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**Chapter 2**

**American Animal Psychology and the Eugenics Movement:   
Mental Darwinism institutionalized (1900-1918).**

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The mere reference to both qualitative and quantitative differences in mental evolution made by George Romanes (1888) did not solve the problem of continuity and discontinuity.  It did, however, raise another pressing question: What sort of empirical practices might be developed to expose or reflect these qualitative changes in mental evolution?  The early debates on this question were accompanied by, and sometimes aimed against two forms of methodological excesses (i.e., anthropomorphism and psychophysical reductionism).  Within both early American experimental psychology and evolutionary zoology, there was considerable debate regarding not only how to go about studying the animal mind but also whether there is a legitimate and distinctly psychological reason for doing so (see, Plotkin, 1979; Tolman, 1987b; Wyers, 1987b).

The echoes of these debates still reverberate in the opening chapters of contemporary comparative psychology textbooks.  What is not often mentioned, however, is that these early debates took place within a wider societal context of at least one form of political-disciplinary excess: eugenics (Allen, 1986; 1997).  Our continuing disciplinary inability to provide an unequivocal account of the uniquely psychological aspects of comparative mentality has made North American general psychology vulnerable to successive reductionist attacks (e.g., mind-stuff theory 1880-1890; eugenics 1900-1955; instrumental behaviorism 1913-1950, operant behaviorism 1938-1980; sociobiology 1969-2001).

In this chapter, the efforts of German physiological psychologist Oskar Pfungst to investigate the Clever Hans phenomena (1904-07) will be used as an exemplar of the early European style of coordinated research programs (i.e., combining observational, zoological, and laboratory analysis with sincere efforts at theoretical synthesis).  This European synthetic approach contrasts strongly with John B. Watson's consistently analytic (and antievolutionary) approach to animal and human psychology.  It also contrasts with the more evolutionary, yet logically contradictory, approach taken toward animal and human mentality by Robert Yerkes (who first flirted with eugenics and then embraced the mental testing movement as another means of promoting the discipline).

In my opinion, this very contrast between early European synthesis and American analysis, exemplifies the ongoing difference between sundry historically explanatory glimpses of mental evolution and the more widespread abstract generalization or the somewhat less frequent concrete descriptive used of comparative methods (see also Ballantyne, 1995).[[7]](http://www.igs.net/~pballan/C2P1.htm" \l "_edn1)

**Section One:**

**Pfungst and the Blight of Lay-public Anthropomorphism**

The first form of methodological excess, *anthropomorphism*, was present in numerous textbooks written by evolutionary naturalists for the European general public between 1859-1890.  The U.S., translations of Binet's Psychic Life of Micro-organisms (1894/1910) and Forel's Ants and Some Other Insects (1904), combined with J. Lubbock's Ants, Bees and Wasps (1882) are just some of the later examples of this trend.  As with Darwin and the earliest works of Romanes, these texts tended to interpret animal movements by direct analogy to human-like actions, memories, and intentions.

While anthropomorphism was not adopted by most serious comparative scientists after 1900, it did continue unabated in the European and North American lay public (largely as a means of entertainment at various "clever animal" shows).  It was this grand theater, that provided one of the first well-publicized showcases for the application of the new German physiological psychology to investigate animal mentality.

**The logic of anthropomorphism**

Under the logic of the strict continuity view of mental evolution, it might be possible (under the right environmental circumstances) for a the occasional exceptional animal, which just happened to possess an unusually high endowment of latent reason, to perform mental acts such as reading, mathematical calculation, and music appreciation.  Indeed Darwin, himself seemed to imply this point at times: "We have seen that the senses and intuitions, the various emotions and faculties such as love, memory, attention, curiosity, imitation, reason, & c., of which man boasts, may be found in an incipient, or even sometimes in a well-developed condition, in the lower animals" (Darwin, 1871/36, p. 495).  For instance, he argued that it might be due to a lack of "exercise" that apes do not speak (for they seemed to have adequate anatomical organs to perform this function).

**The Clever Hans Controversy**

In 1904, it was an admixture of this new evolutionary viewpoint with older craniometry, that led Mr. von Osten (a retired grade school teacher) to sincerely believe he had developed a means to train and demonstrate human-like intelligence in especially bright horses.  In fact, during the regular public courtyard demonstrations of the horse's abilities, von Osten, occasionally compared the skull of his previous horse (Hans I, which he considered to be exceptionally bright but which had died during training), with that of his current equine student "Clever Hans" (see Krall, 1912).[[8]](http://www.igs.net/~pballan/C2P1.htm" \l "_edn2)

In short, von Osten believed he had constructed a training regime that could potentially be used to draw out the hereditary latent intelligence in not only horses but also in rural schoolchildren.  It was, he suggested, simply a matter of applying the "appropriate didactic methods" (Bringmann & Abresch, 1997, p. 78).  While the exact details of von Osten's educational techniques have been lost to posterity, it is likely that their effectiveness (as evidenced by Hans' performance under experimental conditions) lies in the social relationship established between owner and horse and not in either hereditarian latent intelligence or in the mechanical stamping in of environmental cues (see fig 9).



*Figure 9* **Clever Hans and owner.** Note the abacus (background), lettered chalkboard (foreground), and other apparatus (including weight estimation balls) used to demonstrate the purportedly well-developed mental abilities of this unusual stallion (Pfungst, 1911/1965; Katz, 1937). Von Osten had trained Hans to "answer questions" by tapping his right front hoof; and by either taking up objects in his mouth, or "pointing" to them with his muzzle. The details of this "Clever Hans affair" are important because neither the results nor the dynamics of such training can be accounted for solely on the basis of standard associationist psychological theories of learning (e.g., classical or operant conditioning, cognitive processes). Only by a truly "transformative" evolutionary approach to psychological investigation can the nature of Hans' cleverness be explained.

**A public commission**

Dismayed by mounting accusations of fraud from the press, von Osten (who had never charged the public a fee) appealed to the local school board for an investigation into both the veracity of his claims regarding Hans, and the viability of his training methods.  A commission of inquiry was soon formed.  It consisted of thirteen dignitaries including two teachers, two zoo directors, two military majors, a circus manager, a veterinarian, a count, a magician, a horse trainer, and two academics (one of which was Carl Stumpf director of the Psychological Institute at the University of Berlin).  On the first day of the enquiry, various members were assigned to watch different parts of von Osten's body while he asked the horse questions regarding colored cloths, photographs of public figures, and the spelling of certain words.  Hans, performed well and no visual or auditory signals were observed to be passing from handler to horse.

The next day, a set of more difficult tasks was demanded by the commission (see fig 10).  But even when von Osten stood behind an assigned questioner, back to back, yet bending forward himself (thus decreasing the possibility of visual signs being passed), the horse again "answered questions" with very few errors.  For instance, when six slates were suspended in a row along a rope, each with the name of a commission member written on it, Hans was able to indicate the correct slate by tapping out its position in the strung up line.  With intentional deception now ruled out, the way was open for finding out just how the horse did it and Stumpf assigned this difficult task to one of his University of Berlin graduate students Oskar Pfungst.[[9]](http://www.igs.net/~pballan/C2P1.htm" \l "_edn3)



*Figure 10* **Hans is asked a mathematical question.**The questioner (von Osten in this case) would raise the first wooden box from the right table revealing some pegs. Hans was then asked verbally to "add, multiply, or divide" this number by the second number of pegs indicated by raising a second wooden box. Note the open storage shed (upper right) where demonstrative equipment including lettered placards, chalk slates (for names), common-place objects, and photographs (of people or objects) where stored (photo from Krall, 1912).

**The observational study**

Between 1904 and 1907, Oskar Pfungst (1874-1932), used a combined approach of observational, experimental, and laboratory methods of controlled variation of conditions to establish a rough outline of the mental abilities (and limitations) of Clever Hans the performing horse (see Pfungst, 1911; Krall, 1912; Katz, 1937; Rosenthal, 1963; Fernald, 1984; Bringmann & Abresch, 1997).

Pfungst's first order of business was to confirm or deny the commission's findings.  As the commission had found no visual signals, Pfungst's initial suspicion was that surreptitious nasal whispers might be involved in prompting the horse.

Observing Hans in the usual courtyard show setting, Pfungst noticed that shouts by spectators did not interfere with Hans's performance.  The horse also exhibited very little ear movements during questioning.  These observations cast considerable doubt on the nasal whisper hypothesis.  Importantly though, Pfungst noted that Hans's performance dropped when the distance from the questioner increased, and also decreased considerably with the onset of darkness.  Neither intentional movements nor nasal whispers on the part of the handlers (von Osten and C. G. Schillings) were noted so Pfungst concurred with the commission's findings regarding the lack of deception.

**The experimental study**

The experimental phase of research was aimed at establishing the breadth or limits of Hans's abilities to answer questions under systematically controlled conditions.  It was carried out in the courtyard, but in the absence of an audience.  A tent was also erected so that some of the experimental tests would not be confounded by movements in the surrounding tenant flats.  One experimental test involved use of placards on which numbers were printed in large type.  Two conditions were used, one in which the questioners knew the answers and one in which they did not (see fig 11).

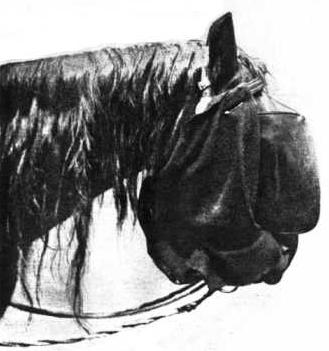


*Figure 11* **Von Osten, Hans, and Pfungst.**A placard is presented to Hans under the watchful eye of Oskar Pfungst a persistent, organized, and perspicacious investigator. Pfungst's integrative (rather than associationist) scientific methodology, which utilizes both analytic (i.e., observational, experimental), and synthetic (i.e., deductive comparative) research techniques, has only recently made a comeback in North American psychology as an alternative to the long-standing operationist and Popperian falsificationist methodologies (photo from Krall, 1912).

For the experimental condition, each placard was read by the questioner and then shown to the horse.  In these "with knowledge" trials Hans readily tapped out the correct answer.  For the control condition, placards were randomly shuffled face down and then, without seeing what was written on the other side, the questioner held one up for the horse.  Hans' famous success rate decreased dramatically.  Next, a similar procedure was use with a name written on slate tablets.  Similar results were obtained.  Pfungst had demonstrated that Hans could not read numbers or words.  Ever cautious, however, Pfungst also designed another "without knowledge" procedure in order to test "non-reading" (i.e., auditory) addition skills.  He simply whispered a given number into Hans's ear and von Osten did likewise into the other ear and Hans was to tap out the sum.  Again, the same dismal results were obtained.[[10]](http://www.igs.net/~pballan/C2P1.htm" \l "_edn4)

These initial experimental tests indicated that, under normal uncontrolled conditions, the questioner was somehow providing Hans with information about which object to select or how many taps to make.  The issue remained open, however, as to how this information was being passed from man to horse.

To test the ever-popular mental telepathy hypothesis, Pfungst devised a test where the questioner would know the answer in both of two sets of trial conditions, but where Hans could actually see the questioner in only one set of trials.  In the second set of "control" trials, Has was prevented from seeing the questioner by a modified horse blinder.  Later, this telepathy hypothesis was retested by having the questioner stand behind a wooden screen.  On both occasions, however, Hans was unable to answer correctly under the control condition of visual impediment (see fig 12).



*Figure 12* **A modified horse blinder to test for telepathy.** By augmenting a standard horse blinder with a dark cloth, it was hoped that all visual contact between Hans and the questioners would be abolished during the initial "control" condition trials. But Hans often reared or shook his head violently during these trials. Pfungst's recording secretary (Dr. E. von Hornbostel) was therefore forced to create an "undecided" category for those trials where Hans might have peaked. As Candland (1993) points out, despite this experimental difficulty, the chances of the percentages of correct answers obtained (i.e., experimenter seen = 89, experimenter not seen = 6, and undecided = 18) being due to chance are <.01.

Pfungst claims that he was first tipped-off to the visual signal hypothesis by an apparently hesitant, modified, half-step which Hans often exhibited just before ceasing his tapping (1911, pp. 47-48).  In conjunction with the other evidence, Pfungst first *deduced* that Hans may be simply tapping until he saw a given signal to stop.  Although Pfungst set up further experimental conditions designed to isolate the exact visual signal being picked up by Hans, the results were inconclusive without the aid of moving film.  He did note that the typical questioner (some less than others) appeared to bend forward slightly from the waist after presenting a question in order to visually count the number of hoof taps and bent backward and upward slightly (either just before) or just as the correct number of taps was reached (1911, pp. 47-48), but he had no means by which to narrow the alternatives down any further.

Pfungst then *demonstrated* the animal's dependence on these signals.  He showed that these signals were sufficient (though not necessarily exclusively responsible) for the control Hans's tapping.  Pfungst asked the horse to count to 13 but leaned forward (in an exaggerated manner) until 20 taps had occurred without hesitation.  Pfungst even showed that no question at all (but only the movement) was necessary to set Hans tapping (1911, pp. 56-57).  He also demonstrated that the very rate of Hans's tapping depended on the degree of the questioner's forward inclination.  In describing this latter effect, Rosenthal (1963) would later refer to it as a phenomenon of expectancy where a questioner (expecting a longer wait) would lean further forward for a large number and less so for a smaller number.  Hans had somehow picked up on these human motor operations and modified his tapping rate accordingly.[[11]](http://www.igs.net/~pballan/C2P1.htm" \l "_edn5)

**Evolutionary and Social source of Hans's abilities**

The key to explaining how the details of this expectancy escaped the watchful eye of numerous scientific, professional, and lay-human beholders, lies in the evolutionary difference between human and equine eyes.  This organic difference in the structure and function of the horse eye played a vital role in making Hans seem so clever.  The eyes in human beings are both at the front of the head and close together.  They are specialized for binocular vision.  The horse, however, has two broadly spaced and immobile eyes placed on each side of the head.  Horses rely on monocular vision in an extraordinarily wide plain of vision.  As Fernald (1984) points out:

"Hans' large and motionless eyes served well to help satisfy his acquired desire for tasty delicacies and to hide the focus of his gaze from all human lookers.  Even when approaching some distant cloth, he easily kept the slightest movements of his questioner well within his sight" (Fernald, 1984, p. 85).

In the concluding chapter of his monograph, Pfungst pointed out that such perceptual abilities are the sort of evolutionary adaptations which would likely be useful for the survival of wild equine species (i.e., natural organic selection).  He also recognized, however, that Hans (as a trotting horse) was a product of selective breeding guided by human beings (i.e., artificial sexual selection).  Hans, like many household pets, also lived under circumstances of total domestication (i.e., his biological and social needs were met through reference to human beings).  In particular, von Osten (over seventy and lacking any immediate family) spent thousands of training hours with his equine pupil.  Pfungst concludes with a statement regarding the bearing of the case upon "animal psychology in general" (p. 240):

"The proof which was expected by so many, that animals possess the power of [human-like] thought, was not furnished by Hans. He has served to weaken, rather than strengthen, the position of these enthusiasts. But we must generalize this negative conclusion... for Hans cannot without further qualification be regarded as normal. Hans is a domesticated animal....To be sure, in some respects they have become more specialized than their wild kin,...and in their habits they have become adapted largely to suit our needs. This latter [point] is shown by all the anecdotes concerning 'clever' dogs, horses, etc.... Though our investigations do not give support to the fantastic accounts of [human-like] animal intelligence..., they by no means warrant a return to Descartes and his theory of animal-machine (as is advocated by a number of*over-critical* investigators)..." (Pfungst, 1911/1965, pp. 241-242; emphasis added).

While Pfungst now considered the position that animal and human minds are not only quantitatively, but also qualitatively different to be experimentally confirmed, he also wanted to further understand the phenomena of expectancy as it is expressed in human-human relationships.  Were the expressive movements of von Osten, Schillings, and others typical of human beings?  If so, could a skilled observer learn to manipulate these signals in others?  Would subjects in the laboratory become aware that they were sending such signals?

**Laboratory Follow-up (Expectancy Effects)**

Finished with the horse, Pfungst left the courtyard and returned to the University of Berlin laboratory to study expectancy effects in various face to face human situations.  In the simplest scenario, volunteers served as questioners and Pfungst played the role of Hans.  In the first tests, the questioner selected some number up to ten and concentrated upon it.  Without knowing the number, Pfungst began to tap and soon found what he expected: a sudden involuntary movement of the questioner's head.  This movement was later measured to be less than one millimeter in distance (as indicated by a kymograph attached to the subject's head).  Twenty-three of his twenty-five subjects signaled consistently in this way, but when asked later, only rarely did they note any particular movement on their part.

In a more complicated task, new subjects were asked to concentrate on any one of six words: up, down, left, right, no, or yes.  Each subject was free to think about the word in any way they wished and could even insert a "blank trial" on occasion (thinking of nothing in particular).  Sometimes Pfungst answered by shaking or nodding his head, or by pointing in a certain direction, but often he simply said the word he thought the questioner had in mind.  With 12 questioners and 350 trials, his score was 73% correct.  Pfungst had learned to interpret the subtle social (i.e., inter-organismic) "expressive movements" of his subjects.[[12]](http://www.igs.net/~pballan/C2P1.htm" \l "_edn6)

The four directions (up, down, left, and right), were typically expressed by combined head and eye movements in these directions.  Similarly, yes and no were indicated by nodding and shaking head movements while blank trials generally yielded no expressive movements.  Importantly, these movements always took place when the subject *began* to think about a concept, and they occurred without the person's awareness or control.  That is, they persisted unaltered even after Pfungst disclosed the secret of his successful guesses to the subject.  Pfungst had now corroborative laboratory evidence for the types of "natural" signals noted to effect Hans's tapping in the courtyard experiments.

Pfungst, however, continued his laboratory experiment to provide clear evidence that "arbitrary" signals could be formed, superimposed on older ones, and even eliminated in favor of the original natural pattern.  Arbitrary movements could be substituted for the natural ones (described above) by merely changing his own answering pattern (i.e., moving his arm up or down to guess the directions "left or right").  The transition in the subjects took some time.  Subjects began with the natural right-left eye signals, but soon these were accompanied by the arbitrary (up or down) movements.  Once this pattern was trained into a subject, Pfungst made 32 correct guesses in 40 test trials.  His high hit rate was maintained even when he placed a blindfold on the subject and observed only the induced head movements.

Next, these arbitrary movements were reversed (i.e., Pfungst would guess "left" with a downward movement and "right" with an upward movement).  After a dozen trials of this new system, the former arbitrary head movements were completely displaced by the still newer ones (i.e., totally the reverse).  Finally, Pfungst ceased all arm movements, indicating his guesses merely by saying them (i.e., up, down, right, left, yes, no).  The novel head movements continued for a time, then became more tentative, and finally disappeared.  The collective summary of his combined research program was published in German as Das Pferd des Herrn von Osten. (Der kluge Hans) (1907).

**Aftermath of Pfungst's research**

Pfungst, subsequent to these studies, demonstrated that cavalry horses do not make good use of verbal commands from their riders (see Fernald, 1984).  He also foiled the act of a clever German setter called Don by making phonographic recordings of this dog's "speech" and testing them on control subjects (Rosenthal, 1963; Krall, 1912).  Von Osten, after some consternation regarding his own treatment at the hands of scientists, ceased to display Hans publicly and died in 1909.

Shortly afterward, Hans was moved to a farm and then sold to Karl Krall a wealthy jeweler from Elberfeld.  Hans was soon back on public display with two other stallions (Muhamed and Zarif).  These horses used inclined wooden platforms to tap out answers (see Katz, 1937).  Wolfgang Kohler (another student of Stumpf's) saw all three horses perform and this inspired him to attend the 1912 conference of the Society for Experimental Psychology where Pfungst and Alexander Sodolowsky (an evolutionary biologist) squared-off on the issue of ape intelligence.  Regardless of all such conservative scientific proceedings, however, Krall's (1912) book about the famous horses of Elberfeld retained its popular appeal.

The overlap between the empirical outcome of Pfungst's laboratory research and the much later operant behavorism (of Skinner) is noted by Fernald (1984) but the accomanying emphasis on the social realm of meaning in Pfungst's wider program is unfortunately severly underplayed.  The details of Pfungst's inclusive empirical approach have been provided here because subsequent works (e.g., Kohler's Mentality of Apes, 1917/1925; C.L. Morgan's Emergent Evolution, 1923; Vygotsky & Luria, Studies on the History of Behavior: Ape, primitive and child, 1930/1993; and Leontiev, Problems in Development of the Mind,1959/1981) have utilized similar empirical and theoretical procedures to outline qualitative shifts in the phylogenetic, ontogenetic, and socio-historical realms of mentality.  These and other works will be referred to later especially with regard to their direct bering on a transformative structure of animal and human mentality.  The most pressing issue at present however, is to show that Pfungst's program of combined, ecologically valid research differed significantly from the pattern of research set down in contemporaneous (and subsequent) early American psychology.