POLICE DOGS.

CANINE DETECTIVES.

BY KARLERNST KNATZ.

Good detectives are very rare, and correspondingly expensive. Hence a police administration conducted with due regard to economy could scarcely afford to employ a veritable Sherlock Holmes, if he could be found. Ordinary detectives and policemen, on the other hand, cannot cope successfully with the highly developed and refined methods of the modern criminal. The police authorities, confronted with this dilemma, have lately employed, to a limited extent, an auxiliary possessed of instincts which take the place of detective genius. This auxiliary is the police dog, which, in Berlin at least, is giving almost daily proof of its fitness for detective and police work. The training and practice of these four-legged guardians of the peace are most interesting to witness.

One morning last summer, the writer was conducted by Police Major Klein, the organizer and commander of the canine police force of Berlin, to a public garden in the suburbs. Here we found assembled a number of the men of the corps, all selected from the general body of police with especial reference to their liking for dogs. On the grass lay the dogs attached to the northwestern police station—gaunt, sinewy animals with shrewd faces, of the German sheep dog breed. We took seats and the drill commenced. The dogs were required to give tongue at a signal and to lie still at assigned stations until the trainer, moving away from them, summoned them by a call or a whistle. Even when running at full speed they instantly stopped and lay down at the word of command. All of the dogs leaped a seven-foot fence with ease, even when they carried heavy objects in their mouths. The next test of obedience was the refusal of food. A dog was chained to a tree and ordered to guard some object, such as a bunch of keys. When I cautiously fished for the treasure with my cane, the dog rushed at me savagely, tugging at his chain, growling and gnashing his teeth. An appetizing piece of sausage that I had offered to distract the animal's attention, was regretfully sniffed at and then contemptuously ignored. The experiment was repeated with all the dogs, with the same result. Frack, the champion of the corps and the winner of many prizes, did not even turn his nose toward the sausage.

One of the police officers then beckoned to Grete, a bitch of remarkable beauty, and directed her, by a gesture, to search for something hidden in a clump of bushes at the back of the garden. Grete followed the indicated direction and soon returned with a two-mark piece in her mouth.

After witnessing these specimens of school work, we went out into the open fields, to see the dogs track and arrest supposed criminals. A crowd of curious onlookers had already collected. A young man, who subsequently proved an uncommonly tame and stupid

malefactor, was enveloped in a heavy padded leather coat, which showed the marks of numerous dog bites, and directed to lay a trail by walking across a meadow, and then to conceal himself. Several other trails had been previously laid across the same field. A striking exhibition was then witnessed. Frack and another dog followed all of the trails, bringing back a handkerchief from one of them, and finally traced and discovered the criminal and sprang upon him, but released him instantly at their master's command. The sight made me shudder. These wise and faithful animals could become savage and ravenous beasts when duty demanded. They always seize their victim by the throat or the wrist, and a wild pistol shot only redoubles their zeal and ferocity. The poor fellow who impersonated the criminal was bathed in sweat, which was not due solely to his leather coat.

The exhibition closed with an aquatic performance in the neighboring canal. Here the leading part was taken by a dog which has actually rescued a number of persons from drowning and has brought many floating corpses to land. A puppet filled with cork was thrown into the canal. The dog swam out to it, seized it by one arm and drew it to shore, displaying astonishing skill, care and strength. In the water, as on land, the dogs surprised me by the promptitude and precision with which they advanced, retreated and turned to right or left, at the word of command.

The canine police corps of Berlin, already very efficient, is steadily improving, under the able guidance of Major Klein, who has given me his views on the functions and the training of police dogs in a personal letter, from which I quote the following:

"The fidelity and affection of the dog must be won, maintained and rewarded by kind and intelligent treatment. All dogs, even those of naturally obstinate disposition, are amenable to kindness. Many dogs are so sensitive that they cannot endure even a scolding, while a rash blow or violent imprecation may spoil them for a long period, if not forever. Obstinate and unimpressionable dogs may be treated with greater severity, after the trainer has clearly recognized their peculiarities. Such dogs must be taught that their willfulness and obstinacy are useless, and that man is their master, and the whip, applied at the right moment, is an efficient aid in inculcating this lesson."

In an article on police dogs, recently written by Dr. Th. Zell, this keen observer of animals gives a scientific explanation of the remarkable faculty of tracing persons and things by scent, upon which the efficiency of the dog, as an ally in the war against criminals, chiefly depends. Dr. Zell illustrates this faculty by comparing its absence with the defect of vision known as color blindness. A person who is color blind may

see as clearly and sharply as a person with normal vision, but he cannot gather strawberries with conspicuous success, because the ripe and the green berries and the green leaves appear to him alike in color. A similar defect is exhibited by an ear that is unmusical, or tone deaf. The musical person distinguishes small differences in pitch and quality, which have no existence for the person who is tone deaf, although his acuteness of hearing, as shown by the ability to perceive very faint sounds, may equal or surpass that of the musician.

A color blind person cannot trace the course of a vessel or of a railway, as indicated on a chart or map by a red line, which is followed easily by a person of normal sight. If the dog, as we appear to be justified in assuming, attaches a definite mental image to each distinct odor, the animal's ability to trace the right trail through a labyrinth of other trails becomes explicable.

The following hints are abstracted from Major Klein's manual for the police dog service:

"The dog must be at once the assistant and the protector of the police officer, a trustworthy and respect-inspiring companion, giving to the solitary patrolman a sense of security and a moral support. He must be attached to his master alone, regarding other persons with suspicion and not allowing them to approach him. He should precede the patrolman to spy out the land. The keen scent, watchfulness and agility of the dog should facilitate the discovery of suspicious persons and conditions and save the policemen many useless steps.

"In the arrest and conveyance of prisoners, and in resisting attempts to free prisoners, and attacks upon officers, the dog should afford very valuable assistance, while in the pursuit of a criminal detected in the act of crime, the dog should, so to speak, extend the reach of the policeman's arm, by 'dogging' the footsteps of the fugitive, following his fresh tracks and finally holding him until the policeman arrives. The police dogs are also expected to assist in the rescue of persons in danger of drowning, and to follow persons whose manner indicates that they are contemplating suicide, and give warning by 'baying.' In raids the dogs should hunt out concealed persons and betray them to the police."

In Paris, according to the newspapers, the police dog has already made his appearance on the theatrical stage, thus following in the footsteps of Sherlock Holmes, Lecoq and other real and fictitious human prototypes. This could never have occurred in a theater managed by Goethe, who left the theater in a rage when a dog was brought upon the stage.—Translated for the SCIENTIFIC AMERICAN SUPPLEMENT from Ueber Land und Meer.

QUANTITATIVE VS. QUALITATIVE THINKING.*

By R. W. RAYMOND.

It was not so very long ago that the catalogue of a certain college announced the Rev. ———, D.D., as president, and professor of ancient and modern languages and history; of mental, moral and natural philosophy and applied science! A small and in some respects a ludicrous beginning—but it contained at least the aspiration, which was a prophecy, of the manifold and multiform training with which our best universities are now equipped and competent to furnish.

In the second place, this gathering emphasizes the underlying unity of all these specialties: Mining, metallurgical, civil, mechanical, electrical, chemical engineers—you are all engineers. Even the architects are engineers or else they are not fully accomplished as architects. You must, methinks, all possess something in common which makes you engineers, and which, as engineers, you are bound to make effective for the benefit of your generation.

I am not going to excite your ridicule or aid the somnolency of your digestion of such a feast as this, by offering you a complete, inclusive and exclusive definition of an engineer. Certainly, it means more than simply a man who runs an engine. Somewhere in the '70s of the last century, when the American Institute of Mining Engineers held its first meeting in Baltimore, a leading manufacturer of that city said to one of us, "If you have any influence with

your brethren in that engineers' convention, I hope you will urge them not to order a strike. In these times, \$2.50 a day is really all that we can afford to pay our engineers." Of course, he was told that ours was not a labor union, but a union of laborers, who never struck for high wages, but simply earned them and got them; and that our chief purpose was not to increase the wages, but to improve the work.

QUANTITATIVE THINKING ESSENTIAL.

While I do not propose to define the engineer, I beg to suggest one element which characterizes, I think, all true engineers. And I will use as a name for it a term borrowed from the laboratory. The engineer's thought and work are quantitative, not merely qualitative. Engineering lies at the base of the edifice of civilization; but the progress of civilization is often erroneously measured by mere inventions. Now inventions may sometimes be made and must always be perfected and utilized by engineers. But inventors who are nothing more fare badly, as they ought to.

How often we hear the accusation that the world has ill repaid the first propounder of an idea which in the hands of another has proved greatly profitable. But, in truth, it is not the happy thought about a thing, but the practical doing of the thing, that deserves reward. No doubt the first man, looking at the first bird, wanted to fly, and tried to fly, but the trouble was he couldn't fly. Should we now hunt up his heirs and pay them for the invention of their ancestor? His work was merely qualitative.

Once upon a time a pale, inspired inventor climbed up to my office and asked me to help him to go to Colorado. He had invented the idea of using

electricity in mining and metallurgy; and he wanted to go to the Rocky Mountains, because at their summits electricity was so abundant. His notion was a qualitative one. Yet, no doubt, if he is still alive, he cherishes the notion that he has been robbed of the glory justly due to him for his bright idea.

INEFFICIENCY OF THE MERELY QUALITATIVE THINKER.

These qualitative enthusiasts grow more and more numerous every year, with the increase in half-educated practitioners of "applied science." And the old errors continuously crop out anew. After every big snowstorm, we have a number of qualitative proposals to remove the snow from our streets by thawing it with steam jets, and letting it run away of itself. What is still more remarkable, the editors of our leading newspapers gravely publish such communications, under the impression that there may be something in the notion, and that they had better not disparage it lest haply they be found fighting against science.

After the great blizzard a storekeeper in Brooklyn undertook to apply quantitatively this qualitative proposition. Having a 16-foot heap of snow opposite his store, and a cellar full of old boxes under it, he dug in the drift a chamber with a chimney, crammed this stove with the kindling wood from the cellar, lit the fire, and waited for the mountain to disappear in fervent heat. He, being a qualitative thinker, did not know the difference between temperature and heat units, or dream of the amount of work he was expecting his little fire to do. When he had burned all his wood he abandoned his faith in science.

*Excerpts of an address given at the dinner of alumni of the Schools of Science and the School of Architecture of Columbia University. Republished here from the Engineering and Mining Journal.

I could multiply such illustrations indefinitely. But I may be permitted, in conclusion, to say generally and inoffensively, that qualitative thinking is one of the dangers of our day. Great popular manias, fads of special reform, exposures of public evils or hardships, appeals for governmental interference, all are,

or are likely to be, merely qualitative. I think it was Thomas Jefferson who said, in substance, "A free people never loses its liberties by surrender to force. It gives them away in moments of enthusiasm."

It is the duty of engineers, who have been trained to regard and handle things quantitatively, to con-

tribute this needed element to the thought and action of their time. Let them make no haste to conclusions; let them count the cost, measure the means, weigh the sacrifices, appraise the gains and the losses—in a word, hold fast to the distinction between heat units and mere degrees of temperature.

THE "TYPICAL" MAN WHO DOES NOT EXIST.

THE COMPOSITE OF A HUMAN GROUP.

BY PROF. R. S. WOODWORTH

ONE of the most agreeable and satisfying experiences afforded by intellectual pursuits comes from the discovery of a clean-cut distinction between things which are superficially much alike. The esthetic value of such distinctions may even outweigh their intellectual value and lead to sharp lines and antitheses where the only difference that exists is one of degree. A favorite opportunity for this form of intellectual exercise and indulgence is afforded by the observation of groups of men. The type of man composing each group—that is what we should like to find; and we hear much of the "typical" scientist, the typical business man, the typical Englishman or Frenchman, the typical southerner, the typical Bostonian. The type of any group stands as a sort of ideal within the group, and, more or less caricatured, as the butt of the wit of other groups. There is one peculiar fact about these types: you may have to search long for an individual who can be taken as a fair example. And when you have at last found the typical individual, you may be led to ask by what right he stands as the type of the group, if he is a rarity amid it.

If we would scientifically determine the facts regarding a group of men, we should, no doubt, proceed to examine all the individuals in the group, or at least a fair and honest representation of them. The first fact that meets us when we proceed in this way is that the individuals differ from one another, so that no one can really be selected as representing the whole number. We do find, indeed, when we measure the stature of any other bodily fact, or when we test any native mental capacity, that the members of a natural group are disposed about an average, many of them lying near the average, and few lying far above or far below it; and we thus have the average as a scientific fact regarding the group. But the average does not generally coincide with the type, as previously conceived, nor do the averages of different groups differ so much as the so-called types differ. Moreover, the average is itself very inadequate, since it does not indicate the amount of variation that exists within the group—and this is one of the most important facts to be borne in mind in understanding any collection of individuals. It is specially important in comparing different groups of men, since the range of variation within either group is usually much greater than the difference between the averages of the groups. The groups overlap to such an extent that the majority of the individuals composing either group might perfectly well belong to the other.

No doubt statements like this will be readily accepted as far as concerns the different nations belonging to the same race. One could not seriously doubt that the nations of Europe, though they might differ slightly on the average, would so much overlap one another that, except for language and superficial mannerisms, the great majority of the members of one nation might be exchanged with a majority from another nation without altering the characteristics of either. But when we extend our view to all the peoples of the earth, the case would at first appear quite changed. Certainly whites and negroes do not overlap, to any extent, in color of skin, nor negroes and Chinamen in kinkiness of hair, nor Indians and Pygmies in stature. Such specialization of traits is, however, the exception. Whites and negroes, though differing markedly in complexion and hair, overlap very extensively in almost every other trait, as, for example, in stature. Even in brain weight, which would seem a trait of great importance in relation to intelligence and civilization, the overlapping is much more impressive than the difference; since while the brain of negroes averages perhaps two ounces lighter than the brain of Europeans, the range of variation within either race amounts to 25 ounces.

Our inveterate liking for types and sharp distinctions is apt to stay with us even after we have become scientific, and vitiate our use of statistics to such an extent that the average becomes a stumbling-block rather

than an aid to knowledge. We desire, for example, to compare the brain weights of whites and of negroes. We weigh the brains of a sufficient number of each race—or let us at least assume the number to be sufficient. When our measurements are obtained and spread before us, they convey to the unaided eye no clear idea of a racial difference, so much do they overlap. If they should become jumbled together, we should never be able to separate the negroes from the whites by aid of brain weight. But now we cast up the average of each group, and find them to differ; and though the difference is small, we straightway seize on it as the important result, and announce that the negro has a smaller brain than the white. We go a step further, and class the white as a large-brained race, the negro as a small-brained. Such transforming of differences of degree into differences of kind, and making antitheses between overlapping groups, partakes not a little of the ludicrous.

We seem to be confronted by a dilemma; for the group as a whole is too unwieldy to grasp, while the average, though convenient, is treacherous. What we should like is some picture or measure of the distribution of a given trait throughout the members of a group; and, fortunately, such measures and pictures can be had. Convenient and compact measures of variability are afforded by the science of statistics, and are of no less importance than the average. But still better, because closer to the actual facts, are graphic or tabular pictures of the distribution of the trait, showing the frequency with which it occurs in each degree. The distribution of a trait is for some purposes more important than the average. Let us suppose, for instance, that two groups were the same in their average mental ability, but that one group showed little variation, all of its members being much alike and of nearly the average intelligence, while the other group showed great variability, ranging between the extremes of idiocy and genius. It is evident that the two groups, though equal on the average, would be very unequal in dealing with a situation which demanded great mental ability. One master mind could supply ideas for the guidance of the group, and his value would far outweigh the load of simpletons which the group must carry.

If groups of men differ in average intelligence, this difference would have an influence on their effectiveness in mental work, and so, no doubt, on their advance in civilization. If groups differ in variability, this would probably have a still greater influence. There is one respect in which groups certainly do differ. They differ in size, and size is an important consideration, even from a purely biological point of view. The more numerous the individuals born into a group, the greater the absolute number of gifted individuals to be expected; and in some respects it is the absolute rather than the relative number of able men that counts. Besides this, the larger the group, the greater the chance of its producing a truly effective genius, just as, in the experiments of Burbank and other breeders, a vast number of plants are grown, in order to increase the chance of sports occurring.

One further consideration of this partly biological, partly statistical nature should be brought forward. When the individuals composing a group are measured or tested in several traits, it is found that those who rank high in one trait do not always rank high in others. On the whole, there is more correspondence than opposition; an individual who ranks well in one trait is rather apt to rank well in others. The correlation, as we say, is positive, but it is far from perfect. The individuals most gifted with ability in war are not altogether the same individuals who are ablest in government, or in art or literature, or in mechanical invention. This fact is not only of importance in reaching a just conception of a group, but it should be considered in comparing different groups. The circumstances surrounding a group call for certain special abilities, and bring to the fore the individuals possessing these abilities, leaving in comparative obscurity those gifted in other directions. Judging the group largely by its prominent individuals, we get

the impression that the group is gifted in certain lines and deficient in others. A nation whose circumstances call for industrial expansion and the exploitation of natural resources gives prominence to those of its members who are successful in these pursuits, and leaves in obscurity many who have native capacity for military leadership. Should war come to such a community, time and bitter experience are often necessary before the leadership can be transferred from the previously eminent men to those obscure and often despised individuals who are capable of doing best service in the new direction. This lack of perfect correlation between various abilities makes it difficult to judge of the capacity of a group of men by casual observation; and we must accordingly discount largely the appearance of specialization of mental traits in different peoples.

A SCIENTIFIC CLASSIFICATION OF SMELLS.

In a recent number of the *Lancet* a correspondent of that journal makes a plea for a scientific classification of smells, just as there is a classification of colors and of sounds.

"The sense of smell," writes he, "is the function of the olfactory nerve, which also distinguishes the various flavors, and this may be the reason why so many persons cannot distinguish smell from taste. The four primary tastes are sweet, bitter, acid, and salt, and these have no effect on the olfactory nerve; hence analysis of this nerve does not delete the sweet, bitter, acid, or salty character of substance, but does of the flavoring agents. But paralysis of the glosso-pharyngeal and certain fibers of the fifth nerve destroys the sense of taste, but not flavor. Some of the senses are very fully classified, vision and hearing in particular; probably these give the greater pleasure to the great majority. We have primary and secondary colors, and therefore to describe a color as horrid would not be acceptable, although such passes muster for the smell."

How is a basis of a classification to be arrived at? Is such a classification, in truth, possible? The writer thinks that it is, and he makes the following suggestions: "In the selection of odoriferous substances one recognizes the importance of choosing pure definite chemical bodies so as to avoid mixed smells, and that they should be capable of ready dilution, as strong odors not only quickly temporarily paralyze the olfactory nerve endings, but also irritate the fifth nerve. The concocted names of the primary odors should be easily adapted to affixes and prefixes. Having adopted the standard of odors and their names, I would suggest sets of them at the elementary schools to familiarize the children with them and their names, as is done at present in the case of colors. The foundation laid of an octave of smells, it would not be so difficult as hitherto to impart more definitely and intelligently the character of a smell to others in legal and medical cases. As a preliminary classification of the primary odors we might select such bodies as 1, ammonia; 2, sulphureted hydrogen; 3, bromine; 4, valerianic acid; 5, ether; 6, menthol; 7, camphor; 8, artificial musk; 9, nitro-benzol. Next we have to concoct a name for each of these odors apart from the names of the substances, such as is done with colors. For example, red does not pertain to any particular substance, but is the quality of large numbers, and we can qualify the quality in various ways, such as reddish-yellow and reddish-brown, or yellowish-red and brownish-red. After settling the primary odors and names we could, I think, in the same manner describe the odors fairly well of a larger number of substances."

Creosoted piles driven in sea water in a dike at New Haven, Conn., about 1885, were examined a year ago. About 5 per cent. of the piles in the channel arm and 25 per cent. in the shore arm were in bad condition, due to rotting, beginning at the top in the center. The engineer suggests that deterioration might not have occurred if the tops had been protected.

* Abstracted from the address of the vice-president and chairman of Section H. Anthropology and Psychology, of the American Association for the Advancement of Science.