We should not raise the nation's medical costs to make a few universities and current practitioners wealthier unless there is a compelling public safety concern.

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Spatial coherence from ducks

It is not generally appreciated that radiation from uncorrelated random sources—for example, radiation generated by spontaneous emission of light by atoms—can produce a well-behaved, spatially coherent field over large regions. An illustration of this fact is the diffraction image of a star in the focal plane of a telescope. On a good observing night, the image will consist of a bright central spot surrounded by dark rings that represent regions in the focal plane where destructive interference cancels the light. This is a manifestation of strong correlation—a high degree of spatial coherence—between light fluctuations in the aperture of the telescope. The phenomenon illustrates the so-called van Cittert–Zernike theorem of optical coherence theory.[1,2]

In this letter we provide an example of the generation of spatial coherence. Thirteen Rouen ducks jump into a still one-acre pond, disturbing the surface at randomly distributed positions and times. The water surface exhibits an irregular, rather incoherent spatial pattern, as seen in panel a of the figure.[3] With increasing distance and time, the pattern evolves into a more regular one, as captured in panels b, c, and d, which clearly indicate the generation of spatial coherence in the far field from randomly distributed sources.

References

1. L. Mandel, E. Wolf, *Optical Coherence and Quantum Optics*, Cambridge U. Press, Cambridge, UK (1995), sec. 4.4.4.
2. E. Wolf, *Introduction to the Theory of Coherence and Polarization of Light*, Cambridge U. Press, Cambridge, UK (2007), sec. 3.2.
3. The pictures are from a 28-second video clip, available at http://www.youtube.com/watch?v=4o48J4streE.

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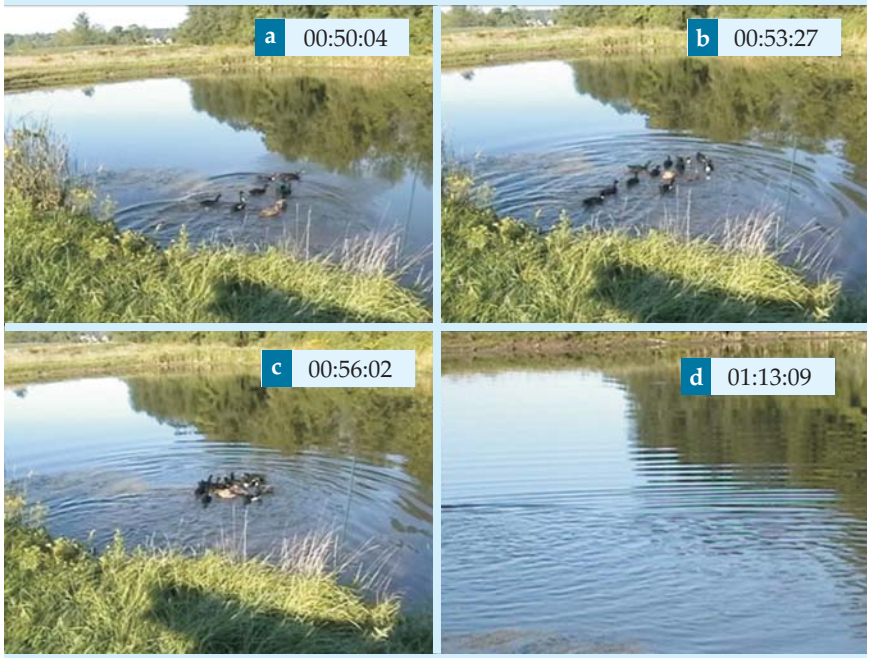
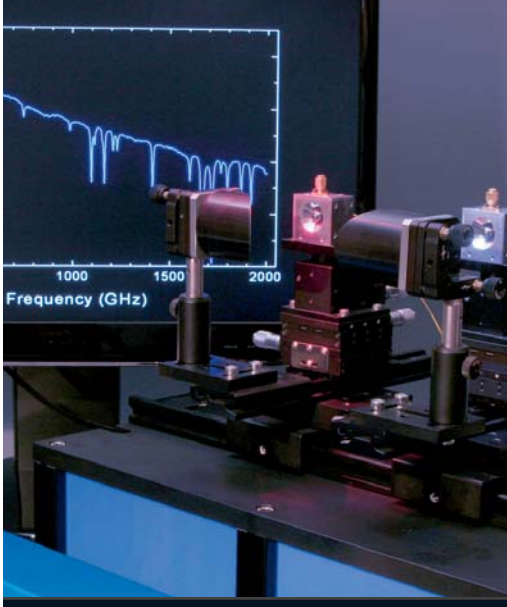
Correction

January 2010, page 23—The academic affiliation of Ahmed Zewail, one of three prominent US scientists who have agreed to serve as US science envoys to Muslim nations, was incorrect. Zewail is a professor at Caltech. ■



Generation of spatially coherent water waves from randomly distributed wave disturbances produced by 13 ducks jumping into a pool at time 00:47:12. The frame times are indicated.



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