

Flight through Time: On Dove Navigation, Evolution and Symbolism

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Citation | Smith, Annabel (2024) Flight through Time: On Dove Navigation, Evolution and Symbolism.

Journal of Big History, VII(4); 175–179.

DOI | <https://doi.org/10.22339/jbh.v7i4.7406>

Abstract

For millennia, doves have played a significant role in human history, culture, and ecosystems. This paper examines the unique characteristics and symbolism of doves through the lens of Big History, which encompasses the inanimate world, life, and human society. First, it explores how doves navigate using Earth's magnetic field, sunlight, and celestial maps. Second, it highlights dove intelligence, comparing their pallium to the mammalian neocortex, emphasizing their cognitive abilities. Finally, the paper discusses how doves have symbolized peace, fidelity, and spirituality across different cultures and religions. Through these lenses, the interconnectedness of doves with the material, biological, and cultural aspects of human history becomes clear, offering a deeper understanding of their role in shaping human civilization.

“Great ideas ... come into the world as gently as doves.”

-Albert Camus, Nobel Prize acceptance speech, 1957

Introduction

For thousands of years, humans and doves have shared a special connection. Doves are a part of our religions, literature and histories and have faithfully served human societies as a source of communication and even food. Doves, along with pigeons, between which there is only a distinction in colloquial English and not a scientific one (though there are varying opinions) make up the bird family Columbidae. This family is comprised of around 300 species, many domesticated (Er 2010).

This paper will explore doves specifically through the Big History lenses of the inanimate world, life and humanity. The first section will look at how doves navigate by utilizing Earth's magnetic field along with stars and sunlight. Following this, it will consider dove intelligence in the context of evolution. Finally, this paper will explore how doves have interacted with human society from both a functional standpoint, e.g. as carrier pigeons, and from a symbolic standpoint, in which humans have assigned symbolism and status to them.

Navigation, the Inanimate Connection

Migrating doves have an exceptional sense of direction and navigation, along with other migrating birds (and animals, such as sea turtles and trout) (Johnsen and Lohmann 2008). Even the name of one variant of dove, the homing pigeon, acknowledges its incredible ability to navigate and find its way home. Throughout time, this trait has been refined by both evolution and selective breeding.

However, only recently has it become more evident how birds are able to do this.

One of the leading and more recent hypotheses on how migrating birds can orient themselves is through magnetoreception, by interpreting magnetic field lines of the Earth. For longer than human society or even life on Earth, the Earth's solid inner core, made of iron and nickel, has moved at a different rate from the liquid outer core. Because of this, the Earth acts as a large magnet with magnetic field lines running from the North to South pole. These field lines vary in intensity and angle, depending on the location. At both poles, the intensity and angle with the Earth are much higher than at the equator. One important feature of the Earth's magnetic field is that it protects the planet from cosmic radiation and charged solar particles (Spier 2015). In addition, it is thought to be sensed by some animals, including doves. Humans have also learned how to harness and use these field lines for navigation with compasses; however, within the time scale of evolution, the compass is a modern discovery and still somewhat crude, as it generally does not provide information on field intensity or angle.

There are two hypotheses on how homing pigeons can perceive these field lines. The first is that some animals have acquired a compound called magnetite within their bodies. This extremely magnetic, naturally occurring metal effectively provides pigeons with a natural compass. It is estimated that in order to pick up magnetic field lines, the quantity of magnetite pigeons would need to have accumulated (or attained via food sources) is ~50 nanometers (Cadiou and McNaughton 2010). A nanometer is one billionth of a meter, well within the body space of a dove.

A second hypothesis is that doves are able to intercept magnetic field lines through cryptochrome, a protein found in many living organisms. This protein seems to enable magnetoreception in other organisms, including certain species of flies. A behavioral study with flies suggested this. Flies with cryptochrome responded to magnetic field lines, yet under UV-A light, which cryptochrome is sensitive to, the behavior of flies with cryptochrome was indistinguishable from that of the control flies. These control flies did not have cryptochrome. Homing pigeons carry this protein in their bodies as well, suggesting a link between cryptochrome and migrating animal navigation (Cadiou and McNaughton 2010).

It has not yet been determined which of these two hypotheses (if either or perhaps both) are causal in the ability of homing pigeons to interpret magnetic field lines. However, it is increasingly clear that they do have this ability.

In addition to magnetoreception, migrating birds are believed to navigate with solar cues and celestial maps, just as sailors have done throughout the ages. Regarding solar cues, when the Earth rotates, the sun shines at different angles depending on the location and time of day (Spier 2015). To use this method of orientation, birds would need to see the sun and have an internal clock. Based on studies of feeding times, it is now indeed believed that migrating birds, like many animals, have internal clocks, suggesting that they have the tools necessary to navigate by the sun (Cassone 2014).

Furthermore, migrating birds are speculated to use star constellations to navigate. Human-designated constellations, e.g., Orion, the Big Dipper, are arbitrary star patterns that humans have designated as relevant. There is even a constellation in the Southern hemisphere called Columba (Latin for dove). Even though homing pigeons are presumably unaware of human-designated constellations, it is nevertheless believed that they can navigate celestially. One pattern recognition experiment showed that pigeons could successfully discriminate between paintings by Monet and Picasso, suggesting the ability to apply the same skills to stars (Watanabe, Sakamoto, and Wakita 1995).

Most likely, birds use some combination of these three methods to orient themselves (Wiltshko and Wiltshko 1991). Not only do they rely on the inner workings of the Earth, but also on the larger universe.

Bird navigation has been used by civilizations for millennia, from Genghis Khan's empire to the First World

War in which an astonishing quantity of 100,000 pigeons were used in WWI for communication (Staughton 2023). It is estimated that of these pigeons, approximately 95 percent were successful in delivering messages (Steenhard 2014).

For millennia a traveler between lands could confidently take a homing pigeon or two on their travels, knowing that in a pinch, a message attached to a bird's leg would most likely find its way back home.

Brain Structure, the Living Connection

As is the case for all living things, doves have evolved. In contrast to humans, who have relatively large brains in comparison to our bodies, the brains of birds are quite small (Spier 2015). Although the term "bird brain" has come to be pejorative, it turns out that doves (and birds generally) are quite intelligent even though the evolution and structure of their brains is different from those of humans.

For mammals including humans, social and intellectual complexity is usually attributed to a highly developed portion of the brain called the mammalian neocortex, which consists of six vertical layers of neurons that interact horizontally and vertically. The neocortex is part of the brain's cerebral cortex, which allows for higher cognitive functioning. Generally, it is believed that the more complex the neocortex, the more complex the animal (Baillie 2018). For example, for some mammalian species, such as elephants, apes and certain dolphins, the neocortex is relatively large and complex, which signifies enhanced sensory perception and learning capabilities (Spier 2015).

Until recently, it was believed that birds did not have a neocortex. This led to speculation that birds did not possess higher cognitive functioning. However, research has shown that birds have a structure with functions very similar to that of the human neocortex. In birds, the layered neurons are called the pallium. Both the neocortex and the pallium are used for among other things, problem-solving, vocalization, and memory, once again suggesting similarities between the neocortex and the pallium. While the functioning of the pallium and neocortex are comparable, the pallium was overlooked due to its dissimilar shape from the neocortex (Stetka 2020). With this discovery, it might be concluded that birds are better equipped and therefore more capable of processing information than previously thought.

Symbolism, the Human Connection

For millennia, doves have played an important role in

human history and mythology. Some of this may have been derived from the dove's extraordinary ability to navigate and the reliance humans have placed on them for this ability. Images of doves bearing messages are present throughout many cultures, such as Christianity, where a dove is depicted bringing an olive leaf as proof of safety and peace.

Doves are found in all societies and lands of the world except Antarctica (Shapiro and Domyan 2016). Despite an abundance of doves in large cities, humans have degraded the habitat of doves at various points throughout history. It is estimated that there were 3 to 5 billion passenger pigeons in North America during the 19th century. "The air was literally filled with pigeons," John James Audubon, namesake of the future National Audubon Society, wrote in 1813. Until 1897 there were no regulations on dove hunting, leading to a period of several months in Michigan in 1878 in which 50,000 passenger pigeons were killed per day by hunters. This mass eradication of birds was in large part due to a lack of environmental awareness and policy (Dep. Of Vertebrate Zoology n.d.).

Humans have been dependent on birds, including doves, in many ways. Not only were doves used for communication, but they were also relied upon for nutrition. This bird holds both a positive and negative association. Mainly in cities, pigeons have earned the dubious nickname "rats of the sky." On the other hand, doves are referenced as symbols of peace and tranquility (Soniak 2016). For example, the United Nations has a dove carrying an olive branch as its primary logo. The idea that doves symbolize peace, equality and safety is so broadly accepted in modern culture, that the dove is the emoji that pops up when one types "peace" on many mobile phones.

Of all the animals and creatures known to humans for the past 5000 years, it has been the dove, more than any other, that has become the central symbol of peace and harmony. We may never know why the dove attained this elevated role in religious and moral symbolism, but some reasons explaining this might be their ability to navigate and communicate between people and societies, the fact that they are herbivores and are seen as peaceful and that they mate for life, suggesting fidelity.

From a historical standpoint, as states and urban areas began to form and social relationships started to become more complex, there was an increasing need for moral religion and ethics, i.e., something "right" versus something "wrong." With religion, people had moral obligations,

making society more structured and manageable for state elites (Spier 2015). Religion was an efficient and reliable way to make citizens abide by laws. This method has been stronger and weaker during different periods and regimes, yet overall proved effective. Many years later, the power of religion in Western culture started to weaken most significantly with the emergence of the Enlightenment in Europe by political philosophers such as Locke, Hobbes, Rousseau and Montesquieu, all of whom began to question the nature of human society.

Within the past 5000 years, doves attained their symbolic meaning. By the time biblical mythology emerged, the symbolism is evident as seen on stained glass art. For example, the dove brings an olive leaf, signaling safety for Noah and his family in the Old Testament. The dove could also represent baptism or appear as the Holy Spirit, part of the Holy Trinity. The usage of the dove was most likely derived from the Romans and Greeks, where the dove is a symbol of the goddess Aphrodite/Venus. Doves being affiliated with the goddess of love is no coincidence, as doves mate for life, representing monogamy. In the second century, Clement of Alexandria encouraged Christians to use the dove (or fish) to represent and identify themselves. Interestingly, the dove was a prominent symbol of Christianity even before the cross. Only around the fourth century did the cross come to represent Christians (Dorrell 2021).

The dove is one of the many ideas and symbols linking various religions. The Abrahamic religions have many common ideas between them. In Islam, doves are respected as they protected Muhammed by making nests outside the cave he was hiding in, thus preventing Muhammad's pursuers from capturing him (Dorrell 2021).

Ancient Mesopotamian stories have parallels with stories from the Old Testament. For example, both tell a story of a plague and a flood. There are also commonalities with Buddhism, which references doves in the context of compassion and kindness. According to one story, King Shibi protects a dove from a hawk, by offering the hawk his own flesh instead (Johnson 2005). In addition to doves, both Buddhism and Christianity focus on the birth of a savior who managed to reach enlightenment. One reason for this common theme could be attributed to the Silk Road, a trade route connecting Europe and Asia that spread culture, ideas, and technology. This could explain the common motif of the dove representing compassion and peace.

Over time, doves have become potent symbols within religions around the world. However, religions themselves are not static and are also shaped by individual societies. One school of thought as to how religions have developed is diffusion, which suggests that religion spreads through people when they geographically disperse (Avetyan and Zunner-Keating 2021). This has been happening since the beginning of civilization, from tribes interacting with other tribes to modern globalization. Today, international trade and social media establish an interconnection.

Aside from this, many theoretical explanations of how religions developed might be applied to explain commonalities among different religions. People of diverse cultures dispersed and eventually ended up influencing each other's religions. However, religions also evolved with the civilizations that believed in them. There most likely is some combination of explanations, including diffusion, that led to doves appearing prominently in multiple religions and cultures.

Conclusion

For thousands of years, doves have connected societies and people both physically through their ability to navigate, and symbolically in their prominent role in religion and history representing common themes such as peace, kindness and fidelity.

The ability of the dove to navigate using the magnetism of the Earth, and patterns of stars and sunlight is a remarkable example of the way doves interact with the inanimate world.

Bird intelligence shows that high level cognitive functioning, such as sensory perception and learning capabilities, is not reserved for large mammals. With the pallium, doves' brains emulate the function of the neocortex, contributing to problem solving, vocalization and pattern recognition.

Aside from their interaction with the inanimate and living world, doves have left a mark on mankind and within distinct traditions and cultures, doves appear. A likely reason for these similarities, is the idea that religions diffuse and influence each other.

At first glance, dove navigation, intelligence and symbolism may seem to be unrelated. However, by using a Big History approach and exploring links deeply, the material, biological, and cultural histories become clearer and lead to a deeper and more creative understanding of the dove and its role in our human history.

As the world looks to the future, the dove remains a fitting symbol of the connections among the physical world, life on Earth, and the history of humanity.

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