ABSTRACT
In electromagnetism and optics, the Stokes-Helmholtz law of reciprocity states that light traveling through an optical system composed of active and non-magnetic components (such as lenses, mirrors, and prisms) would experience the same amount of attenuation traveling from the source to the receiver as it would if the system was reversed; i.e. if light traveled from the receiver to the source. The statement of the law is a curious result considering that optical systems containing multiple components of variable characteristics admit different cones of energy—and yet it is a result we have come to accept on a daily basis: “If I can see you then you can see me.” We set out to examine whether the law holds for a simple optical arrangement of two fibers and two lenses each with different specifications (focal length, diameter etc.) than its pair; light will be passed through both ends of the system and measured at the respective output.

BACKGROUND
Reciprocity is a fundamental law in optics. However, it is a very curious result to witness that the strength of light received between two fibers that accept cones of energy of different sizes and travel through lenses of different focal length in reverse direction are basically the same. The result is non-intuitive and the question is whether or not this is true for a simple arrangement and to accurately explain why if this result could be invalidated for certain arrangements then it would be possible to construct a diode or a rectifier for light without employing the use of a Faraday rotator (a construction that is invalid for certain arrangements then it would be possible to construct a diode or a rectifier for light without employing the use of a Faraday rotator).

MATERIALS AND METHODS
The configuration of the experiment is that there are two fibers (one APC and the other PC) facing one another end to end. One fiber acts as a receiver for the light and the other fiber acts as a source for the light. In between the two fibers are two lenses; one is a set focal length and the other one is half of that set length. The configuration of the experiment is that there are two fibers (one APC and the other PC) facing one another end to end. One fiber acts as a receiver for the light and the other fiber acts as a source for the light. In between the two fibers are two lenses; one is a set focal length and the other one is half of that set length. The other materials are there to align the fibers in three dimensions.

RESULTS
When the light passes through the lenses closest to the fiber, it exits parallel to the optical axis, as shown below. When the light passes through the second lens, it is focused to a point on the second fiber itself to be measured, also seen below.

REFERENCES

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