

## The Origin of the Domestic Cat

Recent discoveries have expanded our knowledge of the origins of the house cat:

1. The fossil record has yielded evidence of the domestication of cats far earlier than previously known: A 2004 excavation of an archaeological site on Cyprus found the buried bodies of a human and a small cat in close proximity. The bodies were dated to 9500 years ago.
2. In June 2007 the Cat Genome Project published their findings that the Domestic Cat was really *Felis silvestris catus*, a sub-species of the small wildcat *Felis*, and a first cousin of the Near Eastern/North African Wildcat *Felis silvestris lybica*. The Domestic Cat and the Near Eastern Wildcat have a common ancestor dated to 131,000 years ago.

### Cat Genome Project

The Laboratory of Genomic Diversity, an arm of the National Cancer Institute, was established in 1986; the current lab chief is Stephen J. O'Brien, Ph.D. The LGD has an ongoing Cat Genome Project with the goal of using the domestic cat as an animal model contributing to our understanding of human hereditary disease.

[http://home.ncifcrf.gov/ccr/lgd/comparative\\_genome/catgenome/index\\_n.asp](http://home.ncifcrf.gov/ccr/lgd/comparative_genome/catgenome/index_n.asp)

The project team has published articles about their findings, the most recent and provocative being:

- “The Late Miocene Radiation of Modern Felidae: A Genetic Assessment” appeared in the January 6, 2006 issue of Science magazine. It is a highly technical discussion of the unique lineages of modern cats, when they appeared, and their geographical distribution over time.
- “The Near Eastern Origin of Cat Domestication” appeared in the June 29, 2007 issue of Science magazine. It describes their genetic assessment of 979 small cats, both domestic and wild, from three continents.
- “The Evolution of Cats” appeared in the July 2007 Scientific American. It presents highlights of the previous two articles in a less technical format.

They study mitochondrial DNA (mtDNA), which is found in the cellular cytoplasm in organelles called mitochondria. In sexually reproducing organisms, mitochondria are normally inherited exclusively from the mother. Hence mtDNA is a powerful tool for tracking ancestry through females (matrilineage).

### *Felis silvestris catus*

Today's Domestic Cat has five known lineages, meaning five different female ancestors, each ancestor in a different time and possibly place. The cat genome researchers conclude that the Domestic Cat evolved in the Near East in close proximity to the location of modern Near Eastern Wildcats: Israel, Saudi Arabia, and other Middle Eastern countries including the Fertile Crescent of 10,000 years ago. Stephen O'Brien said “It's plausible that the ancient [domestic cat] lineages were present in the wildcat populations back as far as 70,000 or 100,000 years ago.”

This sub-species is now widely distributed over the planet, presumably a result of its role as companion to human travelers.

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## Whence the House Cat

While mtDNA says all house cats are *F. s. catus*, it does not say why *F. s. catus* coalesced or why she took up with people. For the latter we can look to our own pets. I believe the label “pet” is profoundly indicative of why the Domestic Cat, just another wildcat in its beginnings, moved into our hearts and homes. They love to be touched and we do it so well and so willingly.

Consider this:

- Captain Courageous jumps up to my desktop where he stretches on his side in front of me—and responds with visible pleasure to my strokes.
- Tiger Boy, originally named Mister Clever and generally ignored in favor of his brother, looked at the world through wild eyes until, at 5 months of age, I deliberately renamed and socialized him. He quickly became a happy and contented pet.
- Adult feral cats will live near people and eat food left out for them, but will not be caught.
- Feral kittens, if separated from their mom, can be tamed.

These are facts. We know them. They are also clues to the earliest domestication of cats. We have no reason to think either of us—cats or people—are any different now than we were then.

As with today’s feral cats, early adult *F. s. catus* would live near people, would eat food left for them, but would not let themselves be caught by people, let alone enter their homes. But kittens . . . ah, kittens. We cannot resist them now and we very likely couldn’t resist them 10,000 years ago. As feral kittens can be tamed into house cats, so very likely could wild *F. s. catus* kittens be tamed into house cats.

Grain stores of the earliest civilized man might have brought wild Domestic Cats into regular proximity to humans, but it was their kittens who came in from the cold. The Domestic Cat seems to have a genetic willingness to be tamed. This willingness is strongest in childhood. Mother house cats teach their babies to eat from plates and use litter boxes. But people must socialize kittens or they will revert to wildcats.

## Genetic Findings

The Cat Genome Project identified six clades corresponding to the following subspecies of Wildcat, *Felis silvestris*:

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|-----|---|
| I   | <i>Felis silvestris silvestris</i> , European Wildcat or Forest Cat   |
| II  | <i>Felis silvestris cafra</i> , Southern Africa Wildcat   |
| III | <i>Felis silvestris ornata</i> , Asiatic Steppe Wildcat, Desert Cat, Central Asian Wildcat, and Indian Wildcat                  |
| IV  | <i>Felis silvestris lybica</i> , North African Wildcat and Near Eastern Wildcat<br><i>Felis silvestris catus</i> , Domestic Cat |
| V   | <i>Felis silvestris bieti</i> , Chinese Desert Cat and Chinese Mountain Cat   |
| VI  | <i>Felis silvestris margarita</i> , Sand Cat  |

It is clade IV that most interests us. It is composed of both the Domestic Cat and the Near Eastern Cat. It was found to have one common ancestor and to contain five separate lineages. There is no correlation between lineages and geographical locations. These findings infer that domestication occurred at least five separate times—each of the five lineages domesticated separately.

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Hybridization is common. A number of putative wildcats from Europe, south Africa, and central Asia carry domestic cat haplotypes. And some domestic cats carry wildcat haplotypes.

The researchers estimated the coalescent date for all *Felis silvestris* as 230,000 years ago and estimated the age for the common ancestor of *F. s. lybica* and domestic cats as 131,000 years ago. Other dating techniques yielded a range of 107,000 to 155,000 years ago. “These estimates are all greater by an order of magnitude than archaeological evidence for cat domestication.”

There are many surprises in these findings. It reclassifies four cats:

- The Chinese Desert Cat was originally named *Felis bieti*, a separate species, in 1892.
- The Southern Africa Wildcat was originally named *Felis cafra* in 1822 and renamed as *Felis lybica cafra* in 1944.
- The Sand Cat was originally named *Felis margarita* in 1858.
- The Scottish Wildcat was originally named *Felis silvestris grampia* in 1907. It has been found to be the same as *F. s. silvestris*.
- The notion that the European Wildcat is an ancestor of some domestic cats like the Norwegian Forest Cat was disproved.

It may be that an analysis of north African wildcats would lead to an inference that the domestic cat also domesticated in north Africa.

Which cats were studied? The 979 cats studied included 4 Maine Coon Cats and 4 Norwegian Forest Cats. All cats described as “Breed cat” and “Lab cat” were from the USA. “Recent events prevented collection of wildcats from Iran, Iraq or North Africa for use in this study, however the taxonomic literature is almost unanimous in synonymizing wildcats from these regions with wildcats from throughout the Near East. . . . Wildcats throughout Africa, and Egypt particularly, require a broader sampling and deeper analysis than afforded to this project.”

In a separate effort Dr. Marilyn Raymond of the LGD has done a phylogeny of 38 cat breeds; her sample set of 1040 breed cats included 43 Main Coon Cats and 67 Norwegian Forest Cats (40% of which came from Norway). She found the Maine Coons to be closely related to British Shorthairs, Ragdolls, Russian Blues, and American Shorthairs and have no signs of hybridization with anything more exotic. Additionally, she found that there are several variants of the gene that causes long hair in cats. These variants do not indicate any relationship between long-haired cats in Maine and long-haired cats in Norway. (A paper describing the longhair mutation is in progress.)

### Terminology

In writing this article to my satisfaction I’ve had to become familiar with the terminology of genetic research.

**lineage:** descent in a line from a common progenitor (ancestor).

**clade:** a taxonomic group of organisms consisting of a single common ancestor and all the descendants of that ancestor.

**divergence:** the acquisition of dissimilar characters by related organisms in unlike environments.

**phylogeny:** the evolution of a genetically related group of organisms as distinguished from the development of the individual organism.

**genome:** one haploid set of chromosomes with the genes they contain.

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**haploid:** having the gametic number of chromosomes. The haploid number is the number of chromosomes in a gamete (sex cell—sperm and egg) of an individual.

**binomial nomenclature:** a system of nomenclature (naming) in which each species of animal and plant receives a name of two terms where the first term identifies the genus and the second term identifies the species. This system was established by Carolus Linnaeus (1707–1778) and was based on anatomical similarities and differences.

**phylogenetic nomenclature:** a naming system formulated in terms of evolution and common descent and based on genetic similarities and differences. It does not rank species by category. It does establish a phylogenetic tree of genetic descent.