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TECH TALK

WINGED REPORTERS OF AIR POLLUTION LEVELS

BY GARY BEERS • FOR ENERGY PIPELINE

FIGURE 1



Member of Pigeon Air Patrol (2016).

PIGEON AIR PATROL (TECHNOLOGY + BIRDS + SOCIAL MEDIA)

IN MID-MARCH 2016, many media outlets reported a squad of racing pigeons, outfitted with backpacks (Figure 1) containing air-quality sensors (25 gm), performed a popular and clever marketing stunt to increase public awareness about London's urban air pollution problem. During the three-day test period earlier in the month, the "Pigeon Air Patrol" flew 100 to 150 feet above London while carrying sensors (cost \$250 each) able to measure nitrogen dioxide, ozone levels, volatile organic compounds, and location. In real time, the sensors tweeted the pollution data to the bird's account where people could follow along and tweet sensors for updates on local pollution data for a specific London neighborhood (location@PigeonAir).

The idea, proposed by a marketing agency (DigitasLBI), won a London Design Festival award in 2015. The agency teamed with Plume Labs, builder of the sensors, and an owner of racing pigeons. Plume Labs is crowdfunding the Plume Sensor, a personal air-quality monitor, which will be deployed on 100 human Londoners

to track their daily exposure to air pollution. This research project is called E-Plume and will involve the Imperial College of London ("This Team has built adorable tiny backpacks for pigeons to tack air pollution." R. Dillet. Tech Crunch, March 16 2016).

EARLIER EXAMPLES OF INCREASING ENVIRONMENTAL AWARENESS

This was not the first time pigeons have served as winged reporters of air quality to increase environmental awareness.

In the mid-2000s, Pigeonblog was a collaborative, grassroots effort in southern California between homing pigeons, artists engineers and pigeon fanciers to utilize sensor-packing pigeons to gather and electronically distribute information about air quality to the general public. This arts/science project was initiated by activists to help increase awareness of social injustice in urban, minority-based communities where local, low-level (less than 300 feet) air pollution levels were difficult to measure. In 2006, to introduce the project to a larger audience, Beatriz da Costa (University



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of California Irvine) released the pigeons at the Inter Society for Electronic Arts Festival and another conference in San Jose, Calif.

Inspiration for Pigeonblog came from a German effort in 1907 when a small camera (with mechanical timer to take pictures) was attached to a pigeon (Figure 2) that flew over regions of interest in Germany. This was a pioneering example of using living animals as participants in early surveillance technology systems. This micro-camera was invented by a German engineer (Julius Neubronner) and to assist spy technology during wartime, but was never used for this purpose (Pigeonblog, March 2016)

WIRELESS REMOTE ANIMAL MONITORING (WRAM)

The above examples of birds equipped with sensors to report on environmental conditions is a new and unique sector of animal biotelemetry, since the majority of activities in this field, during the past 20 years, has focused on harnessing animals with sensors that relay location and physiological measures of the subject animal. As an example of the latter, a bird can be outfitted with a solar-powered GPS/GSM unit for collecting position, acceleration, and body temperature data which are wirelessly relayed to the researcher's computer.

This latter and major portion of the field is amassing at an increasing rate information and data due to advances in sensor technology and diversity of applications across the world. Further, researchers need to interact with colleagues around the world to share information and pursue development of scientific findings. A missing critical component was an international "e-structure" that automatically captured, stored and managed sensor data from animal studies scattered across the globe. The initial platform of this "e-structure" was completed in the late 2000s with creation of WRAM at the Swedish University of Agricultural Sciences (Wireless Remote Animal Monitoring - WRAM - a new international database e-structure for telemetry sensor data from fish and wildlife. 32nd European Telemetry and Test Conference, 2012, Munchen, Germany). WRAM hosts

data from sensors on 1,446 animals from 12 species in four countries, resulting in 68.2 million database records.

For this column, the import of this "e-structure" is the availability of a design of a wireless information management system that can be adapted for use with animals equipped to collect information and data on their environmental setting and support local and/or regional interpretations of environmental patterns by scientists and/or environmental regulators.

POSSIBLE APPLICATION TO MONITORING ENVIRONMENTS WITH OIL FIELDS?

While the innovative and popular "Pigeon Air Patrol" effort serves to provide a glimpse of how pigeons can become collaborators in the co-production of knowledge (B. da Costa, University California, Irvine), this acquired information is far from being valuable in a scientific context. However, the intrinsic navigational abilities of homing pigeons ("Pigeon Homing Along Highways and Exits". Current Biology, July 2004) could be trained to adhere to predetermined flight paths and, thus, the pigeon-mounted sensors could provide real-time environmental data (i.e., air quality levels, aerial photographs) from various low-level altitudes along a known route. For example, with special squads of pigeons released from various locations within a large oil field, air quality data could be rapidly collected and processed (i.e., using a version of e-structure) for monitoring evaluations and decisions by industries and regulators.

Sensor-equipped pigeons may prove a viable option to drones for low-level, environmental monitoring - in certain situations. ♦



FIGURE 2

German SpyBird with Camera Backpack (1906).

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