LightTrans' talks at SPIE Optical Systems Design 2018

The Gouy phase shift reinterpreted via the geometric Fourier transform

Computational Optics
Thursday 17 May 2018 • 13:20 – 15:10 • paper 10694-26
Olga Baladron-Zorita, Zongzhao Wang, Christian Hellmann, Frank Wyrowski

Geometrical and physical optics, particularly when it comes to simulations of optical systems, tend to be presented as completely separate from each other, the links between the two tenuously acknowledged at best. However, when they are viewed for what they are—merely two different levels of approximation—it is evident that not only are they not separate, but that in fact the two types of behaviours very often coexist within the same system; what seemed like a clear barrier becomes a much blurrier affair, a grey area characterised by a gradual decrease in accuracy of the geometric model. The Gouy phase shift, being a physical phenomenon that is perched precisely on this figurative fence between geometric and diffractive behaviours, tends to cause fascination in the optics community, as it refuses to comply with the neat separation between the two models (geometric and physical) that characterises general perception. Re-evaluating the Gouy effect in the framework provided by the novel concept of geometric Fourier transform [Wyrowski and Hellmann, The geometric Fourier transform, In Proc. DGaO, A37, 2017] yields a logical, straight-forward interpretation for the "anomalous" phase, leading to a more nuanced understanding of the general theoretical context in the process.