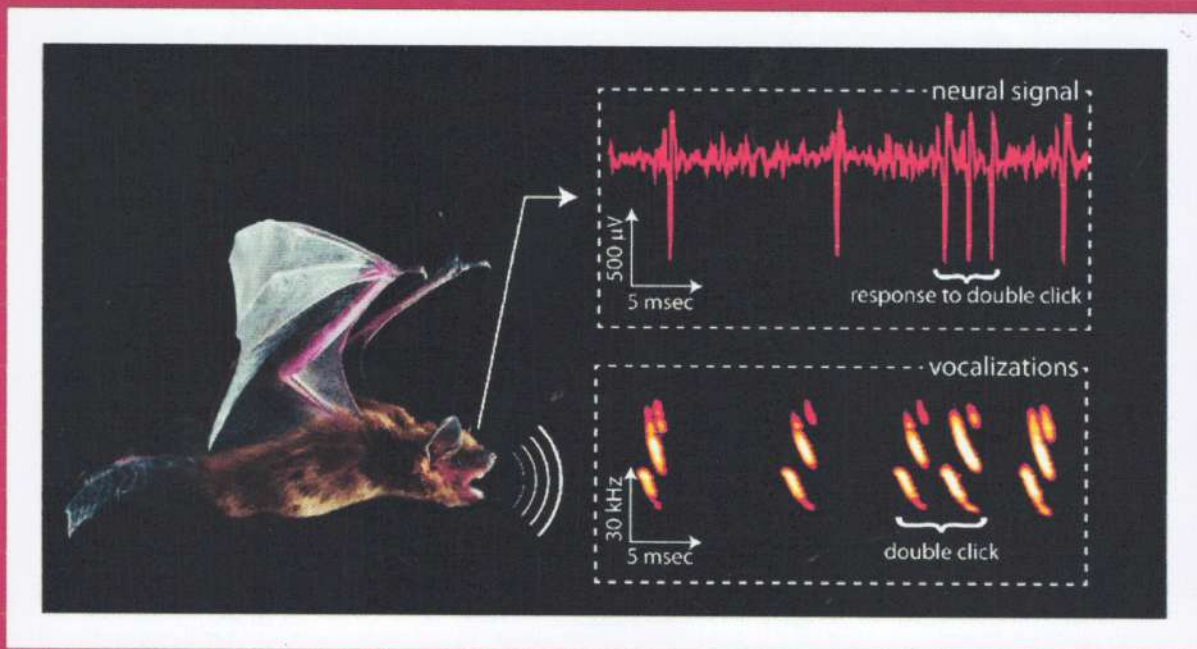


DEPARTMENT OF PHYSICS
STUDENT STUDY PROJECT
ON
BIO-SENSORS OF VARIOUS
FORMS OF LIFE



GDC CHENNOOR
DIST.MANCHERIAL

Title of the Project

CERTIFICATE

Certified that the study project titled "Study of Specific Sensing Characteristics Endowed To Various Species of Life; Manipulation Towards The Betterment Of Mankind As Well As Environment", a genuine multi-disciplinary project work, not copied or published earlier, is done by the following students under the guidance of Ms.Sridevi.K, Asst.Prof of Physics of Govt.Degree College; Chennoor Dist. Mancherial of Telangana during the academic year 2020-2021.

1. Swathi – BZC III -
2. Shekar – MPC III Year
3. Rajesh – MPCs II Year
4. Samatha –MPC II Year
5. Anil – MPC I Year
6. Anjanna-MPC I Year

Aims and Objectives:

- To study specific characteristics of different species of life.
- To study underlying principles of special characteristics.
- Manipulation of properties for the betterment of human race.

Review of Literature:

Signature of Principal

Signature of Guide

(K. Sridevi)

Asst. Prof of Physics.

PRINCIPAL
Govt. Degree College
CHENNOOR, Dist: Mancherial (T.S)

IQAC Co-Ordinator
GDC Chennoor,
Dist: Mancherial.

Title of the Project:

Study Of Specific Sensing Characteristics Endowed To Various Species of Life; Manipulation Towards The Betterment Of Mankind As Well As Environment.

Statement of the problem or hypothesis:

Earth embodies innumerable mysterious and magnificent phenomena. Human race with the highest evolved mental ability, is trying to manipulate the underlying processes of all phenomena for the best manifestation of its own race.

Looking at the special characteristics gifted to various species of life, innovative implements that may benefit science, engineering and medicine are already emerging. Biomimetics is an excellent example of this.

Study of such characteristics may help unfold new innovations that may help local communities in terms of predictions or designing of tools.

Aims and Objectives:

- To study specific characteristics of different species of life.
- To try analyzing underlying principles of special characteristics.
- Manipulation of processes for the betterment of human race.

Review of Literature:

Ants:

Ants are seen to form amazing trails and follow the routes exactly. Scientists have long shown that the insects place a variety of chemicals known as pheromones as they walk. These are useful to trace the path right. Ants also touch their antennas to communicate the information like which type of colony they belong to, what type of food is discovered, source point, dangers, predators etc. This can be considered as wireless sensor communication.

The social behavior of the ants where data communication is carried out in a wireless sensor networks has inspired modern day robotics to carry out ANT COLONY OPTIMIZATION (ACO) a technique used in wireless routing.

Low cost and low power sensor nodes which are small in size are receiving more attention. Combining these sensor nodes in large numbers, a new technological platform called Wireless Sensor Networks (WSN) is being developed. These WSN are operational in the fields of health monitoring, vehicle tracking, military surveillance and earthquakes observation.

Bats:

We see bats fly in the darkness without get hitting or jamming. They are said to be echo locating. Bats perceive the distance between objects with high precision using the time delay between emission and echo. They can differentiate as small as one centimeter.

[Daniel Kish](#), who is blind and is a well-known expert echolocator, is able to ride his bicycle, hike in unfamiliar terrain, and travel in unfamiliar cities on his own. Daniel is the founder and president of [World Access for the Blind](#), a non-profit charity in the US that offers training in echolocation alongside training in other mobility techniques such as the long cane.

Since 2011, the scientific interest in human echolocation has gained momentum. For example, [technical advances](#) have made it feasible to scan people's brains while they echolocate. [This research has shown that](#) people who are blind and have expertise in echolocation use 'visual' parts of their brain to process information from echoes. It has also been found that anyone with normal hearing can [learn to use echoes](#) to determine the sizes, locations, or distance of objects or to use it to avoid obstacles during walking. Remarkably, both blind and sighted people can improve their ability to interpret and use sound echoes within a session or two.

Dogs:

Dogs have amazing capacity of listening and smelling. Dogs are said to hear frequencies as high as 60,000 Hz and soft sounds as feeble as -5db to -15 db. This capacity varies with breed as well. The Brainstem Auditory Evoked Response (BAER) tested has been performed on dogs to test their hearing capabilities.

Due to their exceptional response to frequency ranges, the dogs are said to become nervous before the occurrence of storms and earthquakes. Dr. Stanley Coren who is a neuropsychological researcher at University of British Columbia conducted a study on the behavior of dogs, and collected data the day before a level 6.8 earthquake hit the Pacific Northwest. His data included activity and [anxiety](#) levels in 200 dogs living in Vancouver, Canada, a city that was affected by the quake.

Dogs also are unique in their capacity of smell and are extensively used in investigations. Also, they are said to be identifying some diseases, more importantly, cancer. They can be trained to sniff out a variety of types including skin cancer, breast cancer and bladder cancer using samples from known cancer patients and people without cancer.

In a [2006 study](#), five dogs were trained to detect cancer based on breath samples. Once trained, the dogs were able to detect breast cancer with 88 percent accuracy, and lung cancer with 99 percent accuracy. They could do this across all four stages of the diseases. More recently, a study has even shown that dogs can use their highly evolved sense of smell to [pick out blood samples from people with cancer with almost 97 percent accuracy](#).

A [study published in 2013](#), found that two trained dogs detected 11 out of 12 narcolepsy patients using sweat samples, demonstrating that dogs can detect a distinct scent for the disorder. The dogs pick up on biochemical changes in the body that lead to an attack and help with different tasks to avoid injury. But most importantly, they can provide a warning up to 5 minutes before an attack comes on, giving their handler a chance to get to a safe place or a safe position.

- ◆ Thejasvi Beleyur, Holger R. Goerlitz: bioRxiv 817734; doi: <https://doi.org/10.1101/817734> , also published in *Proceedings of the National Academy of Sciences* doi: [10.1073/pnas.1821722116](https://doi.org/10.1073/pnas.1821722116)
- ◆ <https://www.scientificamerican.com/article/learning-how-to-be-a-human-bat/>
- ◆ <https://www.akc.org/expert-advice/lifestyle/can-dogs-predict-earthquakes/>
- ◆ <https://listcaboodle.com/the-amazing-superpowers-of-owls/>
- ◆ <https://www.allaboutbirds.org/news/why-dont-birds-collide-when-they-are-flying-close-together-in-tight-flocks/>
- ◆ <https://www.discovermagazine.com/planet-earth/scientists-finally-figure-out-why-birds-dont-crash-into-each-other>
- ◆ <https://doi.org/10.1371/journal.pone.0162435>
- ◆ <https://www.forbes.com/sites/grrlscientist/2017/09/08/where-do-birds-go-in-a-hurricane/?sh=4cdc69b5254a>
- ◆ <https://www.youtube.com/watch?v=gcHt5n3NGK0>
- ◆ <https://www.youtube.com/watch?v=nMw-PspfdkQ>
- ◆ <https://www.youtube.com/watch?v=lomlLVosis0>

RESEARCH METHODOLOGY:

The project aims at identifying the special characteristics already existing in different life forms and trying to correlate the underlying principles of physics. Physical observation of behaviour of species under study is done and correlated to the already research work done on the topic. So, the study is based mainly on the observational data and compiled data from sources like youtube, internet, google scholar and related experience of general public.

DATA COLLECTION:

Data has been collected from general experience, public observation, research articles, news paper clippings, internet and established behaviour of the species under study.

3. Ants don't have ears

Unlike other pests such as rats, ants don't have ears. But that doesn't mean they are deaf.

How do ants hear?

Ants use vibrations to hear, using them when foraging for food or as an alarm signal. Ants use the vibrations in the ground to hear by picking them up in the subgenual organ which is located below the knee.

10. Dogs are about as intelligent as a two-year-old



Studies have shown that dogs can learn over 100 words and gestures, which puts their intelligence and understanding of us on a par with a two year old. However, dogs are much easier to train than a two year old! They're used for all sorts of jobs, from military roles to assistance dogs, because they're both clever and extremely loyal animals. **To**

ANALYSIS OF DATA

Ants:

- They are generally scattered into all directions.
- When food is found, ants are seen forming trails and also, it is visible that each ant touches each other ant's mouth part ; on its way. The trails are made within very short period
- The pace at which ants move is seen to be dependent on the nature of the food, they find.
- In case of sugary substances or dead insects, the pace seems remarkably fast.
- Ants, especially black, come out in huge numbers and spread across the walls before rain.
- Ants are seen repellant to turmeric.

Bats:

- It is a general experience that bats fly during night times.
- Though bats have eyes, they are nocturnal.
- We see them hanging upside down on wires during day times.
- They eat insects, worms and mosquitoes also.
- Bats live mostly in caves.
- They are said to be using the phenomena of echolocation.

Dogs:

- There are many breeds of dogs.
- Dogs are brought up as household pets as well as for security reasons.
- Dogs are provided training in the investigative institutions.
- In olden days, the shepherds used to take sheep-dogs that were trained to herd the sheep.
- Dogs are known for their concern, love and affection towards the owners. In some places, they are trained even to fetch groceries from the stores.
- Dogs have great sense of smell and hearing.
- They follow smell up to large distances.
- Dogs predict the sickness of its owners like cancers, narcolepsy attacks, diabetes and now are in the process of detecting COVID as well.
- Dogs can hear a great range of sounds upto frequencies of 60,000Hz and with intensity as low as -15db.
- Due to this hearing sensitivity, they are stated to forecast earthquakes, tsunamis.

Owls:

- Owls have excellent binocular vision coupled with highly developed hearing ability which makes them catch their prey with extreme precision.
- They are stated to hear mice and squirrels even from 300m and hiding under a metre of snow.

Murmuration:

- Starlings murmuration is much seen at evenings during winter. Their number is amusing at times.
- They form many patterns and yet they do not collide.

FINDINGS OF DATA:

Ants: They have excellent communication system. The identification of source and transfer of data happens within no time and exhibit perfect discipline in sharing the food. Their antennas work as sensors in guiding them through the process. They use chemical substances to keep track of their path.

Bats: They locate prey using a phenomenon of echolocation in complete darkness also. They send continuous sound signals and analyzing the echo reflected from the surface of the prey they estimate the distance and direction of the prey.

Dogs: They are the most faithful domesticated animals. They have exceptional sense of smell and hear. They use this power in identification of persons and their prey as well. Their hearing capacity enables them to hear sound frequencies inaudible to humans. They exhibit restlessness in wake of some specified calamities.

Owls: They have exceptional binocular vision with highly developed hearing system. It located its prey with sharp precision.

Murmurations: The birds flying in numbers sometimes in hundreds and all of them changing directions within no time suggests their communication system is very excellent. There have been many predictions about this behaviour but no absolute theory has been established yet regarding the underlying message transfer of the birds.

SUGGESTIONS:

- Wireless communication system with antennas just like ants, may be developed for local areas and in case of emergencies like fire accidents, news may be communicated to surroundings. This will not only facilitate people out of the place but to extend support for extinguishing fire with whatever resources available with them.
- During night times, vehicles move on the highways with great speeds. The animals like monkeys, dogs, buffaloes, cows, sheep and goats that get stray crossing the roads at night times may fall prey to speeding vehicles. Sensors that use low power that may echolocate up to a distance of 10 may be developed and fitted into the vehicles; so that night time accidents may be reduced considerably.
- Blogs of dog owners for local areas may be created and if in a particular time all the dogs are reported to have become nervous and restless; it may be considered in forecasting a calamity. Training Dogs for COVID-19 and planting them at crowded areas like airports, railway stations, bus stands, markets and fairs may help identification of COVID affected persons which may be helping in curbing the spread of disease. There can be a possibility for dogs identifying underground water availability when trained. If this happens, digging of borewells becomes an easy task.

- Acoustical system coupled with optical system just like that of owl if developed, it may be helpful in discovering the interiors of caves and underground passages.
- The discipline which the birds of a herd during murmuration exhibit is highly remarkable. If the same principle is copied for avoiding collisions of aircraft. Also, in examples of stampede calamities more people died because of lack of direction and discipline. If people are trained to follow the principle of murmuration then may be stampede deaths may not happen at all.

CONCLUSION:

Nature has given specific characteristics to each and every species on earth. But human brain the most intelligent of all creatures has been manipulating nature since ages. If specific characteristics exhibited by each animal or bird are investigated and properly analyzed there is a possibility of understanding the sensing the natural calamities well in advance. Also, manipulation of some processes like echolocation, murmuration shall be helpful for humankind in many aspects.
