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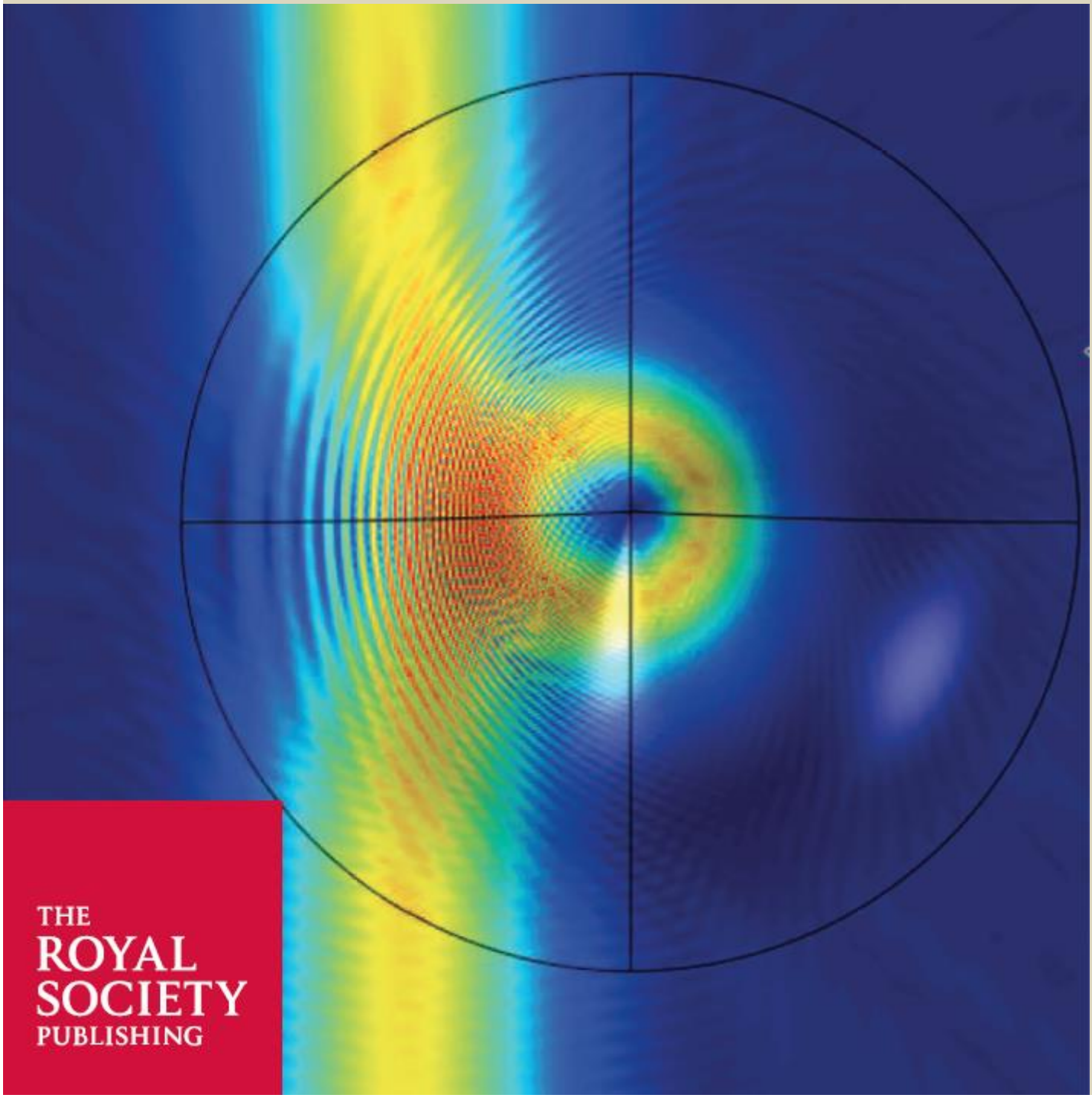
Spatial transformations: from fundamentals to applications

A theme issue compiled and edited by Robert Foster, Patrick Grant, Yang Hao, Alastair Hibbins, Thomas Philbin and Roy Sambles

Published July 2015. Available online and in print.



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Spatial transformations: from fundamentals to applications

This issue discusses the theory and application of spatial transformations to design devices for controlling waves. We often want a wave to follow a curved path, but these are more difficult to design. Spatial transformations offer a way of treating the curved path as straight, by treating space itself as curved. We then interpret the curved space as a material in the original space, where the material properties vary with position in that space. The spatial variation of these properties is calculated directly from the curvature of the second space. This area has attracted significant public interest due to the promise of optical invisibility. The potential applications are wider, however, including cloaking buildings from seismic waves. Spatial transformations provide unprecedented control of wave propagation and enable devices with functions never before possible. This issue considers topics ranging from basic theory, to fabrication issues, to the potential for radically new devices.

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Cover image: *An "invisible cone", from Fig. 3, Horsley et al., "Removing singular refractive indices with sculpted surfaces", Scientific Reports, 4, 4876, 2014*

Introduction