frequency is called the threshold frequency. Increasing the frequency of the incident beam and keeping the number of incident photons fixed increases the maximum kinetic energy of the photoelectrons emitted. The number of electrons emitted also changes because the probability that each impacting photon results in an emitted electron is a function of the photon energy. However, if just the intensity of the incident radiation is increased, there is no effect on the kinetic energies of the photoelectrons.If the photon energy is too low, the electron is unable to escape the material. Increasing the intensity of the light increases the number of photons in the beam of light and thus increases the number of electrons excited but does not increase the energy that each electron possesses. The energy of the emitted electrons does not depend on the intensity of the incoming light (the number of photons), only on the energy or frequency of the individual photons. It is strictly an interaction between the incident photon and the outermost electron.

Keywords – Interference, Kinetic-Energy, Photoelectrons, Photons, Radiation, Threshold-Frequency

----------♦----------

INTRODUCTION

Lighting practitioners work hard at getting the stimulus right to attain a desired response. Historically, that has in large part meant a detailed and careful characterization of visual tasks under different lighting conditions - the stimulus – and a variety of important methods for measuring visual performance as those conditions are varied – the response. From Blackwell's Visibility Level to Rea's models of Relative Visual Performance, we have learned much about the nature of the stimulus-response relationships relating to human visual performance.

Lighting modes & subjective impressions

For most lighting practitioners, the phrase "Lighting psychology" immediately brings to mind the work of the late John Flynn. Flynn's research has been widely documented and discussed within the lighting community .Flynn and his colleagues explored what were at the time new research and analytical techniques, in an attempt to document and understand the full range of human impacts of lighting.

EXPERIMENT WORK

In 1971, Philip Zimbardo of Stanford University conducted his famous prison experiment, which aimed to examine group behavior and the importance of roles. Zimbardo and his team picked a group of 24 male college students who were considered "healthy," both physically and psychologically. The men had signed up to participate in a "psychological study of prison life," which would pay them $15 per day. Half were randomly assigned to be prisoners and the other half were assigned to be prison guards. The experiment played out in the basement of the Stanford psychology department where Zimbardo's team had created a makeshift prison. The experimenters went to great lengths to create a

realistic experience for the prisoners, including arrests that are fake at the participants' homes.

The prisoners were given a fairly standard introduction to prison life, which included being deloused and assigned an embarrassing uniform. The guards were given vague instructions that they should never be violent with the prisoners, but needed to stay in control. The first day passed without incident, but the prisoners rebelled on the second day by barricading themselves in their cells and ignoring the guards. This behavior shocked the guards and presumably led to the psychological abuse that followed. The guards started separating "good" and "bad" prisoners, and doled out punishments including push ups, solitary confinement, and public humiliation to rebellious prisoners.

RESULTS

Zimbardo explained, "In only a few days, our guards became sadistic and our prisoners became depressed and showed signs of extreme stress." Two prisoners dropped out of the experiment; one eventually became a psychologist and a consultant for prisons. The experiment was originally supposed to last for two weeks, but it ended early when Zimbardo's future wife, psychologist Christina Maslach, visited the experiment on the fifth day and told him, "I think it's terrible what you're doing to those boys."

Despite the unethical experiment, Zimbardo is still a working psychologist today. He was even honored by the American Psychological Association with a Gold Medal Award for Life Achievement in the Science of Psychology in 2012.

DISCUSSION

Flynn examined the human response to lighting by studying an array of subjective impressions related to architectural settings, in order to determine which of those impressions were affected by changes in the lighting stimulus. For some impressions, changes in the lighting produced significant changes in the response – impressions such as spaciousness, visual clarity, privacy, pleasantness, relaxation, complexity. By linking lighting to these impressions, Flynn demonstrated that architectural lighting plays a much more significant role in the human experience than simply as an enabler of task performance.

Flynn also sought to understand the nature of the stimulus that produced those responses. Which attributes of lighting in a space seemed to relate to the various impressions that could result? Flynn identified four of these attributes, which he called the "lighting modes." The modes each express a continuum of changes in lighting between two extremes. Flynn's lighting modes express the basic parameters of lighting which designers manipulate in creating the environments they desire – bright / dim, uniform / non-uniform, central / perimeter, and warm / cool. Flynn's message was that as you change the lighting stimulus along these dimensions, you will produce changes in the human response in terms of the impressions that are reinforced. And – importantly – these responses will occur whether you planned for them or not.

In Russell's model the primary emotional responses to the environment determine the behavioral responses. According to this model, human sensory systems process the environment and characterize the relationships between various aspects of the stimulus. This sensory input combines with personality characteristics to produce primary emotional responses in three areas – the pleasure that a person finds in the environment, the amount of arousal or stimulation that the environment provides, and the extent of dominance or control that people feel they have while in the environment.

ACKNOWLEDGEMENT

This research was supported by various books on psychological impacts of photons. I would like to thank all my colleagues from my Dept. who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper.

CONCLUSION

The dominance response has some fascinating implications for lighting, as it depends on how much control we feel we have over the environment compared to how much we feel the environment controls us. The connections to automatic vs. manual lighting controls are intriguing. We've seen studies that document greater energy savings when people have manual control, and we all know stories of negative reactions to fully automatic controls. We may be able to weave this thread together with the Kaplan's "desire for involvement" thread to derive a general principle about human reactions to environments. But, that exploration is beyond our scope for now.

Ultimately, Russell settled on the pleasure and arousal emotions as the two primary ways that we respond to environments. In Russell's view, whenever we enter a new environment, we quickly place it into one of four quadrants that are defined by the two axes of pleasure and arousal. This structure is shown in the figure below.

We can think of many open questions that remain. Can we map the Flynn modes onto the Russell emotional responses? That is, what attributes of the lighting cause a space to seem more stimulating? Or less pleasant? Does increasing complexity as defined by Kaplan lead to higher levels of arousal? At what point does this increased complexity begin to compromise coherence, producing a less desirable emotional response? These are all important and

intriguing questions to explore as we seek to better understand the human brain on lighting.

RERFERENCES

1. http://www.ledinside.com/knowledge/2013/12/lighting_psychology_cognitive_and_emotional_responses_to_lighting

2. http://mentalfloss.com/article/52787/10-famous-psychological-experiments-could-never-happen-today

3. https://books.google.co.in/booksid=EVAyBwAAQBAJ&pg=PA24&lpg=PA24&dq=photons+experiment+work+with+psychology&source=bl&ots=HTlw28WdtQ&sig=kC8QQNsjoi9g3GrcnpgPPPk0n3M&hl=en&sa=X&ved=0ahUKEwj7iPHjurPLAhWScY4KHdVIBnIQ6AEILjAE#v=onepage&q=photons%20experiment%20work%20with%20psychology&f=false