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Equations of Light - The STEAM Journal Inaugural Issue, the Cover Art

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Abstract

This is the background to some of the work, art and thinking that went into the cover art for the inaugural issue.

Author/Artist Bio

Chris Brownell began his career teaching High School and Community College Mathematics, every subject from General Math through AP Calculus, in Fresno CA. After 14 years of that he turned to the collegiate level when he became an Assistant Professor of Mathematics and Mathematics Education at Fresno Pacific University. Now after 11 years of university teaching he is pursuing his doctorate in Mathematics Education at CGU focused on the mathematical knowledge of teachers, and the integration of Applied Mathematics to the High School experience of students. His research interests include: Fractals as Artistic and Mathematical constructs, the History of Mathematics, Humanistic Mathematics, and is deeply interested in the creative acts of the human mind whether they be in the Arts or STEM fields. Please see cgu.edu/steam to access bios of the entire team behind the cover.

Keywords

STEAM, Claremont Graduate University, Art, Mathematics, Cover, Teams, Transdisciplinary

Cover Page Footnote

To learn more about the entire cover team for inaugural issue please visit cgu.edu/steam

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Equations of light

The STEAM Journal inaugural issue, the cover art

Chris Brownell

The cover art for the inaugural edition of The STEAM Journal has a series of four equations in the background. Most physicists will recognize them right away as being what have become known as Maxwell's Equations, and specifically these are in their integral forms (there are several variety of these equations each equivalent to the other, however given the context one variety is more readily exploited than another form.) For those who are not physicists these equations have a rich history and great importance to the study of modern physics. These equations represent a very elegant and concise way to state the fundamental properties of electricity and magnetism. They are considered elegant within the physics world because they embody an aesthetic of concision and power both. From these equations most of the working relationships in the field of electro-magnetism can be built-up.

Interestingly enough, their history is akin to that of the goals of The STEAM Journal, one of collaboration and integration. While they are nearly universally referred to as Maxwell's Equations, their story is definitely one of collaborative efforts. The first and second equations were actually first identified and published by Carl F. Gauss the first is known as Gauss's Law of Electricity and the second his Law for Magnetism. The third equation is named Faraday's Law of Induction, named for Michael Faraday (a property anyone who has a cordless toothbrush that charges without a direct wired connection can appreciate.) In the fourth equation everything you see reading from left to right is actually known as Ampere's Law until you get to the + sign; from that symbol on is what is known as Maxwell's Correction or Constant. These four equations were used extensively in James Clerk Maxwell's paper titled; "On Physical Lines of

Force” and they included his correction. Four people contributed to these equations in collaboration across time and space. What Maxwell’s equations do for the study of Electricity and Magnetism is demonstrate that the fields created by either electric or magnetic charges propagate across empty space as waves and further that these waves travel at the speed of light.

Continuing the collaboration, Albert Einstein makes use of these equations to demonstrate that the one constant in the universe is the speed of light in a vacuum. All other measurable quantities are in fact relative to the speed or position of the observer, in short these equations are at the bedrock of what is now known as Einstein’s Special Relativity. These four equations integrate several fields together into one concept, one central overarching idea.

Light is, it can be argued, at the core of the visual arts. Its study, its play on objects, its illuminating of perspectives is part and parcel of what the visual arts employ and represent. Light is therefore a place where Science and Art come together to integrate their studies, to collaborate on their subject. In this then Maxwell’s Equations are at the core of the various expressions encompassed by STEAM.

Working across disciplines to collaborate on this project for the cover art allowed for a multitude of responses to discussion questions such as ‘how does light play a role in your field?’

The STEAM Journal inaugural issue team is listed below:

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