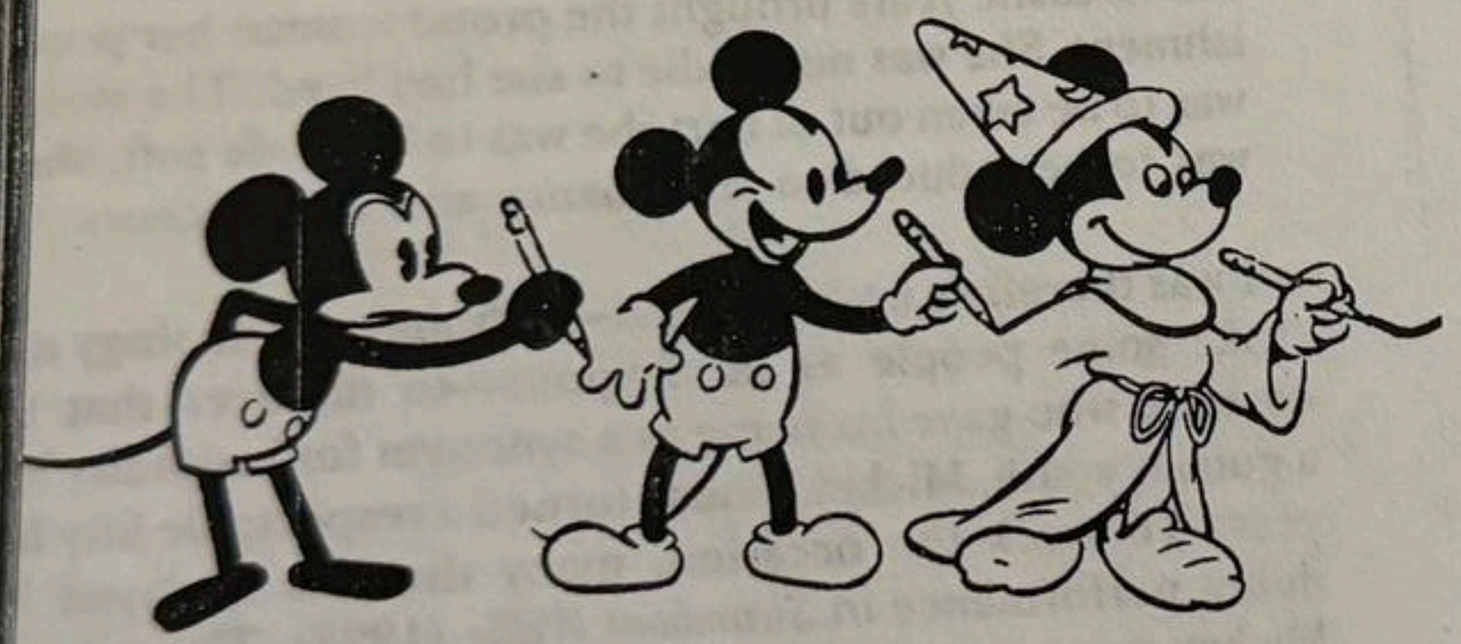
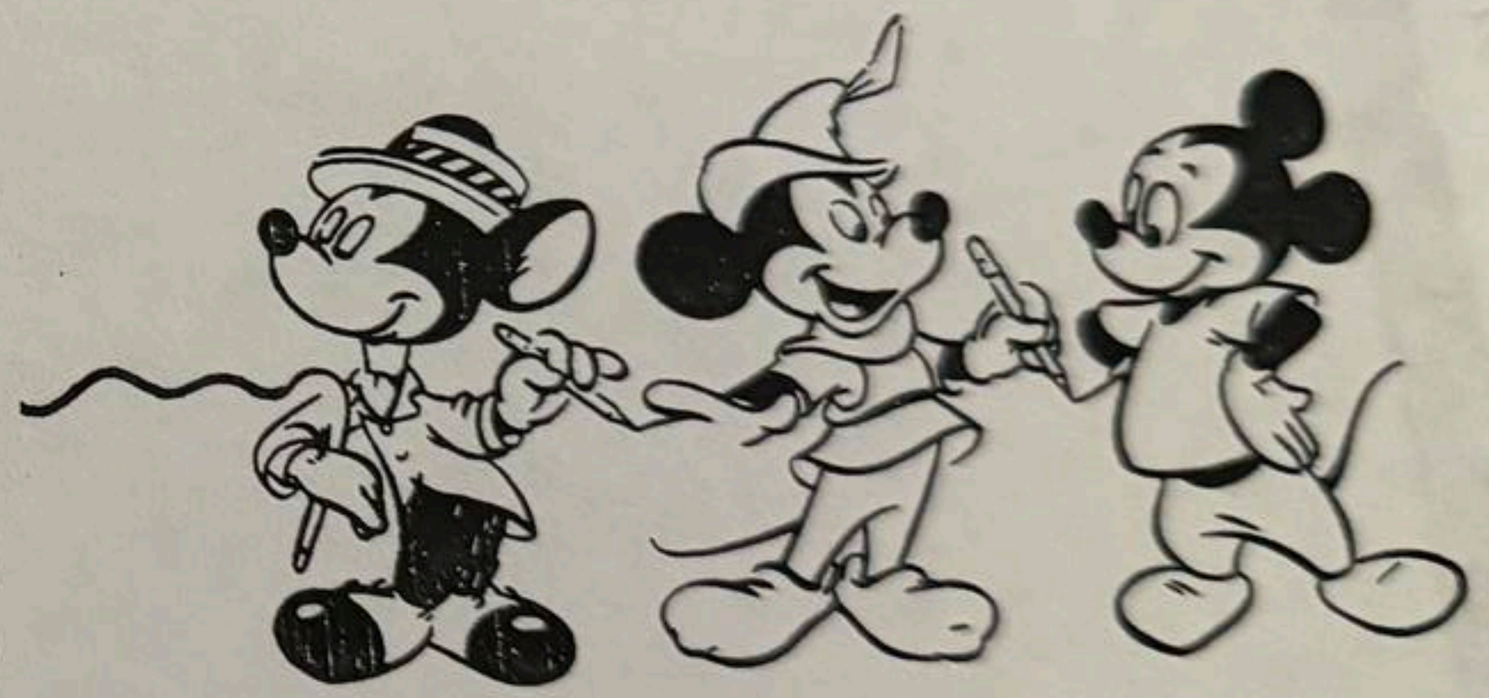
Christopher Finch, in his semiofficial pictorial history of Disney's work, comments: "The Mickey Mouse who hit the movie houses in the late twenties was not quite the well-behaved character most of us are familiar with today. He was mischievous, to say the least, and even displayed a streak of cruelty." But Mickey soon cleaned up his act, leaving to gossip and speculation only his unresolved relationship with Minnie and the status of Morty and Ferdie. Finch continues: "Mickey . . . had become virtually a national symbol, and as such he was expected to behave properly at all times. If he occasionally stepped out of line, any number of letters would arrive at the Studio from citizens and organizations who felt that the nation's moral well-being was in their hands. . . . Eventually he would be pressured into the role of straight man."

As Mickey's personality softened, his appearance changed. Many Disney fans are aware of this transformation through time, but few (I suspect) have recognized the coordinating theme behind all the alterations—in fact, I am not sure that the Disney artists themselves explicitly realized what they were doing, since the changes appeared in such a halting and piecemeal fashion. In short, the blander and inoffensive Mickey became progressively more juvenile in appearance. (Since Mickey's chronological age never altered—like most cartoon characters he stands impervious to the ravages of time—this change in appearance at a constant age is a true evolutionary transformation. Progressive juvenilization as an evolutionary phenomenon is called neoteny. More on this later.)





Mickey's evolution during 50 years (left to right). As Mickey became increasingly well behaved over the years, his appearance became more youthful. Measurements of three stages in his development revealed a larger relative head size, larger eyes, and an enlarged cranium—all traits of juvenility. © Walt Disney Productions



The characteristic changes of form during human growth have inspired a substantial biological literature. Since the head-end of an embryo differentiates first and grows more rapidly in utero than the foot-end (an antero-posterior gradient, in technical language), a newborn child possesses a relatively large head attached to a medium-sized body with diminutive legs and feet. This gradient is reversed through

# 9 | A Biological Homage to Mickey Mouse

AGE OFTEN turns fire to placidity. Lytton Strachey, in his incisive portrait of Florence Nightingale, writes of her declining years:

> Destiny, having waited very patiently, played a queer trick on Miss Nightingale. The benevolence and public spirit of that long life had only been equalled by its acerbity. Her virtue had dwelt in hardness. . . . And now the sarcastic years brought the proud woman her punishment. She was not to die as she had lived. The sting was to be taken out of her; she was to be made soft; she was to be reduced to compliance and complacency.

I was therefore not surprised—although the analogy may strike some people as sacrilegious—to discover that the creature who gave his name as a synonym for insipidity had a gutsier youth. Mickey Mouse turned a respectable fifty last year. To mark the occasion, many theaters replayed his debut performance in *Steamboat Willie* (1928). The original Mickey was a rambunctious, even slightly sadistic fellow. In a remarkable sequence, exploiting the exciting new development of sound, Mickey and Minnie pummel, squeeze, and twist the animals on board to produce a rousing chorus of "Turkey in the Straw." They honk a duck with a tight embrace, crank a goat's tail, tweak a pig's nipples, bang a cow's teeth as a stand-in xylophone, and play bagpipe on her udder.

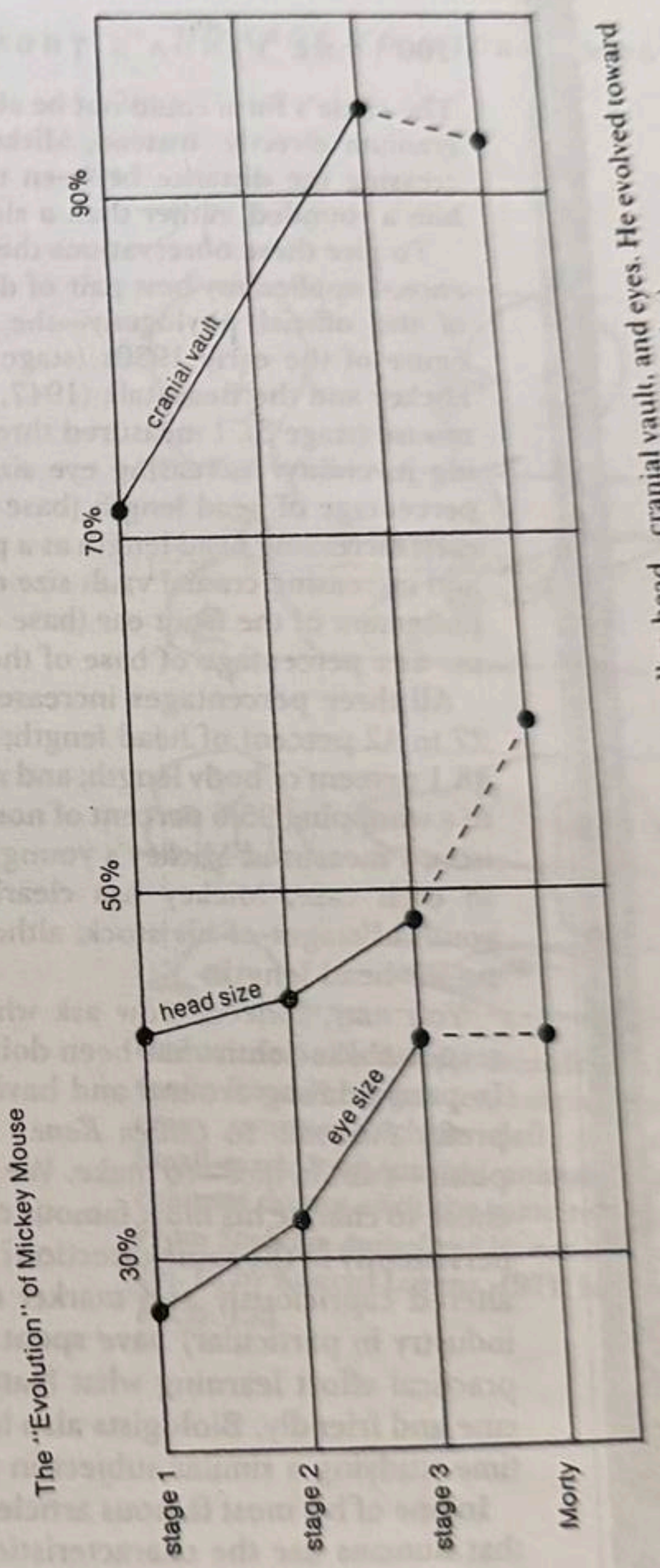
growth as legs and feet overtake the front end. Heads continue to grow but so much more slowly than the rest of the body that relative head size decreases.

In addition, a suite of changes pervades the head itself during human growth. The brain grows very slowly after age three, and the bulbous cranium of a young child gives way to the more slanted, lower-browed configuration of adulthood. The eyes scarcely grow at all and relative eye size declines precipitously. But the jaw gets bigger and bigger. Children, compared with adults, have larger heads and eyes, smaller jaws, a more prominent, bulging cranium, and smaller, pudgier legs and feet. Adult heads are altogether more apish, I'm sorry to say.

Mickey, however, has traveled this ontogenetic pathway in reverse during his fifty years among us. He has assumed an ever more childlike appearance as the ratty character of *Steamboat Willie* became the cute and inoffensive host to a magic kingdom. By 1940, the former tweaker of pig's nipples gets a kick in the ass for insubordination (as the *Sorcerer's Apprentice* in *Fantasia*). By 1953, his last cartoon, he has gone fishing and cannot even subdue a squirting clam.

The Disney artists transformed Mickey in clever silence, often using suggestive devices that mimic nature's own changes by different routes. To give him the shorter and pudgier legs of youth, they lowered his pants line and covered his spindly legs with a baggy outfit. (His arms and legs also thickened substantially—and acquired joints for a floppier appearance.) His head grew relatively larger and its features more youthful. The length of Mickey's snout has not altered, but decreasing protrusion is more subtly suggested by a pronounced thickening. Mickey's eye has grown in two modes: first, by a major, discontinuous evolutionary shift as the entire eye of ancestral Mickey became the pupil of his descendants, and second, by gradual increase thereafter.

Mickey's improvement in cranial bulging followed an interesting path since his evolution has always been constrained by the unaltered convention of representing his head as a circle with appended ears and an oblong snout.




At an early stage in his evolution, Mickey had a smaller head, cranial vault, and eyes. He evolved toward the characteristics of his young nephew Morty (connected to Mickey by a dotted line).

The circle's form could not be altered to provide a bulging cranium directly. Instead, Mickey's ears moved back, increasing the distance between nose and ears, and giving him a rounded, rather than a sloping, forehead.

To give these observations the cachet of quantitative science, I applied my best pair of dial calipers to three stages of the official phylogeny—the thin-nosed, ears-forward figure of the early 1930s (stage 1), the latter-day Jack of Mickey and the Beanstalk (1947, stage 2), and the modern mouse (stage 3). I measured three signs of Mickey's creeping juvenility: increasing eye size (maximum height) as a percentage of head length (base of the nose to top of rear ear); increasing head length as a percentage of body length; and increasing cranial vault size measured by rearward displacement of the front ear (base of the nose to top of front ear as a percentage of base of the nose to top of rear ear).

All three percentages increased steadily—eye size from 27 to 42 percent of head length; head length from 42.7 to 48.1 percent of body length; and nose to front ear from 71.7 to a whopping 95.6 percent of nose to rear ear. For comparison, I measured Mickey's young "nephew" Morty Mouse. In each case, Mickey has clearly been evolving toward youthful stages of his stock, although he still has a way to go for head length.

You may, indeed, now ask what an at least marginally respectable scientist has been doing with a mouse like that. In part, fiddling around and having fun, of course. (I still prefer *Pinocchio* to *Citizen Kane.*) But I do have a serious point—two, in fact—to make. We must first ask why Disney chose to change his most famous character so gradually and persistently in the same direction? National symbols are not altered capriciously and market researchers (for the doll industry in particular) have spent a good deal of time and practical effort learning what features appeal to people as cute and friendly. Biologists also have spent a great deal of time studying a similar subject in a wide range of animals.

In one of his most famous articles, Konrad Lorenz argues that humans use the characteristic differences in form between babies and adults as important behavioral cues. He



believes that features of juvenility trigger "innate releasing mechanisms" for affection and nurturing in adult humans. When we see a living creature with babyish features, we feel an automatic surge of disarming tenderness. The adaptive value of this response can scarcely be questioned, for we must nurture our babies. Lorenz, by the way, lists among his releasers the very features of babyhood that Disney affixed progressively to Mickey: "a relatively large head, predominance of the brain capsule, large and low-lying eyes, bulging cheek region, short and thick extremities, a springy elastic consistency, and clumsy movements." (I propose to leave aside for this article the contentious issue of whether or not our affectionate response to babyish features is truly innate and inherited directly from ancestral primates—as Lorenz argues—or whether it is simply learned from our immediate experience with babies and grafted upon an evolutionary predisposition for attaching ties of affection to certain learned signals. My argument works equally well in either case for I only claim that babyish features tend to elicit strong feelings of affection in adult humans, whether the biological basis be direct programming or the capacity to learn and fix upon signals. I also treat as collateral to my point the major thesis of Lorenz's article—that we respond not to the totality or *Gestalt*, but to a set of specific features acting as releasers. This argument is important to Lorenz because he wants to argue for evolutionary identity in modes of behavior between other vertebrates and humans, and we know that many birds, for example, often respond to abstract features rather than *Gestalten*. Lorenz' article, published in 1950, bears the title *Ganzheit und Teil in der tierischen und menschlichen Gemeinschaft*—"Entirety and part in animal and human society." Disney's piecemeal change of Mickey's appearance does make sense in this context—he operated in sequential fashion upon Lorenz's primary releasers.)

Lorenz emphasizes the power that juvenile features hold over us, and the abstract quality of their influence, by pointing out that we judge other animals by the same criteria—although the judgment may be utterly inappropriate in an

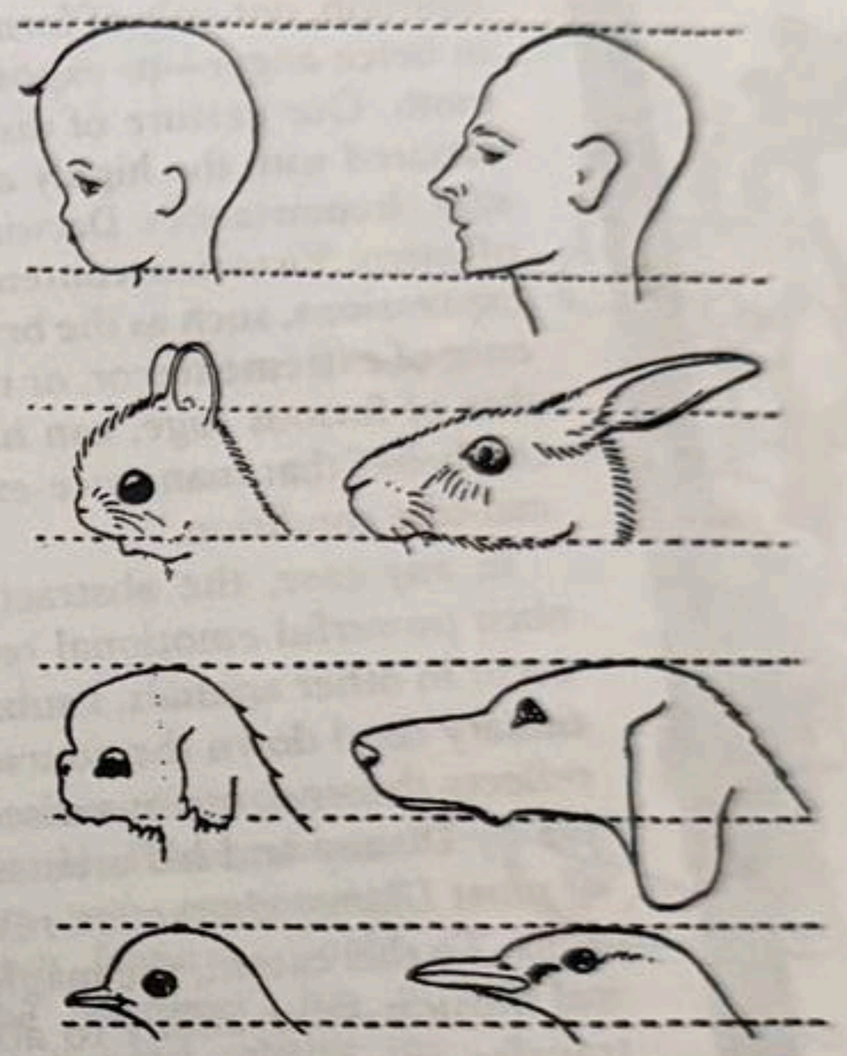
evolutionary context. We are, in short, fooled by an evolved response to our own babies, and we transfer our reaction to the same set of features in other animals.

Many animals, for reasons having nothing to do with the inspiration of affection in humans, possess some features also shared by human babies but not by human adults—large eyes and a bulging forehead with retreating chin, in particular. We are drawn to them, we cultivate them as pets, we stop and admire them in the wild—while we reject their small-eyed, long-snouted relatives who might make more affectionate companions or objects of admiration. Lorenz points out that the German names of many animals with features mimicking human babies end in the diminutive suffix *chen*, even though the animals are often larger than close relatives without such features—*Rotkehlchen* (robin), *Eichhörnchen* (squirrel), and *Kaninchen* (rabbit), for example.

In a fascinating section, Lorenz then enlarges upon our capacity for biologically inappropriate response to other animals, or even to inanimate objects that mimic human features. "The most amazing objects can acquire remarkable, highly specific emotional values by 'experiential attachment' of human properties. . . . Steeply rising, somewhat overhanging cliff faces or dark storm-clouds piling up have the same, immediate display value as a human being who is standing at full height and leaning slightly forwards" —that is, threatening.

We cannot help regarding a camel as aloof and unfriendly because it mimics, quite unwittingly and for other reasons, the "gesture of haughty rejection" common to so many human cultures. In this gesture, we raise our heads, placing our nose above our eyes. We then half-close our eyes and blow out through our nose—the "harumph" of the stereotyped upperclass Englishman or his well-trained servant. "All this," Lorenz argues quite cogently, "symbolizes resistance against all sensory modalities emanating from the disdained counterpart." But the poor camel cannot help carrying its nose above its elongate eyes, with mouth drawn down. As Lorenz reminds us, if you wish to know whether





Humans feel affection for animals with juvenile features: large eyes, bulging craniums, retreating chins (left column). Small-eyed, long-snouted animals (right column) do not elicit the same response. From *Studies in Animal and Human Behavior*, vol. II, by Konrad Lorenz, 1971. Methuen & Co. Ltd.

a camel will eat out of your hand or spit, look at its ears, not the rest of its face.

In his important book *Expression of the Emotions in Man and Animals*, published in 1872, Charles Darwin traced the evolutionary basis of many common gestures to originally adaptive actions in animals later internalized as symbols in humans. Thus, he argued for evolutionary continuity of emotion, not only of form. We snarl and raise our upper lip in fierce anger—to expose our nonexistent fighting canine tooth. Our gesture of disgust repeats the facial actions associated with the highly adaptive act of vomiting in necessary circumstances. Darwin concluded, much to the distress of many Victorian contemporaries: "With mankind some expressions, such as the bristling of the hair under the influence of extreme terror, or the uncovering of the teeth under that of furious rage, can hardly be understood, except on the belief that man once existed in a much lower and animal-like condition."

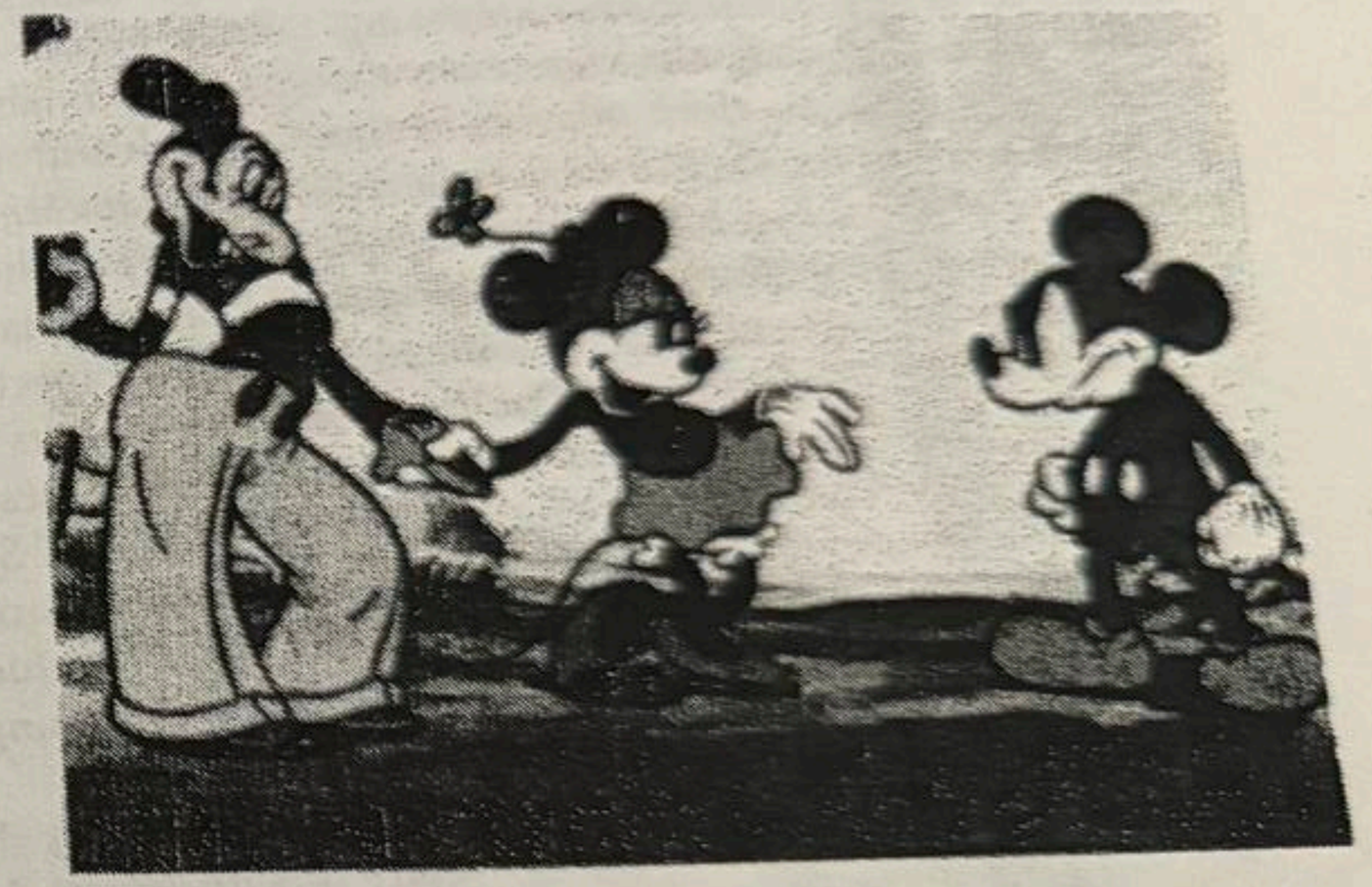
In any case, the abstract features of human childhood elicit powerful emotional responses in us, even when they occur in other animals. I submit that Mickey Mouse's evolutionary road down the course of his own growth in reverse reflects the unconscious discovery of this biological principle by Disney and his artists. In fact, the emotional status of most Disney characters rests on the same set of distinctions. To this extent, the magic kingdom trades on a biological illusion—our ability to abstract and our propensity to transfer inappropriately to other animals the fitting responses we make to changing form in the growth of our own bodies.

Donald Duck also adopts more juvenile features through time. His elongated beak recedes and his eyes enlarge; he converges on Huey, Louie, and Dewey as surely as Mickey approaches Morty. But Donald, having inherited the mantle of Mickey's original misbehavior, remains more adult in form with his projecting beak and more sloping forehead.

Mouse villains or sharpies, contrasted with Mickey, are always more adult in appearance, although they often share Mickey's chronological age. In 1936, for example, Disney



made a short entitled *Mickey's Rival*. Mortimer, a dandy in a yellow sports car, intrudes upon Mickey and Minnie's quiet country picnic. The thoroughly disreputable Mortimer has a head only 29 percent of body length, to Mickey's 45, and a snout 80 percent of head length, compared with Mickey's 49. (Nonetheless, and was it ever different, Minnie transfers her affection until an obliging bull from a neighboring field dispatches Mickey's rival.) Consider also the exaggerated adult features of other Disney characters—the swaggering bully Peg-leg Pete or the simple, if lovable, dolt Goofy.



Dandified, disreputable Mortimer (here stealing Minnie's affections) has strikingly more adult features than Mickey. His head is smaller in proportion to body length; his nose is a full 80 percent of head length. © Walt Disney Productions

As a second, serious biological comment on Mickey's odyssey in form, I note that his path to eternal youth repeats, in epitome, our own evolutionary story. For humans are neotenic. We have evolved by retaining to adulthood the originally juvenile features of our ancestors. Our australopithecine forebears, like Mickey in *Steamboat Willie,* had projecting jaws and low vaulted craniums.

Our embryonic skulls scarcely differ from those of chimpanzees. And we follow the same path of changing form through growth: relative decrease of the cranial vault since brains grow so much more slowly than bodies after birth, and continuous relative increase of the jaw. But while chimps accentuate these changes, producing an adult strikingly different in form from a baby, we proceed much more slowly down the same path and never get nearly so far. Thus, as adults, we retain juvenile features. To be sure, we change enough to produce a notable difference between baby and adult, but our alteration is far smaller than that experienced by chimps and other primates.

A marked slowdown of developmental rates has triggered our neoteny. Primates are slow developers among mammals, but we have accentuated the trend to a degree matched by no other mammal. We have very long periods of gestation, markedly extended childhoods, and the longest life span of any mammal. The morphological features of eternal youth have served us well. Our enlarged brain is, at least in part, a result of extending rapid prenatal growth rates to later ages. (In all mammals, the brain grows rapidly in utero but often very little after birth. We have extended this fetal phase into postnatal life.)

But the changes in timing themselves have been just as important. We are preeminently learning animals, and our extended childhood permits the transference of culture by education. Many animals display flexibility and play in childhood but follow rigidly programmed patterns as adults. Lorenz writes, in the same article cited above: "The characteristic which is so vital for the human peculiarity of the true man—that of always remaining in a state of development—is quite certainly a gift which we owe to the neotenous nature of mankind."



In short, we, like Mickey, never grow up although we, alas, do grow old. Best wishes to you, Mickey, for your next half-century. May we stay as young as you, but grow a bit wiser.

Cartoon villains are not the only Disney characters with exaggerated adult features. Goofy, like Mortimer, has a small head relative to body length and a prominent snout. © Walt Disney Productions