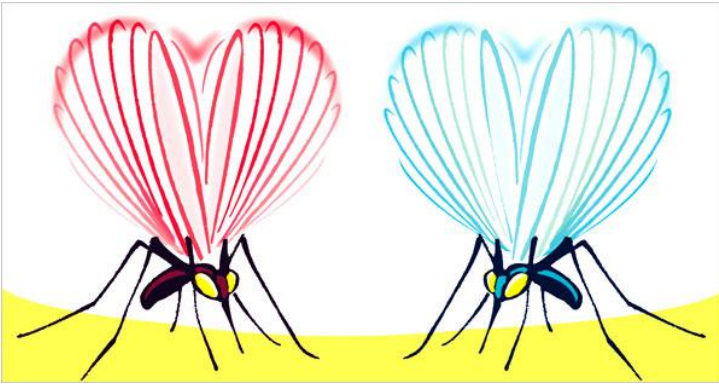


WAVES

Unit 22 Dr. John P. Cise Professor Of Physics , Austin Com. College , 1212 Rio Grande St., Austin Tx

78701 jpcise@austincc.edu New York Times January 13,2009 by Henry Fountain

For Mating Mosquitoes, ‘Harmonic Convergence’



A mosquito may not be anyone’s idea of a hopeless romantic, but the insect does produce a love song of sorts — the whine of its beating wings, resonating in a part of the body called the thoracic box. A female’s whine, at a fundamental frequency of 300 to 600 hertz, is enough to make a male mosquito swoon. **Dr. Hoy said both males and females raise their whines to about 1200 hertz(cycles/sec), which is a harmonic of the fundamental frequency of both the female (about 400) and male (about 600).** It’s the first time that such “harmonic convergence” has been shown to occur. He noted that the finding also disproved what scientists had long believed — that mosquitoes can’t hear above a certain frequency. “We all believed the ceiling to be 800 to 1000 hertz,” he said. Dr. Hoy said the behavior was probably a part of the sexual selection process. “Females are particularly picky,” he said. “A female is going to require of a courting male that he be able to match her flight tone.”

Introduction: Think the waves generated by male and female mosquitoes’ as similar to harmonic standing waves on strings. The first harmonic frequency is the fundamental frequency. The second harmonic is twice the frequency of the fundamental frequency. The third harmonic is three times the frequency of the fundamental frequency. Questions: (a) Sketch the first three harmonic standing waves of female mosquitoes? (b) Give the first three harmonic frequencies of a female mosquito? (c) Sketch the first two harmonic standing waves of a male mosquito? (d) Give the first two harmonic frequencies for the male mosquito? Which harmonic frequencies (first, second, third, fourth, etc) of the male and female mosquitoes are equal to the 1200 hertz needed for proper mating?

