

Disappearing homing pigeon mystery solved

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Feral Pigeon (*Columba livia domestica*) in flight. Credit: Alan D. Wilson/Wikipedia.

Homing pigeons are usually remarkably efficient navigators, however, on rare occasions, things go drastically wrong. So, when Jon Hagstrum of the US Geological Survey read in his local newspaper about two races when pigeons had been lost in 1998, he was reminded of a lecture by Bill Keeton that he had heard years before as an undergraduate at Cornell University.

Keeton had been studying how birds successfully navigated from distant and unfamiliar release sites. However, the birds almost always had problems selecting the correct bearing home when released from three local sites. According to Keeton, pigeons released at Castor Hill and the town of Weedsport consistently took the same wrong turn when they departed. Meanwhile, birds that were released from Jersey Hill tended to

head off in [random directions](#), but with one exception: all of the birds that departed from the hill on 13 August 1969 returned home successfully having taken the correct bearing. Explaining that Keeton had already ruled out the possibility of a disturbance in the local [magnetic field](#), Hagstrum recalls, 'Bill asked if we [geologists](#) had an idea what might be going on at these sites'.

Several years after Keeton's lecture Hagstrum came up with a possible solution to the problem when he read that pigeons can hear incredibly [low frequency](#) 'infrasound'. Explaining that infrasound – which can be generated by minute vibrations in the planet surface caused by waves deep in the ocean – travels for thousands of kilometres, Hagstrum wondered whether [homing pigeons](#) are listening for the distinctive low frequency rumble of their loft area to find their bearing home. In which case, birds that could not hear the infrasound signal, because the release site was shielded from it in some way, could not get their bearing and would get lost. Hagstrum decided to investigate the [meteorological conditions](#) on the days of unsuccessful releases to find out if there was something in the air that could explain the pigeons' disorientation. He publishes his discovery that Keeton's lost pigeons could not hear the infrasound signal from their home loft because it was diverted by the atmosphere in *The Journal of Experimental Biology*.

However, to make this discovery, Hagstrum had to first reconstruct the atmospheric conditions on the days when pigeons had been released from the three locations. Having successfully installed a complex acoustics program – HARPA – with the help of USGS computer scientist Larry Baker and using accurate temperature, wind direction and speed measurements taken at local weather stations on those days, Hagstrum reconstructed the atmospheric conditions. Then, he calculated how infrasound travelled from the loft through the atmosphere, refracting through layers in the air and bouncing off the ground, to find out if Jersey Hill was shaded from the loft's infrasound homing beacon

and how the signal from the loft was channelled by the wind and local terrain to Castor Hill and Weedsport.

Amazingly, on all of the days when the birds vanished from Jersey Hill, Hagstrum could see that the loft's infrasonic signal was guided away from the ground and high into the atmosphere: the birds could not pick it up. However, on 13 August 1969, the [atmospheric conditions](#) were perfect and this time the infrasonic signal was guided directly to the Jersey Hill site. And when he calculated the paths that the loft's infrasonic signal travelled to Castor Hill and Weedsport they also explained why the birds consistently took the wrong bearing. The terrain and winds had diverted the infrasound so that it approached the release site from the wrong direction, sending the birds off on the wrong bearing.

Explaining that the [birds](#) must use the loft's infrasonic homing beacon to get their bearing before setting the direction for their return flight according to their sun compass, Hagstrum says, 'I am a bit surprised that after 36 years I finally answered Bill Keeton's question to the Cornell Geology Department', adding that he is particularly pleased that he was able to use Keeton's own data to solve the mystery.

More information: Hagstrum, J. T. (2013). Atmospheric propagation modeling indicates homing pigeons use loft-specific infrasonic 'map' cues. *J. Exp. Biol.* 216, 687-699.

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