

NATIONAL GEOGRAPHIC

100 WONDERS OF THE WORLD

Archaeological finds are expanding our view of human history—and unlocking the stories of our ancestors.

NELSON





ANIMALS IN SPACE

BY TAYLOR MAGGIACOMO AND ALEXANDER STEGMAIER

TWO SOVIET STEPPE tortoises had already flown around the moon by the time Neil Armstrong set foot on it in 1969. In fact, dozens of animals, including insects, traveled into space before humans did. In the 1940s, scientists began to explore the limits of our atmosphere. They wanted to understand if humans could survive a weightless environment and the rocket journey to get there—and

once they did, whether they'd be able to operate a spacecraft. While the research no longer involves canine cosmonauts (above), decades on, mice, fruit flies, even jellyfish continue to expand our understanding of biology in space and on Earth. The studies may one day hold the key to sending humans to the outer reaches of our solar system and to better treating earthbound diseases such as osteoporosis.

ISRAEL ▶
1 MISSION (2019)

An Israeli vessel containing tardigrades crashed on the moon during an attempted landing in 2019.



IRAN ▶
3 MISSIONS (2010-13)

As recently as 2013, Iran sent monkeys into space in a step toward developing a human spaceflight program.



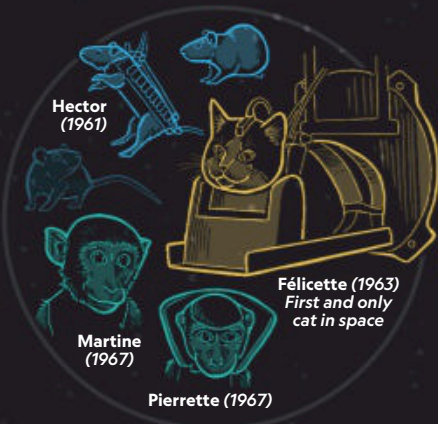
CHINA ▶
9 MISSIONS (1964-2018)

China's animal research began in the mid-1960s; efforts slowed after the Cultural Revolution ended a decade later. There's been limited public information on the space program since it was revitalized in the 2000s.



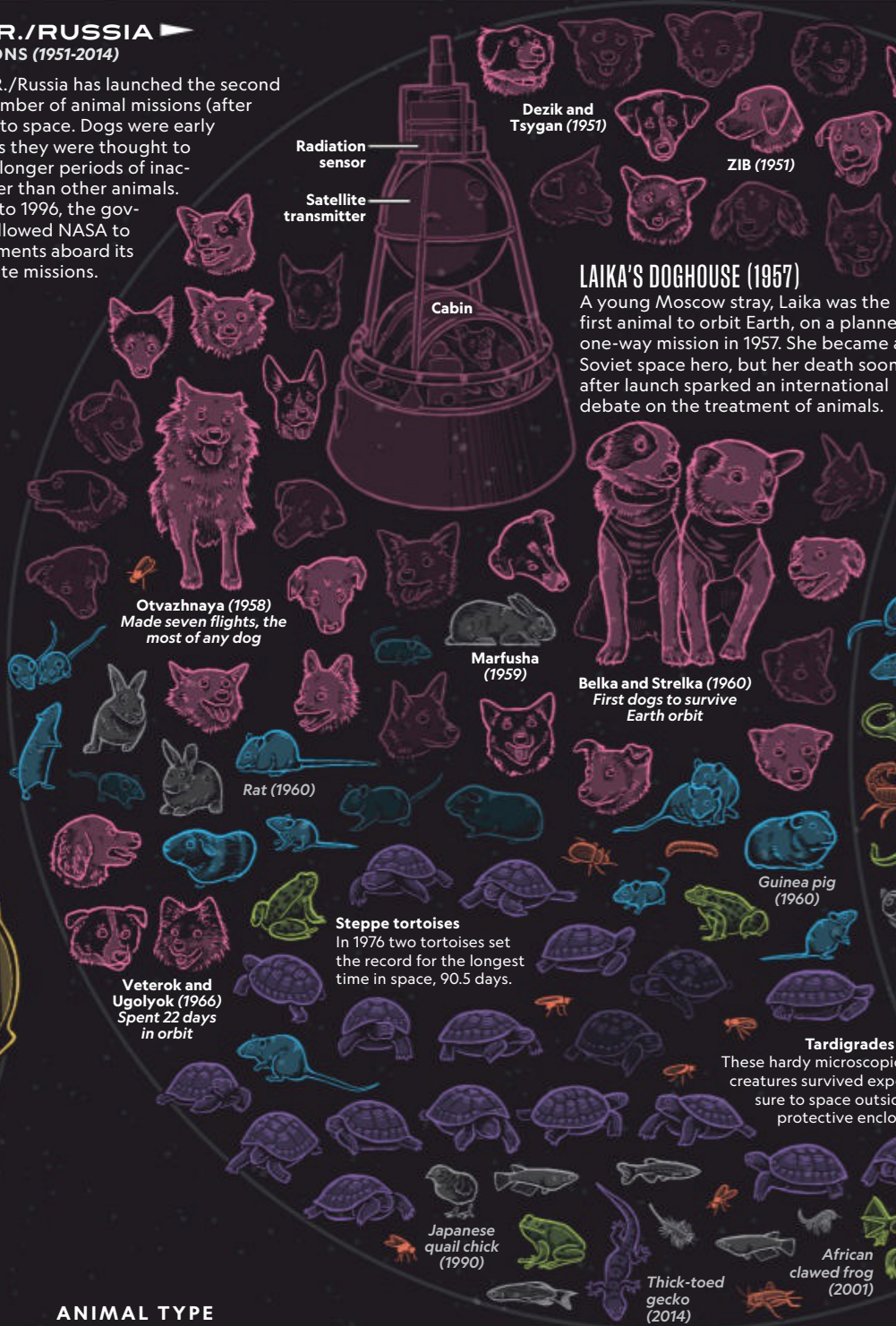
FRANCE ▶
6 MISSIONS (1961-67)

Before the European Space Agency (ESA) was established in 1975, France independently researched space travel and trained 14 cats for spaceflight. Only one successfully made a round trip, in 1963.



U.S.S.R./RUSSIA ▶
69 MISSIONS (1951-2014)

The U.S.S.R./Russia has launched the second highest number of animal missions (after the U.S.) into space. Dogs were early favorites as they were thought to withstand longer periods of inactivity better than other animals. From 1975 to 1996, the government allowed NASA to run experiments aboard its Bion satellite missions.



MICROGRAVITY LAB

Initial animal studies focused on adaptability to and logistics of travel as many nations attempted the race to space. Animals were often jettied into the sky by themselves or in small groups, some even making multiple trips. Today, genetic sequencing and our understanding of an animal's life on Earth inform which creatures are best suited for a research mission.

ANIMAL TYPE

- Primate
 - Rodent
 - Dog
 - Amphibian
 - Cat
 - Arthropod
 - Reptile
 - Other
- └─ Died during mission
└─ Returned alive

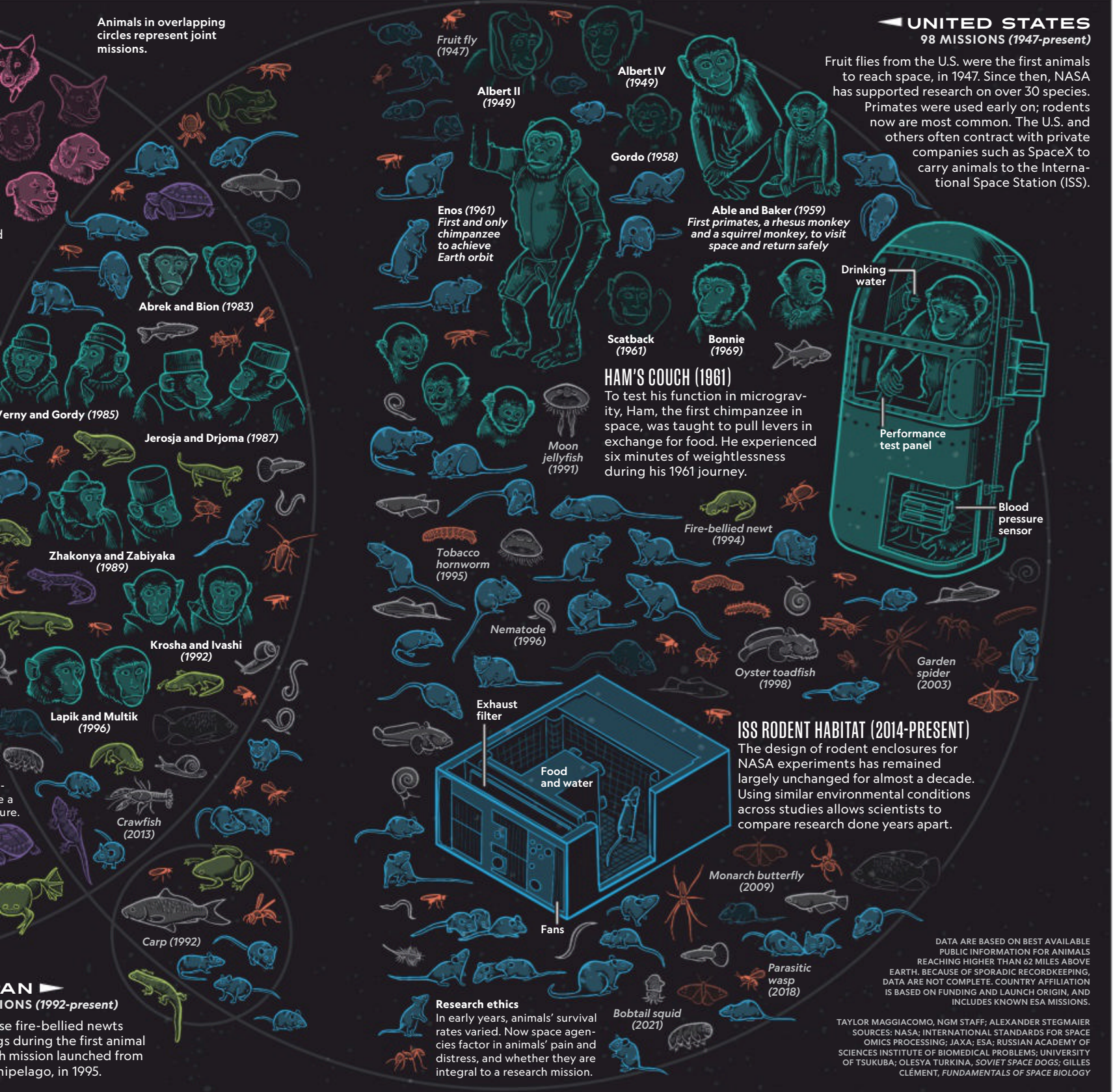
EVERY KNOWN PRIMATE, DOG, CAT, AND TURTLE SENT TO SPACE IS SHOWN; OTHER ANIMALS REPRESENT MULTIPLES OF THEIR KIND, SHOWN ONCE PER MISSION. ILLUSTRATIONS ARE NOT TO SCALE.

JAPANESE
5 MISSIONS
Japanese laid egg research the arch

Animals in overlapping circles represent joint missions.

UNITED STATES 98 MISSIONS (1947-present)

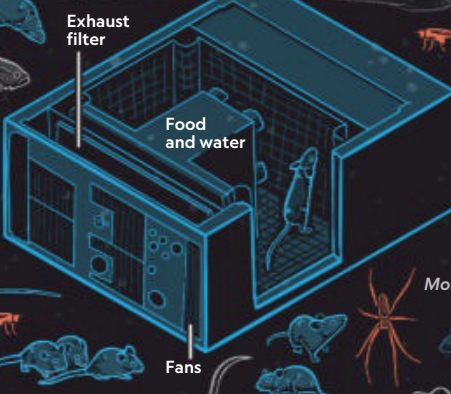
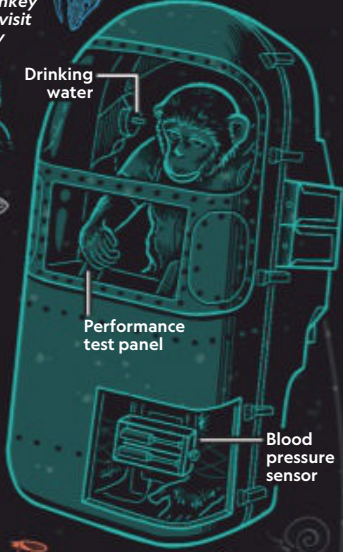
Fruit flies from the U.S. were the first animals to reach space, in 1947. Since then, NASA has supported research on over 30 species. Primates were used early on; rodents now are most common. The U.S. and others often contract with private companies such as SpaceX to carry animals to the International Space Station (ISS).



Albert II (1949)
Albert IV (1949)
Gordo (1958)
Able and Baker (1959)
First primates, a rhesus monkey and a squirrel monkey, to visit space and return safely

Enos (1961)
First and only chimpanzee to achieve Earth orbit

HAM'S COUCH (1961)
To test his function in microgravity, Ham, the first chimpanzee in space, was taught to pull levers in exchange for food. He experienced six minutes of weightlessness during his 1961 journey.



ISS RODENT HABITAT (2014-PRESENT)
The design of rodent enclosures for NASA experiments has remained largely unchanged for almost a decade. Using similar environmental conditions across studies allows scientists to compare research done years apart.

Research ethics
In early years, animals' survival rates varied. Now space agencies factor in animals' pain and distress, and whether they are integral to a research mission.

DATA ARE BASED ON BEST AVAILABLE PUBLIC INFORMATION FOR ANIMALS REACHING HIGHER THAN 62 MILES ABOVE EARTH. BECAUSE OF SPORADIC RECORDKEEPING, DATA ARE NOT COMPLETE. COUNTRY AFFILIATION IS BASED ON FUNDING AND LAUNCH ORIGIN, AND INCLUDES KNOWN ESA MISSIONS.

TAYLOR MAGGIACOMO, NGM STAFF; ALEXANDER STEGMAIER SOURCES: NASA; INTERNATIONAL STANDARDS FOR SPACE OMICS PROCESSING; JAXA; ESA; RUSSIAN ACADEMY OF SCIENCES INSTITUTE OF BIOMEDICAL PROBLEMS; UNIVERSITY OF TSUKUBA; OLESYA TURKINA, SOVIET SPACE DOGS; GILLES CLÉMENT, FUNDAMENTALS OF SPACE BIOLOGY

RUSSIA
MISSIONS (1992-present)
...se fire-bellied newts
...s during the first animal
...h mission launched from
...ipelago, in 1995.