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Why Do Elephants Flap Their Ears? MOISE KOFFI, LATIF JIJI, YIANNIS ANDREOPOULOS, City College of CUNY — It is estimated that a 4200 kg elephant generates as much as 5.12 kW of heat. How the elephant dissipates its metabolic heat and regulates its body temperature has been investigated during the past seven decades. Findings and conclusions differ sharply. The high rate of metabolic heat coupled with low surface area to volume ratio and the absence of sweat glands eliminate surface convection as the primary mechanism for heat removal. Noting that the elephant ears have high surface area to volume ratio and an extensive vascular network, ear flapping is thought to be the principal thermoregulatory mechanism. A computational and experimental program is carried out to examine flow and heat transfer characteristics. The ear is modeled as a uniformly heated oscillating rectangular plate. Our computational work involves a three-dimensional time dependent CFD code with heat transfer capabilities to obtain predictions of the flow field and surface temperature distributions. This information was used to design an experimental setup with a uniformly heated plate of size 0.2m x 0.3m oscillating at 1.6 cycles per second. Results show that surface temperature increases and reaches a steady periodic oscillation after a period of transient oscillation. The role of the vortices shed off the plate in heat transfer enhancement will be discussed.

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