

Biochemical Surveillance

14

Animals



1. Introduction

Animals assist in many aspects of surveillance. A number of species are willing to aid humans in exchange for food or praise and some are even eager to help. Investigators have teamed up with dogs, cats, dolphins, birds, and sea lions that are trained to perform a variety of tasks from finding stowaways, criminals, and lost children to seeking out mines, shipwrecks, and attaching mine-deactivating devices. The training and use of animals in these types of surveillance tasks, especially when they involve search and rescue, can be interesting and rewarding and often highly effective.

Animal behaviors and reactions are sometimes also used as detection systems. A dog bark or strident bird calls are sounds that are recognized by a number of species, including humans, as a warning or alarm. Similarly, natural animal behaviors, such as the scattering of rabbits or deer might indicate the presence of a large predator or an approaching storm or fire.

The team of Federal Emergency Management Agency (FEMA) National Urban Search and Rescue (USAR) Response System dogs and their handlers. Sunny, Hawk, Louis, Ditto, Max, Duke, Miranda, and Guinness were deployed from four different states to Oklahoma City in May 1999 to aid in finding and aiding victims devastated by a tornado. [FEMA 1999 news photo, released.]

Animals as Detectors of Contamination

Animal and insect responses to stimuli or toxins are also studied on a regular basis, particularly mice and guinea pigs that are commonly used in scientific research labs. They have aided people in prospecting and industrial applications as well. From the earliest days of mining, canaries were used as ‘chemical indicators’ due to their sensitivity to vapors in mine shafts; if the ‘canary in a coal mine’ was affected by gases, it usually indicated an environment unsafe for humans, especially in cases of prolonged exposure.

Some animal surveillance is of a less direct nature. Amphibians are ecosystem health indicators due to their sensitivity to changes in the environment. Bear and eagle populations drop when salmon stocks are depleted. Fish disappear when streams and rivers are contaminated by industrial spills. Birds die when a new virus arrives in an area, as when the West Nile virus unexpectedly turned up in New York’s Central Park region.

Insects can also be used to surveil environmental trends or changes. Spiders have been used to analyze the effects of drugs because drugs can selectively change the way they weave their webs. With further research, it may even be possible to identify the level and toxicity of substances to which a spider may have been exposed, to provide information about the surrounding environment in the case of chemical spills or airborne pollutants.

Animal Protection and Conservation

Animals themselves need to be surveilled, as they may be illegally caught or killed. Smugglers and black marketeers regularly kill endangered species for use as folk remedies or as exotic foods. Gorillas are killed for souvenir ashtrays (made from their hands), deer are killed out of season, elephants are killed for their tusks, endangered whales are killed for their meat or glands, rare cheetahs are killed for their pelts. Surveillance of acts of violence toward animals is important not only for the animals themselves but for human survival as well, since we are part of a complex ecostructure which erodes and begins to die when essential aspects of it start to disappear.

Animal surveillance also involves monitoring the health of animals, as they may carry or introduce pathogenic substances that are harmful to humans or they provide important food sources. Swine and chicken flu pose threats to human health. HIV may have originated in monkeys. ‘Mad cow disease’ may possibly be transmitted through the meat of cows, even if cooked. Paralytic shellfish poisoning may indicate increased levels of water pollution. Regular inspections are an important aspect of animal husbandry and devices that can detect dangerous organisms are constantly under development. (See the Chemical Surveillance chapter for information on chemical-detection strategies.)

An unsettling aspect of animal surveillance is the need to inspect animals not only for disease or injury when being transported from one country or territory to another, but for illegal drugs which smugglers have inserted into their bodies. Cocaine, heroin, and other drugs have been found inside snakes, goats, dogs, snails, deer, and in the water of fish tanks. Thus, animal surveillance refers not only to the use of animals as detection systems, but also to the practice of inspecting animals and animal carcasses for the presence of controlled substances or smuggled goods. This exploitation of animals has arisen due to the low level of monitoring of animals in the past. Usually all that was done was to quarantine them for a time for signs of disease. This is slowly changing now that the abuse is becoming evident. Animal rights activists are likely to strongly oppose these smuggling practices as well.

Treatment of Animals as Indicators

Animal treatment has recently come under closer scrutiny as psychologists are studying

evidence that those who abuse animals appear more likely to abuse people. Thus, the way an individual treats animals may be the subject of surveillance in a criminal investigation and may be a warning signal to those involved in crime prevention or family members who suspect the potential for violence among their relatives and wish to seek psychiatric or legal assistance for disturbed individuals.

Animal surveillance is a broad topic and the smuggling and health aspects are touched on in other chapters, particularly in Chemical Surveillance. This chapter primarily discusses how animals (especially dogs) are used to aid humans in surveillance and to some extent discusses animals as 'detection systems' based on their reactions to chemical or physical stimuli. For reasons of space and scientific complexity, the less common aspects of animal surveillance are not covered in detail.

2. Types and Variations

There are four main aspects to animal surveillance:

animals as indicators - The behavior and vocalizations of animals, birds, and insects can warn of contamination, impending danger, or the presence of certain people or objects of interest. This knowledge is valuable when assessing possible contamination from industrial accidents or suspected chemical warfare. It can help when traversing unfamiliar terrain or when hunting for game. It can even alert a homeowner to the possibility of a prowler on the property.

animals as research subjects - Studying the flight patterns, chemical reactions, mating behaviors, hunting abilities, and many other aspects of animals teaches us about animals and about ourselves and leads to new sciences. Planes, helicopters, balloons, and many other technologies were suggested to our imaginations through our observations of animals, their physiology, and behaviors.

animal treatment as indicators - Observations of the ways in which certain people treat animals can sometimes aid in forensic 'profiling' in violent crimes investigations. A statistical correlation has been found between violent criminals' behaviors, particularly serial killers, and their treatment of animals. Cruelty to animals can't predict if a person is going to commit a violent crime, but violent criminals are often found to have been cruel to animals.

animal assistants - Animals are often enlisted to perform surveillance tasks. Millions of people have watchdogs to help surveil their property and homes. Dogs and dolphins have been used to find individuals or objects above ground and underwater, and cats can be trained to retrieve small objects in small spaces. K-9 police dog units have helped to find lost individuals or suspects who have fled the scene of a crime, including car thieves, bank robbers, and those who have committed assault.

The two most common animals specifically trained for animal surveillance are dogs and dolphins, so a large proportion of this chapter discusses these species.

Canine Detectives

Dogs are the most favored surveillance assistants because they are eager for human companionship and often equally eager to help and to receive the praise and appreciation they get for a job well done. They are known for their extraordinarily good scent senses. Their sense of smell is thousands of times better than that of humans. The long muzzle of a dog provides an elongated nasal passage which, if unfolded, has a much greater surface area than that of a

person. Dogs further have instinctive pack and watchdog abilities. Like birds, they will warn of intruders and sound a vocal alarm and, in some cases, will menace the intruder and prevent access to the property.

Dolphin Assistants

Dolphins, like dogs, are intelligent, social, and curious about people. Some of them even enjoy and seek out the company of humans. They have advanced natural sonar capabilities, large brains, and the ability to interpret two-dimensional images in a way that is superior to dogs and similar to humans. Dolphins can actually learn from viewing a videotape, an ability that has not been demonstrated by dogs and cats. They have been used in a variety of commercial and military applications for locating mines, wrecks, and vessels.

3. Context

Animal Warning Systems

Animals are used in situations where humans can't always be on the alert, where animals have better senses, or where humans can't go. Thus, animals are used to guard property when the owners are sleeping or away from the premises, to seek out lost, kidnapped, or murdered victims with their keen noses, or to attach neutralization charges to mines in areas that are hard or hazardous for humans to reach.

In the natural environment, animals are used indirectly for surveillance. We listen to their calls and monitor their reactions in order to sense danger ourselves. The frenetic behavior of bees, beetles, birds, and rodents can indicate a forest fire or impending storm. Elephants can hear and feel infrasonic vibrations and know when a large animal, vehicle, earthquake, or storm might be approaching.

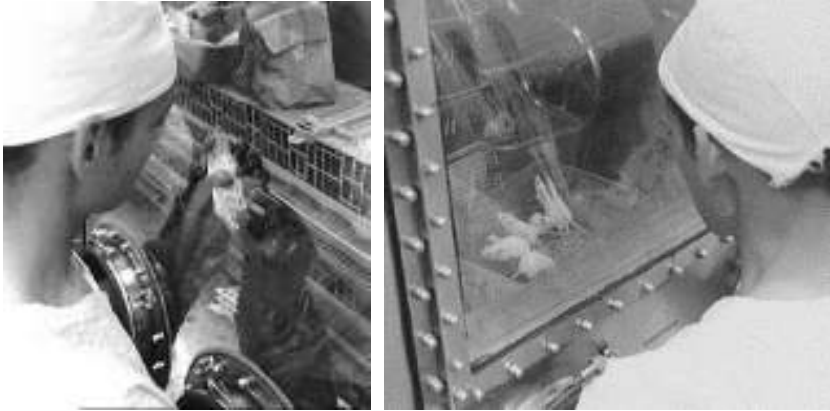
Animal Use in Research and Testing

Animals are sometimes used in situations where there may be dangers to human lives and a tradeoff choice is made. In spite of continuing controversy, animals are used in scientific research and cosmetics testing, somewhat like the canary in the coal mine that may die if exposed to poisonous gases, but whose sacrifice, albeit involuntary, prevents the loss of human life. More and more, however, scientists are finding ways to synthetically duplicate animal sensory systems and detection technologies in order to use machines and computers in situations where animals were once used. The use of animals for scientific research, especially in medicine, will probably never cease completely, however, as drug testing for new medicines is almost always tested on animals (typically mice and rats) before they are tested on humans.

Animals are sometimes used in testing situations where there may be dangers to humans or to the animals themselves. There is controversy over some aspects of animal testing, especially for cosmetics testing, but it is likely that testing will continue, in spite of objections, in medical research and pharmacy. Mice and rats are often used for medical experiments and birds are sometimes used to determine contamination, as they are sensitive to many substances. Many of the early concerns about the dangers of DDT pesticide were raised when observers noticed that birds were having fewer young and laying thin-shelled eggs because of direct exposure to the pesticide and indirect exposure through insects that were contaminated.

Space research has many rewards, but also some hazards. If life is discovered on other planets, even the most primitive viruses or bacteria, they could pose a danger to life on Earth if not handled carefully. Astronauts and their equipment must go through decontamination.

Materials that are brought back from space, such as lunar rocks, are processed to determine if they might endanger any life on Earth. We don't want to risk exposure to pathogens that the organisms on our planet have never encountered and might be unable to counteract.



Materials brought back from the Apollo 12 space mission to the Moon were processed and inoculated into birds and rodents in order to ensure that they did not pose a danger to life on Earth. E. Landrum Young, of the Brown & Root Northrop facility, is shown here inoculating a bird in the quarantine cabinet (left) and examining inoculated mice in the Animal Laboratory, in 1969. [NASA/JSC December news photos, released.]

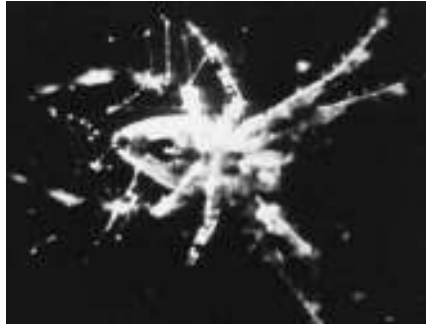
Research of Animal Physiology and Behavior

The study of animal physiology and behavior has led to many important scientific discoveries and has provided ideas and solutions for many types of technologies. The study of dolphin sonar has taught us much about designing electronic sonar. The study of animals has even been suggested as a way to learn how humans might adapt to living in novel environments outside our planet. As an example, studies of the hibernation patterns of bears may yield information on how humans could better withstand the rigors of long space voyages without suffering from muscle wasting and other physical complications.

The observation of biological systems to gain ideas for designing new technological surveillance devices is not new. Studying wing designs and flight patterns of birds has provided a better understanding of aerodynamics and given rise to various types of aircraft.



The Indian River Lagoon, near the Kennedy Space Center, has a rich and diverse population of birds and also harbors dolphins, manatees, and many species of fish. Animals are frequently studied to learn more about locomotion, flight, and biological senses that are not found in humans. [NASA/KSC news photos, released.]



Left: Scientist-Astronaut Owen K. Garriott is taking video footage of two spiders, Arabella and Anita, from the Skylab 3 space platform. In the weightlessness of space, the scientists are interested in observing how spiders cope with their new environment and build their webs, contributing to our knowledge of living and working in space. Right: A photo-reproduction of the color video transmission of Arabella, one of the two Skylab spiders. [NASA/JSC August 1973 news photo, released.]

The study of animal physiology and movement has also led to some innovative design strategies for designing mobility systems for robotics which can, in turn, lead to robots that can survey in unusual terrains. Inventors have devised robots that bounce, robots that move like snakes, and robots that move like insects or birds. The movement and gripping abilities of chameleons have been studied and applied to designs for robots that could walk along pipes and navigate through small spaces or hazardous environments [Immega, 1987].

Animal Assistants

Sometimes animals are used to surveil the environment on behalf of humans who have visual or auditory handicaps. Seeing eye dogs, hearing dogs, and dogs that can lift phones, open doors, and fetch objects regularly assist in improving the quality of life for many people.



Left: Canine Companions for Independence was a vendor at the 1999 Disability Awareness and Action Working Group (DAAWG) Technology Fair that was held at the Kennedy Space Center (KSC). Vendors at the fair were highlighting technologies, both natural and man-made, that could assist in improving mobility, hearing, vision, and silent disabilities. These same technologies, which provide a way to enhance human senses, can also be used in surveillance for hazards and safety monitoring. The Director of the Center, Roy Bridges is shown petting a Labrador Retriever. Right: Nancy Shaw and her Golden Retriever 'dog in training' for the Canine Companions. [NASA/KSC news photo, NASA/GRC news photo by Tom Jares, released.]

Every human has a unique personality, and so does every animal. Dogs that are trained for one task are sometimes found to be unsuitable for the task, but do well at others due to individual differences in temperament and interests. Dogs that are trained as seeing or hearing dogs are sometimes found to be better at tracking or surveilling (and vice versa) and are sometimes reassigned to new handlers and trainers to continue their education in tasks that better match with their abilities.

Dolphins and sea lions are intelligent, playful animals that have been used for many surveillance purposes, but dolphins are favored over sea lions for some types of tasks due to the greater tendency of sea lions to suddenly leave, to play or chase fish.

4. Origins and Evolution

The partnership of humans and animals for companionship and protection has ancient roots. We'll never know exactly how long animals have been helping humans (and vice versa), but the partnership may have existed for over 100,000 years in one form or another. The importance of animals to humans as food in early hunting and gathering cultures has been historically documented in cave paintings that are 25,000 years old, but some of the animals depicted in art also had mystical significance, as did cats in ancient Egypt. Large, black Siamese cats in Tibet are said to have acted as sentries, surveilling for intruders while guarding the crown jewels.

Dogs in Military Forces and Law Enforcement

The *dogs of war* existed hundreds of years ago, in Roman times. Many surviving Roman artworks depict dogs and wolves. The Rottweiler breed is said to have descended from the dogs that accompanied the Romans on their invasions.

Since Roman times, history is full of stories of animal helpers, sentries, and messengers. Horses, elephants, camels, and carrier pigeons have all aided in transporting not only individual travelers, but couriers, spies, and messengers, as well, and sometimes, in times of war, it was only the animal that got through alive.

Formal Animal Organizations

Historically, there are many stories of the strong bond and love between humans and animals, but there are also some unsettling stories of irresponsibility and cruelty. In the 1860s, the Society for the Prevention of Cruelty to Animals, one of the oldest animal rights organizations, began working in America to prevent animal abuses, to find homes for lost animals, and to provide education and medical care. It has since become a prominent and outspoken leader in the humane treatment of animals. Numerous other organizations now support this cause.

The formal use of dogs in modern police work originated in Nordic countries in the early 1900s, although hunting and tracking dogs had been used informally before that time for hundreds of years in many parts of the world. Dogs have long been used to find lost individuals or fleeing fugitives.

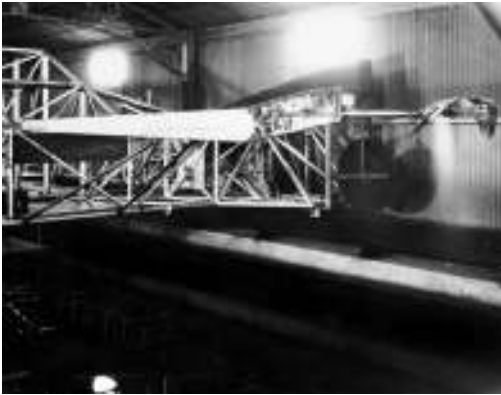
During World War I, thousands of dogs were used as sentries, scouts, pack-dogs, and as messengers throughout France and Germany, so it is not surprising that German and Belgian Shepherds are still favored for many police and military tasks.

Seeing-Eye Dogs

The tradition of formal training schools for dogs was well-established in Europe by the 1920s, but was not common in America at the time. Once news circulated, however, training and breeding programs began to spread. In 1927, Dorothy H. Eustis wrote a column in the

Saturday Evening Post describing the use of German Shepherds to aid the blind and how the dogs were trained at a special school in Potsdam, Germany. The Seeing Eye organization was established not long after, in 1929, to provide education and seeing-eye dogs to blind people. This organization is still active and other organizations for the blind and for training dogs were established soon after.

Dogs were not the only animals that were of interest to scientists and animal handlers. The invention of the airplane had sparked a great deal of interest in human flight and a wide variety of successful and unsuccessful designs had been tried. Thus, the study of avian aerodynamics (the mechanics of bird flight) became more structured and objective in the early part of the century. Special equipment was developed in the 1930s to better study the mechanics and flying abilities of birds.



This historical photo from the NASA Langley Research Center shows an aerodynamics research system which is studying the flight characteristics of a seagull in motion on the carriage of the towing tank. [NASA/LRC 1932 news photo, released.]

Dogs in War

World War II was a time when new animal regiments of dogs and dolphins were established and new canine organizations were formally founded.

During World War II, many thousands of dogs were used in the same way they were used in World War I, as sentries, messengers, and attack dogs. Sometimes they were also used in ways that were cruel, including the delivery of explosives to the enemy, strapped to their backs, and the detonation of mines.

While the British and American forces did not employ dogs to the same extent as the continental Europeans, they still recognized the value of dogs in military operations. Consequently, the British Royal Air Force Guard Dog School was established in 1941.

The Royal Australian Air Force (RAAF) first introduced dogs into its security practices in 1943, using savage, untrained animals and, unfortunately, sometimes handling them callously.

Following the War, many dog units were disbanded, but a number of the military dog units were turned into training centers, for example, the British RAF Guard Dog School continued as the RAF Police Dog Training Centre.

In 1946, the Guide Dog Foundation for the Blind began providing guide dogs free of charge to blind people through its Guide Dog Foundation.

While the emphasis on dogs after the War wasn't as strong as it had been during the War,

it was still recognized that dogs could play a vital role in many peacetime activities.

In 1954, a RAAF Dog Training Centre was established, becoming the RAAF Police Dog Training Centre two years later. The purpose of the center was to breed and train dogs for security work, primarily German Shepherds, Doberman Pinschers, and Labrador Retrievers.

In 1958, the Australian Navy decided on the German Shepherd as its sole breed for its training programs. The breed was selected for its protective coat, intelligence, and loyalty. Donated German Shepherds of suitable temperament and health were accepted into the program.

Animals in Early Space Research

Since the beginning of space flight, animals have been involved in research into the special problems involved in working and living outside Earth's protective ozone/atmospheric envelope. Monkeys, apes, dogs, rodents, and spiders are examples of creatures that have been to space and back again.

A month after the launch of the unmanned space capsule Sputnik I, the Russian Federation sent up Sputnik II with a dog on board, to test the feasibility of sending people into space and the possible effects of radiation and other unanticipated hazards to health.

Stimulated by the Russian Sputniks, the U.S. soon embarked on its own space program.



Chimpanzee Ham is recovered after a successful suborbital flight in a Mercury MR-2 space capsule. Ham, still strapped into his flight couch, which had been inserted in the space capsule, eagerly accepts an apple. [NASA/JSC January 1961 photos, released.]



Left and Middle Left: Enos with his handler before the flight of the MA-5 and in his spacesuit and protective wrist tethers prior to the space flight. Middle Right: Enos holding hands with his handler as he is prepared in the flight couch that is designed to easily slip in and out of the space capsule. Right: Enos returns after orbiting the Earth twice and landing in the ocean waters south of Bermuda. [NASA/JSC news photos December 1961, released.]

In 1961, a chimpanzee named Ham was sent into a suborbital flight around Earth in a space capsule, to help us learn more about how animals and people react to the space environment and how we can develop technologies to protect their health. Later that same year, chimpanzee Enos successfully orbited the Earth twice in the Mercury-Atlas 5 space capsule. Chimpanzees were used partly for their intelligence and partly because they are almost genetically identical to humans. The physiological similarity between chimps and humans is much greater than most people realize and putting a chimpanzee in space was the closest thing researchers could do to putting a person in space. The return of the chimps indicated that human space flight was possible.

Dog platoons were added to U.S. military forces in the 1960s, including the 47th at Fort Benning and the 59th Infantry Platoon Scout Dog (IPSD), in 1968. The dogs were trained at the Scout Dog Training School. Some of the dogs were flown out by helicopter to serve forces in the Vietnam war. Dogs aided in patrols, the detection of snipers, and the detection of booby traps. Afterward, many were euthanized and buried in South Vietnam, in 1971.

The 1970s and 1980s - Increased Interest in Canine Programs

Many new canine programs were initiated or tested in the 1970s and 1980s. In addition to the already familiar seeing-eye dogs, larger numbers of hearing dogs, narcotics-sniffing dogs, and human-bonding dogs made the rounds of airports, borders, ships, and hospitals, and aided professionals in carrying out their duties more effectively.

In 1972, the designation of *Drug Detector Dog* and non-medical drug detection capabilities were added to the Royal Australian Air Force (RAAF) canine teams. The dogs were used not only for local policing, but for assisting in state and federal law enforcement.

During the 1970s when interest in canine programs increased, there was also increased interest in dolphins and sea lions, largely due to the research and educational information provided by Jacques Yves Cousteau and the Cousteau Society.

In 1982, a New York City bomb squad member joined a forensic chemist from the federal Bureau of Alcohol, Tobacco, and Firearms to demonstrate that a dog could be trained to seek out accelerant odor better than existing mechanical detectors. The ability to detect accelerant was useful not only in sniffing out bombs, but also in sniffing out chemicals at an arson site.

Space exploration and research continued in the 1980s with a series of Space Shuttle missions; animals were sometimes included in the scientific research payloads. In 1985, two squirrel monkeys and a number of rodents went along for the ride in the Shuttle Challenger Spacelab-3 mission.

The Mid-1980s - Health Care, Arson, and Transportation Security

Animals make good companions and many people respond positively to their presence. The U.S. Army initiated a human-animal bonding program in 1985, with two dogs who could soothe and entertain with a variety of tricks. Dogs and other animals have been found to have an especially therapeutic effect in hospitalized patients and tenants of geriatric homes.

In 1985, the police role of the RAAF canine division was formally recognized and the RAAF Police and Security Service formed. The first female RAAF handler was graduated that year.

In 1986, the Connecticut State Police department began a canine arson program with a Black Labrador Retriever that learned to detect more than a dozen different accelerant odors including solvents and lighter fluids. This established the viability of canine units for arson programs elsewhere.

In 1988, tragedy struck when Pan Am Flight 103 exploded over Lockerbie, Scotland. This

tragic bombing resulted in tightened airport security in many nations and dogs were used in some places to search for explosives and other suspicious objects.

In 1988, the Office of Fire Prevention and Control for New York State began using dogs to aid in the investigation of fires. The office currently uses Labrador Retrievers.

We might think that the cruel use of dogs to deliver explosives ended with the end of World War II, but this hasn't been the case. In 1989, Israeli forces are said to have used Belgian Shepherds to deliver remote-controlled explosives and gas into enemy bunkers in Lebanon. When the dogs reached the intended target, the explosives were remotely detonated.

The 1990s - Narcotics and Explosives Detection

In 1990, the County of Santa Barbara initiated their *Canine Drug Detection* program. The dogs are trained to detect a variety of types of illegal substances by searching buildings, vehicles, residences, and containers.

The Australian Customs Service had traditionally used dogs from animal shelters, but as the number of suitable dogs declined, due to responsible spaying and neutering programs, an internal breeding program was initiated. Labrador Retrievers were chosen for the program to carry out a variety of enforcement-related tasks.

During the mid-1990s, there were some terrorist bombings of U.S. personnel and property, and dogs were used in search and rescue operations to help locate victims in the collapsed rubble. Dogs are usually trained either for the detection of live victims or the location of dead corpses. It was discovered that dogs, like humans, can become depressed and lacking in enthusiasm for their work if they come across too many dead victims. Handlers would sometimes allow them to find a live, planted 'victim' toward the end of a day in order to leave them with a positive experience and in a better frame of mind.

In 1996, President Clinton established a White House commission to study air travel security and also declared the investigation and prevention of church arsons to be a national priority. In June 1996, the *National Church Arson Task Force* (NCATF) was formed. In investigations spanning incidents occurring from January 1995 to September 1998, almost 700 cases of arson or bombings in houses of worship were investigated. A variety of law enforcement agencies cooperated in the subsequent efforts, which utilized a number of surveillance devices and techniques including the use of explosives- and accelerant-sniffing dogs. More than 300 arrests and more than 200 convictions resulted from these investigations.

In June 1998, the U.S. Department of Defense (DoD) participated in Working Dog trials and were awarded 12 out of 31 awards in the two-day competition. In September 1998, the Office of the Assistant Secretary of Defense announced that four German Shepherd dogs had been added to the *Defense Protective Service* (DPS) which is essentially the police force to the U.S. Pentagon, which houses over 24,000 workers. The dogs would be used to help maintain security on a more regular basis at the DoD headquarters. Previously, dogs had been brought in, as needed, by military branches. The four dogs and their handlers were graduated from the Air Force police dog training school with a specialty in explosives detection.

Bee Studies

The DoD wasn't limiting its research on animal surveillance to dogs. Through a DARPA project, it began studying whether honeybees could be equipped with tiny radio frequency tags to enable them to be used to detect land mines as part of a larger effort called the *Controlled Biological and Biometric Systems* program to determine some of the possible ways in which insects, reptiles, and crustaceans might be used in surveillance tasks. The Pacific North-

west National Laboratory and the University of Montana were assisting in fitting the bees with radio tags. The tags can help track the exit of a bee from the hive, its direction of travel, points where it may have landed, and the time that has elapsed. Chemical analysis of returning bees can lead to information about where they may have been and what they may have encountered, which might include industrial or warfare residues.

Bees have been used by other researchers in the past to collect information on pollutants or trace materials. Their bodies tend to absorb contaminants to the point where they are registered as valid data collection means with the Environmental Protection Agency. Some species of moths and wasps could perhaps also be used in similar experiments.

Sandia National Laboratory embarked on another ambitious project using bees. It is studying whether they can be trained to sniff out TNT and associate the smell with food. TNT residues sometimes seep from land mines and contaminate the surrounding area. The bees appear to learn readily, traveling up to 100 yards to the source after just a few hours of training.

The Late 1990s - Continued Security Concerns

In the late 1990s, the human population was reaching six billion, and never before had the Earth's populace been so mobile. With concerns about terrorism, violence, and smuggling on the increase, the interest in using dogs and other animals in ways that could improve security and detection continued.

In 1998, the CIA provided assistance to Fairfax County and the Vienna Police Departments in searching for explosives that might be present due to the high-profile Kasi trial. Dogs that were members of the K-9 Explosive Ordinance Disposal assisted with this security operation.

The U.S. Federal Aviation Advisory, in efforts to increase airport security and lower the threat of terrorism, recommended, among other things, that high-traffic airports have at least two explosives-sniffing dog teams in conjunction with other bomb-detecting equipment.

Electronic Sensors

New technologies are often developed from ideas that come from nature. Electronic 'sniffers' based on a dog's nose have been tried a few times in the past, but their use in surveillance is now considered a higher research priority because electronics has improved and made new types of devices not only possible, but more economical.

The American Forces press service announced that the Department of Defense was working on a three-year research project to attempt to electronically duplicate some of the sensing abilities of a dog's nose, which could aid in detecting explosives, such as those found in mines. It was hoped this would supplement and perhaps even overcome some of the limitations of other methods currently used to search for mines such as ground-penetrating radar, infrared sensors, and metal detectors. If the project is successful, it could signal the end of the use of dogs for the detection of land mines. It could also create technologies that could 'smell' a wide variety of substances for use in thousands of industrial and security applications. It remains to be seen how well these sniffers will work and how long it will take for the technology to become advanced enough to be practical.

5. Description and Functions

Dogs are the most common animal used in surveillance tasks, with tens of thousands of trained dogs in use worldwide.

Dogs as Surveillance Workers

Much of the surveillance work carried out by dogs involves their willingness to keep watch and their ability to smell.

The ability to pick up scents varies somewhat with the breed of dog. Bloodhounds are known in stories and the media for their ability to scent people. The nose of a dog is long, with a much greater surface area than that of a human, and is divided into specialized chambers to distinguish and classify many hundreds of individual smells.

There are air-scenting dogs and near-scenting dogs, depending on the breed and training of the dog:

air-scenting - These dogs are used to pick up a scent on the wind, usually of a lost or fugitive person who hasn't been gone for too long. Depending on the wind and individual circumstances, a dog can scent a human up to about 550 ± 400 meters. Air-scenting is usually done on a leash unless the dog is specifically trained to seek, attack, and hold an intruder, in which case it may work off-leash.

near-scenting dogs - These dogs are trained to discriminate particular scents on items that are close to the dog's nose. Near-scenting dogs may be able to pick up a scent on the ground, but near-scenting is more commonly used in narcotics and explosives detection, in which the dog is taken close to the item or furnishing being checked, which can include vehicles, dressers, school lockers, suitcases, clothing, or appliances. Most proximity-scenting is carried out on a leash, although some dogs are well-disciplined and well-trained and can be relied upon if off-leash.

Selecting a Dog Breed

Breeders become especially attached to their favorite breeds, but it should be remembered that almost any breed of dog can be trained for surveillance tasks if the animal is individually evaluated to see if it has an alert temperament, sufficient intelligence, and a willingness to work. Many professional dog trainers and official K-9 units get their dogs from local humane societies, which include both purebred and mixed-breed animals. Mixed breeds, in some cases (there are no guarantees without X-rays and medical examinations), are less subject to genetic abnormalities such as hip dysplasia or deafness (as is found in some dalmations), but again, there are exceptions. A mixed breed of two genetically inbred breeds may be just as prone to genetic abnormalities as a purebred. There is no hard and fast rule about whether a specific breed or a mixed breed is better for surveillance tasks in general, though some breeds can be more suitable for specific branches of surveillance.

Some breeds of dogs are favored for particular tasks because they have been bred to be suitable for their willingness to work, their congenial dispositions, or for certain types of scent surveillance. Some have also been bred for their willingness to work in or around water (not all dogs like water). For police work, the psychological advantage of using a dog that has dignity and a certain aloof air is also taken into consideration.

Genetics can strengthen particular traits in animals, but the way dogs are bred and judged for shows does not guarantee intelligence unless the breeder and his or her dogs are regularly involved in obedience trials. Not every individual animal has a good temperament even if the breed, in general, is docile or affectionate by nature. Even when a specific breed is chosen, each animal should be individually evaluated. A puppy with good potential will look up and try to understand when spoken to, rather than looking away or running off. High-strung dogs generally are difficult to train and don't always calm down as they get older.

There aren't substantial differences between male and female dogs but there are some, including a greater tendency on the part of male dogs to wander or fight. These tendencies can be suppressed somewhat by neutering the dog at a young age. The dog trainer who trained the various dogs for the Lassie television series in the 1950s was once asked if there was a difference between the sexes. He replied that he felt the females were smarter, but the males were more willing to take risks, like crossing rough rivers.

Bloodhounds, Golden Retrievers, Labrador Retrievers, Belgian Malinois, German Shepherds (Alsations), and Border Collies are particularly favored for surveillance work. Beagles are used for some types of contamination-detection. St. Bernards were traditionally bred for searching for victims of avalanches in the high mountains of the European Alps. Labs and Retrievers are particularly favored as *seeing-eye* dogs. Seeing-eye dogs are trained to surveil surroundings in order to protect and provide cues for their blind companions. Newfoundlanders were bred to find and aid seafarers who had gone overboard from their boats.

Dog Training

The best time to start training a dog is when it is five weeks old. A dog that is trained young can be remarkably well-trained by the time it is four months old and often will have fewer 'bad habits' to try to undo later. However, for professional purposes this is often not practical or possible. Puppies want to chew, run, pee, and play, and most trainers in professional positions find it better for their purposes to train a dog that is between six and 18 months, when the dog has settled down and is more prone to listen. The ideal compromise is to board the dog with a good owner/handler while the dog is young, so it learns to listen and to respond to praise and instructions and then to give it professional training for a particular task when it has settled and matured.

Dogs are usually trained to indicate a 'find' by a behavior or a sound (or both). If a dog is being used for covert surveillance, such as looking for snipers or patrolling in a military zone, a dog may be taught to sit, to return, to grasp clothing, or to crouch in order to indicate a 'hit.' For regular police work, search and rescue work, or forensic searches (e.g., for a body), the dog may be taught to sound an alarm by barking or whining. The breed may determine which type of task is best suited to the dog. Husky breeds tend to be very vocal, for example; they like to 'talk' and may not be suitable for silent alarm tasks.

Dogs can be taught with treats as rewards for their work, but it is best to teach them with praise. Sometimes a dog that is taught with praise can be given a special treat for an especially good training session or action. Playing vigorously with the dog after a good training session is also a good reward.

Scenting dogs get tired, just as people get tired, when they are doing work that requires concentration and skill. It is best not to use a scenting dog for more than half an hour at a time and to give it breaks. Patrolling dogs have longer duty periods. Dogs are descended from wolves which have good stamina. Most of the breeds used for surveillance work have good stamina and can run or stay on patrol for long periods of time. If a dog is fatigued and needs a break, a good handler will notice and respond appropriately.

Dolphins

Dolphins are air-breathing, highly intelligent mammals that live about 30 years, depending on conditions and whether they are wild or captive. They live in tight-knit groups and form strong social bonds. They only have about one offspring every two years, so they cannot quickly or easily replenish their numbers when their members succumb to injury or illness.

Dolphins are cetaceans, which includes a wide variety of whales, porpoises, and dolphins. They are cooperative when they are 'in the mood' or if they know there will be a

reward of food or something they desire. Otherwise, like human youngsters, they are usually more interested in socializing and playing with each other than in doing work.

Dolphins, like people, take a few years to mature, so dolphins are usually a few years old before people begin training them. It takes about three years to train a dolphin to be proficient at detection work.

Sea Lions

Sea lions may not be quite as intelligent as dolphins, but they are still bright animals, trainable, and have a number of good sensing abilities. They don't have the sophisticated sonar of dolphins, but they have excellent hearing and an amazing ability to navigate in murky water. Their hearing allows them to find objects under the water that make noise, like pingers that may be attached to wrecks or flight recording devices. Like dolphins, sea lions need to be motivated and rewarded for their work or they will take time out for unscheduled play.

Birds

Birds have been used as surveillance partners because they can fly, they are cooperative (birds often strongly bond to the people who raise them), they can live a long time, and some of them have strong homing instincts. Carrier pigeons, once extremely numerous, were used for sending messages, but were ruthlessly hunted to extinction around 1914. Parrots and cockatoos are intelligent problem solvers that sometimes live longer than humans. Birds can be taught to pick out certain objects or colors and to place or retrieve various types of objects. They also make good 'watchdogs.' A cockatoo, for example, has a very strident alarm call that can be heard for some distance, that it uses when it encounters intruders or some person it doesn't like.

6. Applications

Search and Rescue

Dogs, with their keen sense of smell, are especially valuable in seeking out individuals who have run away, been lost, kidnapped, or become endangered by a hazardous situation or environment. Hazardous situations include collapsed buildings, train wrecks, chemical spills, avalanches, floods, and earthquakes.



Two search dogs and their handlers en route to a Coast Guard Air Station after finding the body of Ned Rasmussen on Uganik Island. Rasmussen had been wearing camouflage clothing which made it difficult for searchers to locate the body. Mack, the German Shepherd on the left, handled by Jennifer Brevik, was able to locate the body by smell. On the right is Jean Adams with her Golden Retriever Meeko. [U.S. Coast Guard 1999 news photo by Keith Alholm, released.]

Dogs can sometimes fit through holes that are too small for people, can swim in water that is too cold for people without wetsuits, and can smell individuals who may be unconscious or confused and unable to call out for help.



Members of the Federal Emergency Management Agency National and Urban Search and Rescue (USAR) Response System use dogs to aid in urban search and rescue operations. Left: A USAR worker with a trained Golden Retriever at an Oklahoma tornado site. Right: A USAR Task Force member and a Retriever search through the debris of the Murrah Building after the 1995 Oklahoma City bombing that collapsed the building with many people inside. [Federal Emergency Management Agency 1999 and 1995 news photos, released.]

Accelerant, Explosives, and Firearms Sniffing

Dogs have been trained to sniff for explosive materials, which makes them suitable for helping locate bombs or land mines.

Since 1986, the U.S. Bureau of Alcohol, Tobacco, and Firearms (ATF) has been involved in training dogs to detect accelerant, a telltale sign of arson. Since 1992, it has also had a canine team trained to detect explosives, explosives residues, and post-blast forensic evidence. The ATF canines can also detect firearms and ammunition that are buried or otherwise hidden. The ATF canine program is operated in conjunction with several organizational branches, including the National Response Team, the Explosives Technology Branch, ATF Labs, Certified Explosives Specialists, and the ATF Firearms Branch and Tracing Center.



U.S. ATF canines are trained to detect a variety of explosives scents, as well as hidden firearms and ammunition. The dogs are trained and certified for their jobs. [ATF Canine Operations Branch news photos, released.]

The ATF has also worked with the U.S. Department of State and the Connecticut State Police to train and provide explosives-detecting dogs that can be sent overseas to aid foreign

countries with programs to combat terrorism. The ATF also offers training to other federal and state agencies, and local law enforcement agencies.

Terrorist threats at events that attract large numbers of people have also been a concern after bombings at sports events triggered calls for tighter security. New Orleans police canines were used to sniff under each seat and around public areas before the kickoff of the Super Bowl in the Louisiana Superdome, to seek out any explosives that might have been hidden in anticipation of the crowds. Dogs are also used for similar events in which large numbers of people congregate, for religious meetings, pageants, and music concerts.



Left: A Massachusetts State Police collector's patch depicting a bomb detection dog, in this case, a Shepherd. Right: A vehicle in Saudi Arabia is searched by Jacky and Snr. Airman Tammy Kirksey, who served as an Explosives Detector Dog Handler with the Security Police during Operation Southern Watch. [Classic Concepts photo, used with permission; U.S. DoD 1996 news photo by R. M. Heileman, released.]



Left: Jupiter, a bomb-detecting dog, with handler SSgt. Leach checks vehicles entering a compound at the Rafha Airport in northern Saudi Arabia. Right: Members of the Bureau of Alcohol, Tobacco, and Firearms (ATF) sift through the debris at the scene of a fire in Colorado, seeking evidence of arson, with the assistance of a dog trained to detect explosives and accelerant. [U.S. Army 1991 Airborne Corps archive photo by LaDonna S. Kirkland; ATF news photo, released.]



Mica, a Black Labrador Retriever with the New York State Office of Fire Prevention and Control (OFPC) aids handler Randi Shadic in seeking out accelerants that may have been used to burn down this wood-frame building. [OFPC news photo, released.]

Narcotics and Other Substances Sniffing

The chief responsibility of canines associated with most justice departments and customs organizations is sniffing for narcotics or explosives. However, there are also dogs trained for recovering victims or bodies from accident or disaster sites and dogs trained to identify contaminated foods or other substances that might pose a health risk.

Food Substance Sniffing

Dogs can be trained to search for a general category of substances or for specific substances. Since tainted food products or foreign species of plants can pose health risks if imported illegally, dogs are used to aid customs officials in inspecting luggage. The U.S. Beagle Brigade is specially trained to sniff luggage for the presence of meat products. In one year alone, almost 1/4 million pounds of illegally imported meat and related animal products are seized and confiscated in the U.S.



A member of the U.S. Department of Agriculture's 'Beagle Brigade,' which aids the Animal and Plant Health Inspection Service detecting illegal imports that might threaten the health of domestic agricultural products. The dogs are trained to detect fruits, meats, nuts, and other regulated plant materials. [U.S.D.A. news photos, released.]



Left: The Australian Ministry of Justice canine section is used to assist in detecting illicit drugs in Western Australian prisons. There are currently six dog teams which include dogs that are trained either as drug-detection dogs or as multipurpose dogs. Right: An Australian Customs Service Detector Dog Unit (DDU) aids in locating smuggled narcotics that may be hidden in luggage, cargo containers, vehicles, and other vessels, or carried on a person's body. The program began in 1969. [© 2000 Australian Ministry of Justice photo and 2000 Australian Customs Service photo, used as per copyright specifications.]

The customs agents of many countries use dogs to sniff for narcotics, smuggled items, and stowaway humans.



Top Left and middle: This 86-foot oil-supply vessel was found to have 86 kilos of cocaine hidden in the hull. Bottom Left and Right: Dogs are used to sniff the vessels to make a positive detection. In this case, it was a ship, so a drill was used to make a hole into the hull. The dust that came out with the drill bit was put in a sensitive chemical identifier and the blue color that resulted indicated a positive identification for cocaine. The hull was then opened to reveal individually packed kilos of cocaine. Top Right: Just a portion of more than a ton of cocaine that was detected and seized aboard another marine vessel. [U.S. Customs news photos by James Tortelotte and top right photo by Todd Reeves, released.]

The detection of narcotics smuggling at various borders is an ongoing challenge for law enforcement agents. In half a year in Arizona, more than 100,000 pounds of various narcotics were seized. Dogs are used to help detect and locate hidden narcotics in vehicles and containers. Large amounts of undeclared currency are sometimes found with the narcotics.



Left: The U.S. Customs sponsors a “Canine of the Month” section on their Web site which features pictures and descriptions of the various dogs that aid enforcement officers in carrying out their duties. This Golden Retriever named “Zulu,” is currently stationed in San Juan, Puerto Rico. “Zulu” has been working with the Customs service since 1990. Golden Retrievers are popular because of their mild, friendly dispositions, their desire to please, and their pride in their work and their handlers. Right: “Rufus” is another Golden Retriever who began working with Customs in 1990. Rufus was stationed in San Diego at the time this picture was composed. [U.S. Customs 2000 news photos, released.]

The following examples give a picture of how high technology and trained canine narcotics-sniffers are used to detect and locate hidden drug shipments:

- In February 2000, canine “Bo” was used to sniff a Dodge sedan driven by a man and woman from Mexico City. The dog signaled a positive hit in the vehicle floorboards. A drill was used to check through the floor and cocaine dust was positively identified on the drill bit with a chemical test. Opening the compartment revealed 91 pounds of cocaine.
- Another Dodge sedan with one male occupant at a nearby customs crossing was referred for a secondary inspection. The Customs Inspectors used a high-tech density-measuring device to detect irregularities in the vehicle’s bumper area. Canine “Boyka” produced positive alerts for the bumper and dashboard. Inspection revealed 50 pounds of cocaine in the bumper, dashboard, and quarter panels.
- In San Diego, a pleasure boat was detained while a narcotics-detecting canine from the San Clemente Border Patrol station was summoned. The dog made a positive alert that resulted in the discovery of a hidden compartment retrofitted with an electronic latching device designed to make it look like a sealed compartment. More than 2,000 pounds of marijuana were found wrapped in cellophane bags in the compartment.
- When a Laredo truck driver came through the Colombia import lot hauling an empty trailer, a post-primary canine inspection by “Cowboy” resulted in a positive alert to the front wall of the trailer and the fifth wheel area. X-ray scanning was then used, which confirmed irregularities in the front wall. On inspection, it was found to be hiding almost 4,000 pounds of marijuana. The seizure was a cooperative effort between Customs Special Agents and Laredo Police Narcotics Unit Officers.

- In March 2000, 13 canines and their handlers were graduated after a two-week training session at the Customs Canine Enforcement Training Center. The training was to teach the dogs to detect MDMA “Ecstasy,” which is being increasingly used by young people at “Raves” and parties. MDMA is primarily methamphetamine.



Left: Spc. Colleen Neubest and narcotics-sniffing Dutch Shepherd “Fedor” disembarking from an aircraft in Bosnia in August 1998. Right: Dr. Dunn of the Armed Forces Institute of Pathology veterinary department is shown here with a microscope. The IoP provides veterinary support for about 1,500 military working dogs in the U.S. Department of Defense plus others with the Federal Aviation Administration, Customs, Border Patrol, and the Secret Service. [Armed Forces Press Service news photo by John Lasky; DoD news photo by Rudi Williams; U.S. DoD news photo, released.]

Pest Inspection

Dogs have been trained to sniff walls for the presence of termites and other possible pests for an exterminating company in San Francisco.

Pipeline Management

Dogs have been trained to detect Tekscent, a nontoxic chemical that is used as a detection aid in finding leaks in pipelines. Dogs are used by companies like Imperial Resources Limited in Calgary, Alberta to find leaky pipes buried as deep as 15 feet.

Wildlife Detection

Almost everyone is familiar with hunting dogs which have been trained to seek or pursue specific species of animals or birds, especially pheasant, duck, deer, wolves, or bears. Dogs are also used to seek out poaching activities and endangered species or wildlife that is being monitored for conservation purposes.

Dogs can be trained to seek out individuals suspected of poaching, or animals which have been partially harvested and the remaining carcasses abandoned (gutpiles, hides, heads, etc.). They may also be trained to locate contraband carcasses in vehicles, campsites, or storage containers.

Dogs are able to detect the feces of target species so they can be studied and monitored and so sampling in the field can be done more selectively and efficiently. The dogs can find specific types of species so samples can be taken back to a lab for further analysis, including DNA profiling. With DNA profiling, the specific individual that left the feces can be identified for noninvasive tracking without the use of radio collars or tags or in instances where the radio collar has been lost. The data from these samples are valuable in census-taking and

wildlife management and conservation activities.

Underwater Surveillance

Both dolphins and sea lions have been found to be willing partners in aiding people in surveilling underwater environments. Sea lions can hear well and navigate well in dark water and dolphins are extremely intelligent and have remarkable sonar systems that allow them to see objects inside other objects (described more fully in the Sonar Surveillance chapter). Dolphins can be used to help locate underwater wrecks, divers in distress, minefields and individual mines, lost items, and more. Sometimes they can even be used to place and retrieve specific types of items.



This dolphin is a member of the Mobil Unit 3 team out of San Diego, California, shown here on location in Lithuania with Staff Sgt. Fahs (left) and Col. Linn of the U.S. Air Force (right). The dolphins were deployed in Lithuania as part of Operation Baltic Challenge, a peace support exercise in the Baltics that included the U.S. and 11 European nations. [U.S. DoD 1998 news photo by Eduardo Guajardo, 55th Signal Company, released.]

In the U.S. Navy Mk 4 Mod 0 program, Pacific Bottlenose dolphins have been trained to attach neutralization charges to the mooring cables of buoyant mines.

Commercial Products

This section does not constitute a complete list of all vendors, nor does it imply an endorsement of the quality of their products or services. The following are intended as educational examples only, to provide an introduction to the types of products that may be purchased on the market related to this topic.

Dog Training Scents

In order to train an animal to recognize and respond to particular scents, it helps to have selective examples of those scents for the animal to smell. There are commercial companies

that create containers with specific types of odors that might be relevant to arson, smuggling, or explosives surveillance and package them for use for training.

Sigma Chemical Company - Produces pseudoscents that simulate odors ranging from narcotics to a fresh corpse, or the smell of a person in distress.

Dog Training Equipment

Verschoorpak - A Dutch dog sport equipment company which includes bite-training cuffs and suits. Florida-based with equipment produced in The Netherlands.

Dog Training Schools

Note, some of these training schools also supply dogs.

Command Dog College - Okotoks, Alberta. Labrador retrievers have learned to detect Tekscents.

The K9 Center - A two-acre dog training facility located in Richmond, B.C., Canada. It is managed by Eden & Ney Associates which provides information on police dogs and related law enforcement issues. The K9 Academy for Law Enforcement trains dog handlers.

Lynnwoods Kennels, Inc. - Located on 12 acres, this facility provides law enforcement canine handler courses including narcotics, explosives, accelerant, and cadaver detection along with patrol work handling. Located in Fremont, Ohio.

Commercial Dog Sniffing Services

Commercial services require a license from the Drug Enforcement Administration.

Detector Dogs Against Drugs and Explosives (DDADE) - Founded in 1997 to provide narcotics and explosives sniffing services to businesses, schools, and private homes. Located in Virginia with franchises in other states. The fee can range from \$250 to \$1,000 per search.

InterQuest Detection Canines - Established in the late 1970s, InterQuest conducts over 10,000 searches a year. About one in five searches leads to detection of drugs or explosive substances. The company also supplies dogs to law enforcement, school security, and commercial firms. InterQuest is a Houston-based multistate service.



In 1995, the U.S. Fish & Wildlife Service initiated the *Search and Find* canine program in collaboration with Special Agents and Inspectors in San Diego. Dogs trained for search and rescue tasks were trained to detect both live and dead smuggled wildlife for use in the San Diego and Los Angeles areas. [U.S. Fish & Wildlife Service news photos, released.]

Dog Suppliers

Note, some of the dog training schools listed on the previous page also supply dogs.

Police Service Dogs International (PSDI) - Includes patrol, tracking, detection, and multiple-purpose dogs of the German Shepherd and Belgian Malinois breeds. Canine Protection Services is a division of PSDI. Based in Massachusetts.

7. Problems and Limitations

Narcotics-Sniffing False Positives

False positives are somewhat common in drug sniffing operations by dogs due to their excellent sense of smell. Drug smoke and residues linger on clothing for some time, sometimes so strongly that human noses can easily pick up the scent. As an example, for every 100 students who might be identified by a dog as potentially carrying drugs, usually only about a third are found by subsequent searches by people to have drugs in their possession. This may be a mistake on the part of the dog. The student may have been playing with dogs or something else that attracted the sniffing dog's attention. But there are also instances in which the student threw away the drugs prior to the search, or previously smoked or ingested drugs, or was in close proximity with others who had been using drugs, and the smell is still on the hands or clothing of the person identified by the dog. In fact, people who do not smoke marijuana but who regularly socialize with those who do, sometimes have detectable amounts of marijuana in their bloodstream from second-hand smoke. While there hasn't been much research on this, dogs might be able to detect these trace blood levels if the person is perspiring and excreting body fluids.

More research is needed to determine the specific reasons for false positives. In the meantime, sniffing dogs will sometimes single out individuals based on their recent activities, rather than actual possession of substances at the time of the search.

Relocation of Animals

Animals are no different from people when it comes to susceptibility to infections and parasites in unfamiliar regions. If a dog or dolphin is transported to a new region, it may be vulnerable to tropical diseases, to parasitic infections from worms in the water or food, or spirochetes transmitted by insects. Dolphins are specialized in that Atlantic dolphins can't survive in Pacific waters. The environments are different enough that it would take them generations to adapt. They can't be moved to oceans anywhere in the world. These factors have to be considered when animals accompany humans to foreign regions.

8. Restrictions and Regulations

There are a number of professional and regulatory guidelines for the handling and care of animals, some of which specifically protect animals used for professional services.

Service Animal Protection

The regulations with regard to the use of animals in law enforcement vary in wording somewhat from state to state but, in general, they safeguard the animals from harm by levying fines and prison sentences for anyone who engages in malicious obstruction or harm to an animal acting in the line of duty. In some cases, persons are even barred from entering the area of control of a police service animal. Fines vary, but tend to be up to a few thousand dollars and prison terms range from about 6 to 18 months. Some statutes are written specifi-

cally for police service dogs and others are generic for police service animals. Since horses are used in many areas for police work, particularly in Canada, the generic wording is intended to cover them as well as any other animals that might be brought into service in the future. This is not unreasonable considering that many species of animals have been used in other parts of the world as messengers (e.g., carrier pigeons) or as patrol or ‘watchdog’ animals, including geese, ostriches, llamas, crows, cockatoos, and Siamese cats.

Legal Searches

Regulations regarding personal privacy and constitutional freedoms influence what an animal can or cannot search. Since dogs are often used to seek out controlled substances, explosives, and other contraband, the search of luggage, vehicles, possessions, school lockers, and closets is common. The search of people is also common, but there may be restrictions to using an animal to search in addition to those applying to the search of a bag or cupboard.

Animal Handling and Protection

There are a number of humane societies listed in the resources section that provide information on the proper care of animals and regulations governing the owning and use of animals.

9. Implications of Use

The use of animals in surveillance brings up some issues that are unique to this ‘biological technology’ that are different from issues related to the use of electronic or mechanical devices.

Individual Temperament and Intelligence

Handling an animal is obviously very different from handling an inanimate video camera, robot, or other surveillance ‘device.’ Unlike a piece of equipment, you can’t stuff it in a briefcase when it isn’t being used. It requires care and attention 24 hours a day. Unlike a tape recorder, a 15-minute training session isn’t sufficient to make you an expert in using the ‘technology.’ Trainers and handlers need years of experience. Even if the animal is just a tiny firefly used to observe its chemical reactions to stimuli, an animal requires humane, ethical treatment, and the right environment, or it cannot thrive.

The more intelligent the animal, the more its personal attributes have to be considered, and the more experience it takes to work with the animal. Not every person has the temperament to be a good animal handler and not every animal has the temperament to carry out surveillance work. Some people believe animals shouldn’t be used in surveillance work at all, with dogs a possible exception because they naturally enjoy protecting their owners and their property.

Handling an animal is different from handling equipment. Animals have individual personalities, emotional needs, and intelligence. Dogs may not match humans in higher-level abstract or conceptual thinking skills, but they are extremely similar to us emotionally. While we can never confirm this with absolute certainty, their body language and reactions to situations indicate that they experience happiness, sadness, grief, anger, annoyance, and pretty much the range of emotions that we intuit a child feels and that we personally experience and acknowledge in adults.

Most canine handlers in professional positions are ‘on duty’ 24 hours a day, in that a dog requires continual care and desires companionship. There is a strong bond between the han-

handler and the dog which is important to the partnership and also necessary for the emotional and physical well-being of the animal; dogs have highly social natures. Handling, training, and managing a dog includes home care, in many cases, above and beyond what the handler's non-canine-handling colleagues may be required to do in the execution of their duties. Home care includes feeding, grooming, exercise, the administration of medicines, when appropriate, and maintenance training. In some instances, this time is compensated in a variety of ways, depending on local and national labor laws and arrangements made between the employer and the employee.

Dolphins are similar to dogs in that they are interested in humans and sometimes seek out their company, provided they are not threatened or unduly confined. The study and training of dolphins have resulted in many surprises. Dolphins have large and complex brains, sophisticated sonar and communication systems, and the ability to communicate to us what they are seeing inside various objects. We don't yet know how 'smart' they are relative to us, because they are different from humans in many essential ways, but preliminary studies indicate they may have a wealth of abstract thinking ability and mental talents as yet not fully understood.

Unfortunately, there are still many people who think that dolphins are fish. They don't realize that dolphins typically have only one offspring every two years or so, resulting in a dozen or so 'children' in a lifetime, as opposed to a fish that can lay hundreds or thousands of eggs every year and can more easily replenish themselves. Given that fish stocks are declining, even with the more prolific nature of fish reproduction, it can be seen why dolphin and whale populations, which have a harder time replacing themselves, are declining at alarming rates, in spite of protections, more humane nets, and export restrictions. The training and use of dolphins in surveillance activities have aided us in understanding more about the abilities and lifestyles of these remarkable mammals and will hopefully have a secondary benefit in educating the public in the need to observe and preserve the dolphins and their habitat.

Animal Rights

The use of animals in surveillance in the service of humans often provokes comment or criticism from animal rights advocates. Animal rights advocates are concerned for the safety, dignity, care, lifestyle, lifespan, and nonexploitive relationship of animals and people. Any attempts to confine animals, to conduct tests on them, to expose them to danger they may not understand, or to have them engage in activities that may reduce the quantity or quality of their lives will continue to be the subject of scrutiny and opposition. It is important for anyone training or handling animals to be aware of the concerns of animal rights groups, and the laws related to the keeping of animals, in order to work within our complex social structure to achieve ends that are of mutual benefit.

Rights activists are not opposed to every aspect of the use of animals in surveillance. Dogs clearly enjoy interacting with humans, engaging in field trips, and many of them love to work, requiring only appreciation and good care in return. They are indispensable partners in locating avalanche victims, missing children, people buried in earthquake rubble, and the bodies of those who have died under natural or suspicious circumstances. Given the enormous benefit we derive from their eager assistance, these types of activities raise few concerns as long as the animal receives good care.

10. Resources

Inclusion of the following companies does not constitute nor imply an endorsement of their products and services and, conversely, does not imply their endorsement of the contents of this text.

10.a. Organizations

American Rescue Dog Association (ARDA) - This is the oldest air-scenting search dog organization, founded in 1972. The organization has been involved in the development of standards and training for air-scenting in different conditions. ARDA developed the first National Search and Rescue Dog Directory for the National Association for Search and Rescue. <http://www.ardainc.org/>

American Society for the Prevention of Cruelty to Animals (ASPCA) - One of the most prominent animal rights and educational organizations. They sponsor adoption programs, spaying and neutering, hospitals, and investigations into cruelty to animals. <http://www.aspc.org/>

Animal and Plant Health Inspection Service (APHIS) - A department of the U.S. Department of Agriculture that is tasked with ensuring the health and care of animals and plants, agricultural productivity and competitiveness. APHIS uses dogs to aid in detecting illegal animal and plant matter. <http://www.aphis.usda.gov/>

Dogs Against Drugs/Dogs Against Crime National Law Enforcement K9 Association - Established in 1989, this is a not-for-profit organization working with local and foreign law enforcement agencies to aid them in operations and, if necessary, funding for special purpose dogs and K9 equipment. <http://www.dadac.com/>

Humane Society of the United States (HSUS) - Like the ASPCA, the HSUS has worked for many years toward educating the public about the humane treatment of animals. It has also disseminated research and other educational information, much of which is accessible through the Web site. <http://www.hsus.org/>

National Association for Search and Rescue (NASR) - A nonprofit membership association for professionals involved in search and rescue, disaster assistance, and emergency medicine. The site includes a dog section which includes the National Search and Rescue Dog Directory. <http://www.nasar.org/>

National Narcotic Detector Dogs Association (NNDDA) - Provides information, certification standards, events, etc. <http://www.nndda.org/>

National Police Canine Association (NPCA) - Assists and promotes police service dogs and educational programs for the prevention and detection of crime. Further promotes task-related minimum standards and certification programs. <http://www.npca.net/>

Nordic Police Dog Union (NPDU) - sponsors championships, publications, and activities related to the training and handling of police dogs. <http://home3.inet.tele.dk/nphu/>

North American Police Work Dog Association (NAPWDA) - Provides workshop information, training tips, and certification information. <http://www.napwda.com/>

Northern Arizona Police Department (NAPD) - This site not only has illustrated information about police service dogs, but has a very large list of related links on the Web. <http://www.nau.edu/~naupd/k9.htm>

Official Site of the 47th IPSPD "Paw Power" - This is a Scout Dog platoon founded in 1968, with photos, links, history, and communications of members of the platoon. <http://www.geocities.com/Pentagon/4759/>

Royal Australian Air Force Police Dog Handlers Association - Established in 1996.

The Seeing Eye - Since 1929, this organization has promoted the training of dogs to aid the blind. Their Web site includes Dog Guide laws and has a number of articles and electronic books on working dogs that can be downloaded. <http://www.seeingeye.org/>

U.S. Customs Service - This is the primary enforcement agency, within the Department of the Treasury, which protects national borders through extensive air, land, and marine interdiction and its own intelligence branch. Customs detects smuggling and enforces U.S. criminal and import/export laws. Canine sniffers can be used in the detection of narcotics, explosives, and other illegal imports. <http://www.customs.ustreas.gov/>

U.S. Fish and Wildlife Service (FWS) - The FWS is involved in conserving and monitoring American wildlife resources, issues hunting and fishing licenses, and provides educational publications and programs. Dogs are used to detect and deter smuggled wildlife. <http://www.fws.gov/>

Working Dog Foundation - Incorporated as a nonprofit organization in 1995 to promote a positive public image of police working dogs, to operate the New Hampshire Police K-9 Academy, to promote minimum standards, and to aid organizations wishing to establish police dog units. <http://www.workingdog.org/>

10.b. Print Resources

These annotated listings include both current and out-of-print books. Those which are not currently in print are sometimes available in local libraries and second-hand bookstores, or through interlibrary loan systems.

American Search and Rescue Dog Association, "Search and Rescue Dogs: Training Methods," New York: Howell Book House, 1991, 208 pages.

Bulanda, Susan; Luther, Luana, Editor, "Ready! The Training of the Search and Rescue Dog," Doral Publishing, 1995, 170 pages.

Burman, John C., "Dog Tags of Courage: The Turmoil of War and the Rewards of Companionship," MSG, 2000, 300 pages. Scout dogs stories from Vietnam vets.

Button, Lou, "Practical Scent Dog Training," Alpine Publications, 1990. Techniques tested with Mountain Canine Corps search and rescue.

Duet, Karen Freeman; Duet, George, "The Business Security K-9: Selection and Training," New York: MacMillan and Company, 1995.

Eden, Robert S., "Dog Training for Law Enforcement," Calgary: Detselig Enterprises Ltd., 1985.

Gerritsen, Desi; Haak, Rudd, "K9 Search and Rescue," Temeron, 185 pages.

Howorth, Peter C., "Whales and Dolphins Shorelines of America: The Story Behind the Scenery," Las Vegas: KC Publications, 1995.

Johnson, Glen R., "Tracking Dog," Arner Publications, 1989, 200 pages. Reprint of classic with theory and methods.

Johnson, Glen R.; Patterson, Gary, "Training Police Dogs," San Francisco: The Millbrook Press, 1989.

Kaldenbach, Jan, "K9 Scent Detection," includes case files and dog requirements for The Netherlands.

Kearney, Jack, "Tracking: A Blueprint for Learning How," revised edition, Pathways Press, 1999. Military and search and rescue reference for tracking people.

Koehler, William R., "The Koehler Method of Dog Training," IDG Books Worldwide, 1996, 190 pages. Originally published in several editions by Howell Book House (New York).

Koehler, William R., "The Koehler Method of Guard Dog Training: An Effective and Authoritative Guide for Selecting, Training and Maintaining Dogs in Home Protection and Police Work," IDG Books Worldwide, 1977. Matching the dog breed to the purpose, equipment, methods.

Koehler, William R., "The Koehler Method of Training Tracking Dogs," 1984.

Lemish, Michael G., "War Dogs: A History of Loyalty and Heroism," Washington, D. C., Brassey's, Inc., 1999, 304 pages.

Mistafa, Ron, "K9 Explosive Detection," Temeron Books, 1998, 189 pages. Training methods for different dogs, choosing a dog, general requirements, certification, training with explosives.

McKenzie, Stephen A., "Decoys and Aggression: A Police K9 Training Manual," Temeron, 1996, 88 pages. Types of natural aggression, learning the body language, how to be a decoy for bite training.

Morgan, Paul B., "K-9 Soldiers: Vietnam and After," Central Point, Or.: Hellgate Press, 1999, 220 pages.

Mullican, Jr., Herbert, Editor, "A Guide to the Technical Literature on Police and Military Working Dogs," Special Canine Services, Frederick, Maryland. Bibliography that categorizes over 1,000 articles, publications, reports, and films.

Pearsall, Milo; Verbruggen, Hugo, "Scent: Training to Track," Loveland, Co.: Alpine Publications, 1982. Scent science, tracking theory, and method.

Rapp, Jay, "How to Organize a K-9 Unit and Train Dogs for Police Work," 1979.

Reed, Don et al., "The Dolphins and Me," Scholastic Book Services, Sierra Club, 1990.

Robicheaux, Jack; Jons, John A. R., "Basic Narcotic Detection Dog Training," K9 Concepts, 1990. Selecting and training a dog.

Rosenthal, Richard, "K-9 Cops: Stories from America's K-9 Police Units," Pocket Books, 1997, 360 pages.

Seguin, Marilyn; Caso, Adolph, Editor, "Dogs of War: And Stories of Other Beasts of Battle in the Civil War," Branden Books, 1998. Juvenile reading level.

Simpson Smith, Elizabeth, "A Dolphin Goes to School: The Story of Squirt, a Trained Dolphin," Morrow, 1986. Out of print.

Sjrotuck, William G., "Scent and the Scenting Dog," Barkleigh Productions, Inc., 1972.

Sorg, Marcella H.; Rebmann, Andrew; David, Edward, "Cadaver Dog Handbook: A Forensic Guide for Training, Handling, and Searching," 1999.

Thorpe, Samantha Glen; Pesaresi, Mary B., "Search and Rescue," Fawcett Books, 1997, 197 pages. The story of German Shepherds with the Virginia Dept. of Emergency Services on rescue missions.

Tolhurst, Bill, "Police Textbook for Dog Handlers," New York: Tolhurst, 1991, 85 pages. Trailing, cadaver recovery, acclerant training, crime scene canines. The author is a researcher and practitioner.

Tweedie, Jan, "On the Trail! A Practical Guide to the Working Bloodhound and Other Search and Rescue Dogs," Alpine Publications, 1998. A practical professional guide to search and rescue record-keeping and tracking of humans.

White, Joseph J.; Luther Luana, Editor, "Ebony and White: A Story of the Canine Corps," Wilsonville, Or.: Doral Publications, 1996, 168 pages. Canine corps from World War I and onward, including the Vietnamese war.

Articles

Albertson, Mike, "Use of Military Working Dogs in Peace Support Operations," U.S. Army *Call*, 1998. This is a multipart article on many aspects of dog use in military operations.

Immega, Guy, "Tension Actuator Load Suspension System," *United States Patent #4,826,206*, filed 9 Feb. 1987. Suspension and sensor systems applicable to robotics.

National Church Arson Task Force, "Second Year Report for the President," Washington, D.C., October 1998.

Stone, Paul, "Creatures Feature Possible Defense Applications," Washington, D.C., *American Forces Press Service*. An article about how creative thinking can come up with ways to utilize the unique characteristics and talents of a variety of critters to aid in surveillance tasks. It reports on the Controlled Biological and Biomimetic Systems project. Stone has also written a story on how bees might be used to detect mines.

Yarnall, Donn, "My Dog Won't Out!" 1999. Debate about training approaches, control, and aggressive instincts with the Belgian Malinois as the example.

Journals

"American Academy on Veterinary Disaster Medicine Newsletter," journal of the AAVDM.

"National Association of Dog Obedience Instructors," Landing, NJ.

"Nordic Police Dog Magazine," ships to about 61 countries.

"The Canadian Search and Rescue Magazine," quarterly, free to the search and rescue community.

10.c. Conferences and Workshops

Many of these conferences are annual events that are held at approximately the same time each year, so even if the conference listings are outdated, they can still help you determine the frequency and sometimes the time of year of upcoming events. It is very common for international conferences to be held in a different city each year, so contact the organizers for current locations.

Many of these organizations describe the upcoming conferences on the Web and may also archive conference proceedings for purchase or free download.

The following conferences are organized according to the calendar month in which they are usually held.

"International Police K9 Conference," Lake County, Florida, 27 Feb. - 3 Mar. 2000. Topics include beginning and advanced training techniques, tracking, tactics, problem-solving, muzzle work, deployment, and others.

"Narcotic Detection Dog Seminar," Columbia, S.C., 8-12 May 2000.

"USPCA National Seminar," Boulder, Colorado, 31 May - 5 June 2000.

"Police K9 Conference," Sacramento County, Ca., 9 - 13 Oct. 2000. Restricted to law enforcement personnel.

"APDT Educational Conference," 6th annual conference, San Diego, Ca., 17-21 Nov. 1999.

DAD/DAC National Law Enforcement K9 Association offers regular training seminars and workday events through the U.S. <http://www.daddac.com/>

PLES.com provides regular seminars and certification programs for Drug K9 handlers and supervisors. <http://www.ples.com/k9.htm>

Southern Police Canine, Inc. conducts about one seminar per month ranging in length from two days to about eleven days each, with various local police representatives or contact people from SPC. Some of these include certification. <http://www.southernpolicecanine.com/seminar.htm>

10.d. Online Sites

Albert Heim Foundation for Canine Research. This interesting site looks at the historical and physiological development of canines including archaeological skulls and other specimens and dog-related exhibits. The site is of particular interest to scientific researchers interested in the evolutionary history of canines. <http://nmbe0.unibe.ch/abwt/ahst.html>

Tightlines. This site has a number of informative illustrated articles by writers/trainers on the subject of training and handling of tracking dogs. It also lists Tightlines seminars. The emphasis is on German Shepherds but the concepts apply to the training of many breeds. <http://www.memlane.com/business/tightlines/>

Leerburg Dog Training. This company specializes in the breeding and training of service dogs and provides a series of training videos. Their illustrated Web site includes almost 200 free-access dog training articles on a wide variety of obedience, dog-care, and training topics. <http://leerburg.com/>

K9 Case Law. Eden & Ney Associates Inc. includes several sections of interest on their Police Dog Web site, including training and standards information, links to police dog case law, and links to various canine agencies. <http://www.policek9.com/>

10.e. Media Resources

“Animals in the Service of the Military,” an America’s Defense Monitor series show that describes many types of animals, from elephants and horses to dogs and dolphins, that have served military forces over the centuries. It describes some of their abilities, but also some of their limitations and controversy over their use and handling, with dolphin programs as examples. Produced in 1991, available on video.

“In the Wild: Dolphins with Robin Williams,” an introduction and overview of dolphin habits, personalities, and abilities, NTSC format, color VHS.

“K-9 Cop,” a color VHS video in a Police Tactics series. How police dogs are prepared and drilled for attack and crime scene evidence hunting; 40 minutes, E&E Productions, Connecticut. The author has not viewed this video and cannot attest to its quality.

“News Report on Dogs’ Abilities to Detect Chemicals,” part of CNN’s Science and Technology Week which first aired in November 1996 and was subsequently made available to its global networks. It describes the research of an Auburn University professor into the use of dogs for detecting chemicals in explosives.

“Search Dog Training: How to Get Started,” Handlers, selecting a dog, basic training. By Stopper and Watts on VHS.

“Tracking Fundamentals,” video and book (Ganz and Boyd) that outline a training program, mapping, turn techniques, etc., 1992, VHS, 42 minutes.

“Training Police Service Dogs,” VHS video in Leerburg’s extensive Dog Training series, available since 1979. This is an intermediate-level training video which covers equipment, handling, targeting of bites, and off-leash control; 2 hours, Leerburg Video Productions, Wisconsin. The author has not viewed this video and cannot attest to its quality, but notes that the producers specialize in the breeding of working dogs for police work, search and rescue, and obedience.

“War Dogs: America’s Forgotten Heroes,” poignant video showing the canine heroes that aided soldiers in Vietnam. Donors to the Memorial Fund receive the video, VHS. This was shown on the Discovery Channel. <http://www.war-dogs.com/>

11. Glossary

Titles, product names, organizations, and specific military designations are capitalized; common generic and colloquial terms and phrases are not.

AKC	American Kennel Club
CD	companion dog
CDX	companion dog excellent
CU	canine unit
EDC	explosives-detecting canine
HDC	human-detecting canine
K9	canine

mutt	mixed-breed dog
MWD	military working dog
NDC	narcotics-detecting canine
SAR	search and rescue
TD	tracking dog
TDX	tracking dog excellent
UDT	utility dog with tracking dog title
UDTX	utility dog title with tracking dog excellent title
UDX	utility dog excellent