Journal of Visualization, Vol. 11, No. 2 (2008) 112

Portfolio Paper

Optical Effects of Wake Liquid Vortices

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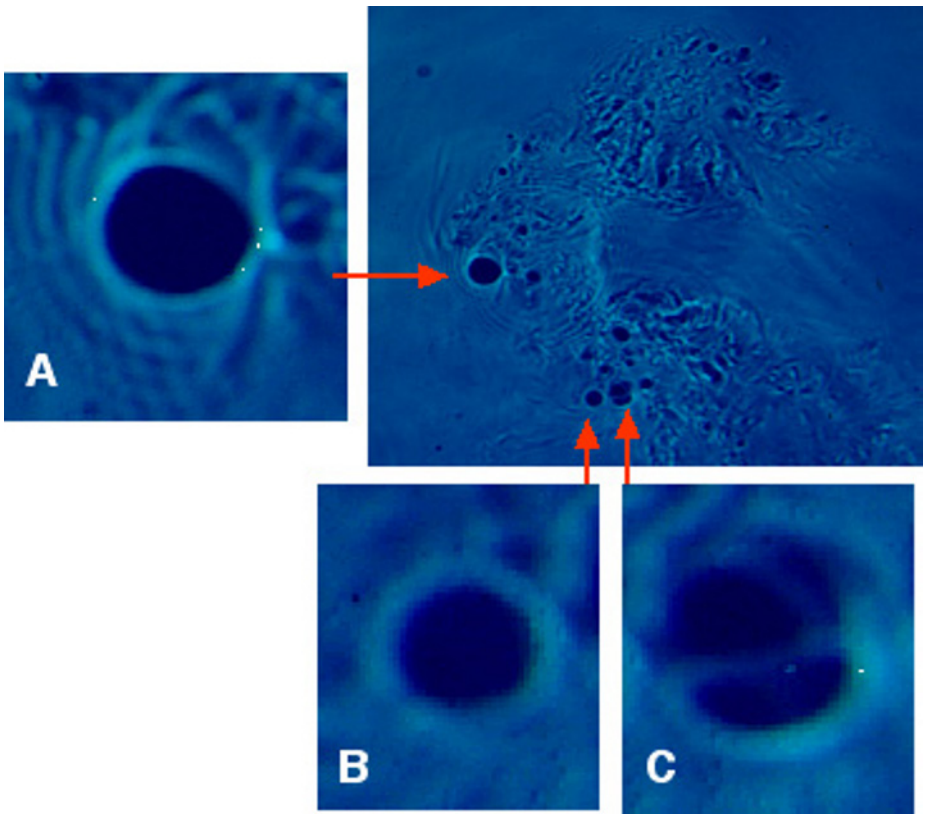
Received 2 September 2007 and Revised 26 November 2007



The above photograph, among other hydrodynamic displays, it captures the refracted shadows of a multitude of free surface, cusp shaped, vortices on the bottom of a swimming pool. Professor Kiehn while emerging from a pool in Brazil[(1)] noticed the intriguing optical properties associated with vortices of this kind. The present flow was generated in a large swimming pool using a thin wooden plank of approximately 20 cm in width. The board was first lowered into water; it was translated to the left, and then it was slowly fully withdrawn. The image, taken from above the swimming poor in sunshine, 40 seconds after the board was fully withdrawn, shows a snapshot of the highly dynamic translating wake development. A Nikon digital camera D50 was used to capture this image. Amongst some other fluid mechanical manifestations it also reveals that the field is infested by a swarm of hydraulic vortices. Appearing in both whirls of the enlargements (A) & (B) is the characteristic dark disk-halo optical pattern. Off course in (A) the corona is interacting with Kelvin's ripples (visible to the left of the vortex) produced by the moving pressure disturbance and other neighboring vortices. Magnification (C) depicts the early beginnings of a single vortex mutation into three vortices. Coalescence of vortices can also momentarily generate comparable refracted patterns.

Reference : (1) Sterling, M. H. et al., Phys. Fluids, 30-11 (1987), 3624.