

Helen Keller Shows Future of Brain

Psychology

By EMILY C. DAVIS

Ever since she was a little child, Helen Keller—going about life blind and deaf, but happy and sure of herself—has been an inspiration to handicapped men and women. She has been called the most remarkable woman of the century, and it would be difficult to think of any one to compete with her for the title.

Now Miss Keller has been given a significant role to play in the unfolding of man's development. Her senses, particularly those of touch and smell, have been studied by Dr. Frederick Tilney, professor of neurology at Columbia University. And, after observing the use that she has made of these senses, he concludes that the average normal person has developed his brain just about 20 per cent.

The 20 per cent. is a matter of simple arithmetic, Dr. Tilney shows. We have five primary senses which keep us posted as to the world around us—hearing, seeing, touch, taste, and smell. A human being who developed these five senses to their limit would be rated 100 per cent.

Helen Keller, depending almost entirely on the sense of touch to guide her, uses that sense to practically its full possibility. Her adjustment to life with this one sense is entirely adequate. She went through college, writes books in beautiful English, enjoys flowers, music, and conversation, and has as happy a philosophy as any one of our day. And because of all this Dr. Tilney believes that it is fair to say that Helen Keller's development with her one really useful sense equals the average person's development of his contact senses, even though he has five of them.

So, to finish the arithmetic problem, our brains are used to just about one-fifth of their possible capacity.

To understand how Miss Keller's example is a challenge, not alone to handicapped people, but to any normal person, you must follow some of Dr. Tilney's experiments. His problem was to measure the sensitiveness of skin, nerve, and muscle in an unusual human being, and to compare the measurements with the sensitiveness of other human beings. The measurements were so delicate that most of the scales had to be read in millimeters. Before some of the experiments could be conducted it was necessary to devise special apparatus.

One of the specially constructed



HELEN KELLER shows how fingers can be used to feel the music of the radio. She knows gay melodies from sad ones by the difference in the vibrations

pieces of equipment was used in testing Miss Keller's sense of touch in respect to motion of the arm, hand or finger. Any one knows when his hand is being moved up and down. But what is the least movement of the hand or finger or wrist that can be felt? Dr. Tilney placed Miss Keller's hand on a flat board surface and raised or lowered it by a worm screw which measured the number of millimeters that the board was being lifted or dropped. Miss Keller recognized a rise of two millimeters and a drop of three.

Now, two millimeters translated into inches is roughly about one-twelfth of an inch. But if you are

about to exclaim at the superior sensitiveness of Helen Keller's hands, wait.

Dr. Tilney also measured a number of people with normal senses, people who would be hard put to it to fumble for an electric light button in the dark. He found that Miss Keller's long practiced hands were not quite so sensitive to motion as those of the average person. She made a better record than some, but not so good as others.

Yet, consider this: Miss Keller, with her delicacy of touch rated scientifically as just barely average, walked in a garden with the nerve specialist and named every flower that he picked merely (*Turn to next page*)

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by feeling its petals and leaves.

In another test of touch, the neurologist took a compass and separated the two points just a little and touched the points lightly to Helen Keller's hand. The object was to find the least distance apart that the compass points could be placed at which she could still feel the pressure of two separate points, instead of only one.

When another famous blind and deaf girl, Laura Bridgman, was tested in this way by Dr. Stanley Hall some years ago, the psychologist reported that she could discriminate two points so close together that the average person would think them only a single touch. But in the case of Helen Keller, it was found that her sensitiveness is just about normal. These tests of skin sensitiveness were made not only on the back of the hand, but also on the arm, chin, cheek, finger, and other points. In each test there was no sign of abnormal delicacy of the skin or nerve endings under the skin.

Dr. Tilney tested Miss Keller's sense of temperature with thermophores. In this test an instrument heated to 100 degrees and another heated to 98½ degrees were placed on the skin for four seconds, and the subject of the experiment was asked whether the feeling was hot or cold. Miss Keller's average of right answers was about what the normal person would achieve. He tested her sense of pressure with special torsion springs and the least amount of pressure she could feel was again no more than you or I would have reported under such a test.

The result of it all is a mass of evidence that loss of sight and hearing has brought no greater sensitiveness to the fingers of this woman. Yet she holds her finger tips to the throat and lips of another person and feels words with them with remarkable facility. She can put a needle to her tongue and find the eye by touch and then by patient application fit a thread into that tiny eye. She went through Radcliffe College with honors, literally feeling her way through the lectures in the classroom, as her own teacher, Miss Anne Sullivan, spelled the professors' words into her hand with sign language.

The sense of smell is not so useful as touch, either to the blind person or to one with all his senses intact, but it adds greatly to the enjoyment and understanding of the world, as Miss Keller's experiences show.

On one occasion Dr. Tilney drove

with Miss Keller from New York to her publisher's office in Garden City. They conversed as usual, Dr. Tilney spelling his questions into her hand by tapping out the letters with his fingers, as Miss Keller herself taught him to do, and Miss Keller answering aloud.

As the car sped along, the neurologist spelled out the question:

"How much does the sense of smell mean to you?"

She replied that she had called this sense the fallen angel, because its possibilities as a means of enjoyment are so much neglected and even scorned.

"It is a beautiful sense," she said. "It is my scenery. It tells me where I am and the character of my surroundings."

"Miss Helen," said the neurologist, "I am going to ask you to use your sense of smell to tell me what we are passing now."

She answered immediately: "We are going through open country."

And Dr. Tilney noted that they were passing a golf course.

Then she remarked that they were passing a grove of trees, which was true.

Then, she said that they had just passed a house with an open fire burning, and the professor looked back and saw a cottage with smoke coming out of the chimney.

Next, she said: "We are passing many buildings." And Dr. Tilney, surprised, observed that they were indeed going past an institution for the insane.

Finally, she announced: "We are now in Garden City," and the professor, still more surprised, asked how in the world she could tell him that.

"I smell the ink of the presses," Miss Keller answered.

Discussing this subject in one of her books, Miss Keller wrote:

"Out of doors I am aware by smell and touch of the ground we tread and the places we pass. Sometimes, when there is no wind, the odors are so grouped that I know the character of the country, and can place a hayfield, a country store, a garden, a barn, a grove of pines, a farmhouse with the windows open."

She also wrote: "From exhalations I learn much about people. I often know the work they are engaged in. The odors of wood, iron, paint, and drugs cling to the garments of those that work in them. Thus I can distinguish the carpenter from the iron-

worker, the artist from the mason or the chemist. When a person passes quickly from one place to another, I get a scent impression of where he has been—the kitchen, the garden, or the sick-room. I gain pleasurable ideas of freshness and good taste from the odors of soap, toilet water, clean garments, woolen and silk stuffs, and gloves.

"I have not, indeed, the all-knowing scent of the hound or the wild animal. None but the halt and the blind need fear my skill in pursuit; for there are other things besides water, stale trails, confusing cross tracks to put me at fault. Nevertheless, human odors are as varied and capable of recognition as hands and faces. The dear odors of those I love are so definite, so unmistakable, that nothing can quite obliterate them. If many years should elapse before I saw an intimate friend again, I think I should recognize his odor instantly in the heart of Africa, as promptly as would my brother that barks.

"Sometimes I meet one who lacks a distinctive person-scent, and I seldom find such a one lively or entertaining. On the other hand, one who has a pungent odor often possesses great vitality, energy and vigor of mind."

Most people are "smell blind and deaf", according to this woman who shows how useful the sense of smell can be, and when we hear her suggest this idea, we immediately jump to the conclusion that probably we are not to be blamed for poor use of our noses. Perhaps we have not the delicate nerve mechanism for appreciating the fine distinctions of scent as she has.

If we do offer this excuse, it is groundless.

To measure the sensitiveness of Helen Keller's olfactory nerves, Dr. Tilney prepared oils, such as wintergreen and asafetida, in various dilutions and asked her to tell him when she could notice any difference between the various odors. The weakest dilution of alcohol that she could smell was one part in 16. She detected eucalyptus as weak as one part in 64, wintergreen one part in 128, peppermint one part in 1,024, and asafetida one part in 2,048. And this is about the sensitiveness of the average person's smelling equipment.

After testing her sense of direction, the nerve specialist declared that Miss Keller has no feeling of direction at all. (*Turn to page 147*)

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Laura Bridgman, famous deaf-blind girl of the nineteenth century, had an acute sense of direction.

The difference is traced to the fact that Laura Bridgman had a certain degree of sight in one eye up to the age of eight. Before that time she had guided herself to some extent and had a feeling of space and direction which remained with her in her sightlessness. But Helen Keller's sight was lost through an obscure disease when she was only 19 months old, and the retina of the eye soon atrophied, before she had had time to gain impressions of herself in relation to the world around her.

This difference between the two girls fits in with Dr. Tilney's theory as to a ninth sense. Adding up the senses, there are five well-known guiding senses which make us aware of the world around us, and the two body senses which keep us aware to a certain extent of the skeletal and visceral machinery of the body, and an eighth sense which Dr. Tilney calls the sense of hurt, which warns us against injury, such as extreme heat, a crushing pressure, or a cut. To these, he believes it may be possible to add a ninth sense which would explain the mysterious homing of the

pigeon and the straight, sure flight of birds to their summer and winter homes. Experiments now under way at Columbia University indicate that this ninth sense may prove to be a magnetic sense located in the retina of the eye.

So, to return to Helen Keller and Laura Bridgman, the latter had a retina which may have functioned magnetically even in blindness to aid her a little in sensing direction. Whereas, Miss Keller, lacking this aid almost from birth, illustrates the negative side of the case.

From his study of Helen Keller Dr. Tilney said:

"I concluded that her fundamental primary senses are no better than ours. The great difference exists in her use of the senses by development of the brain."

Just as we fix in our brains the association between a rose and the colors pink, red, and yellow, so Helen Keller has fixed in her brain the distinction between the fragrance of the American Beauty, the LaFrance, and the Jacqueminot roses. She has no short cut to knowing the world by miraculous means. Every association of touch, smell, or taste has been built up in the remarkable storehouse

of her brain, by the same process that any of us acquire a piece of information. And in the neurologist's opinion, "it is impossible for any of us to fool the brain by shortcuts in the upbuilding of its best associational powers."

There were three questions that Dr. Tilney hoped to answer when he studied this remarkable woman's brain development, and the three questions were answered.

He wanted to know whether the way in which she learned to use her brain would be of any use in ordinary education. He found that her teacher made full use of an important educational principle that is often overlooked. In teaching Helen to use her lips in forming words, to spell, or to do arithmetic, the implements of learning were always recognized as a means to an end. She learned, in the face of difficulties that we can scarcely imagine, because from the first her teacher made her realize that learning was the means by which she could enjoy life more fully.

One incident shows how her mind has absorbed and held knowledge, as a result of her patience, concentration, and her great intellectual interest. At Dr. Tilney's re- (*Turn to next page*)

Relaxation Cure for Nervousness

Physiology

Complete relaxation, deeper than the average sleep, is the treatment for certain nervous disorders evolved by Edmund Jacobson, research associate in physiology at the University of Chicago. The new treatment is the result of a twenty-year period of clinical observation and laboratory research. Although he is continuing his experiments, Dr. Jacobson will publish his results soon in a book to be entitled "Progressive Relaxation."

The "relaxation," which concerns all the voluntary muscles of the body, is described by Dr. Jacobson as "entirely different, yet related to the popular idea of muscular relaxation." That is, if a person lies down to rest, he relaxes most of his major muscles, but the complete relaxation achieved by Dr. Jacobson on his patients and laboratory assistants really begins at this point. Starting with tension of muscle groups, including the smaller muscles such as those of the neck, eyes, fingers and toes, the individual is advised to avoid all sensation of tenseness. Experiments on the knee jerk and with electrical stimulation in-

dicate that trained individuals are able to achieve a state of relaxation deeper even than that of the average sleeper.

"Insomnia yields readily to this treatment," said Dr. Jacobson, "and all the cases of chronic spastic colon or esophagus to which I have had access, have shown marked improvement or cure."

Spastic colon and esophagus are conditions of the upper and lower portions of the alimentary canal in which nervousness of the patient results in more or less permanent contraction with severe discomfort and pain. X-ray photographs of these regions before and after relaxation treatment reveal the improvement.

"This is a case," said Dr. Jacobson, "in which relaxation of the voluntary muscles induces relaxation of the involuntary muscles. In addition to this undeniable relief for nervous persons, it is my belief that complete relaxation periodically should have a tonic effect upon the entire system with general elevation of health and resistance to disease."

Science News-Letter, September 8, 1928

"Denicotined" Tobacco

Chemistry

"Denicotinized" or "denicotined" tobacco which has recently appeared on the market in the form of cigarettes, cigars and smoking tobaccos, is little more than a fraud, according to a report of experiments made by chemists of the Connecticut Agricultural Experiment Station. Samples of these "denicotinized" brands showed, on analysis, 72 per cent. of the amount of nicotine contained in the average unprocessed brands.

Some of the popular brands of cigarettes and smoking tobaccos actually contained less nicotine than some of the processed brands. Nine kinds of widely advertised and well known cigarettes, three kinds of cigars and four kinds of smoking tobacco were examined and compared with the alleged "denicotinized" brands.

The term "denicotinized" or "denicotined" is naturally taken to mean practically free from nicotine, whereas in the brands sold under that description, the cigarettes contained from 2.32 to 0.94 per cent. of nicotine. The popular unprocessed cigarettes examined showed from 1.28 to 2.89 per cent. Un- (*Turn to next page*)

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quest, she wrote him a long letter about the sense of smell. In it, she quoted passages from the old Greek philosophers, from Shakespeare, from Pierre Loti, and other authors who have expressed themselves on this unpopular sense. The quotations were brought in casually from memory, and at the end she recalled that the Bible contained many passages on the subject of smell which she would like to comment upon sometime.

The neurologist concludes that Helen Keller's education does set a standard for normal children in a number of ways, and he summarizes them as follows:

"Education is a continuous process of associations being formed in the brain. Teachers should distinguish clearly between the implements necessary to learning and the useful and toward which the child is working. Education should foster curiosity and expand with the growth of curiosity. There should be pleasurable interest in learning. Education should cultivate the process of concentrated attention. And education should produce the fullest adjustment to life."

The second question that the neurologist set himself to answer with

"Denicotined"—*Cont'd*

processed cigars ranged from 1.16 to 1.90 per cent., the "denicotined" from 0.67 to 1.07 per cent. Smoking tobaccos unprocessed, contained from 1.45 to 2.09 per cent., the "denicotinized" from 0.97 to 2.26 per cent.

Obviously it is better to buy the standard unprocessed brands which are known to have a low nicotine content, especially as the purchaser will then have no false sense of security to lull him into the consumption of a greater amount of tobacco, the report recommends.

Science News-Letter, September 8, 1928

In a government survey of time lost from work by 5,000 women employed in cotton mills, it was found that women who work 55 hours a week were absent from work 13 more days in a year than women who work 48 hours.

The International Boundary Commission is to set about preparing maps and reports showing the exact latitude and longitude of the entire 4,000-mile Canada-United States boundary line, so that the facts may never be questioned.

Miss Keller's help was: Does she demonstrate that humanity in general has not yet begun to make the best use of its brain power?

That question was answered plainly by the tests, and the answer was summed up in the arithmetic problem, showing that man's brain of which he is so proud is just about 20 per cent. efficient by the standard Miss Keller's brain has set.

The third and last question was: Does she demonstrate that further development may lie before the human race when the unutilized gifts of the brain are actually realized?

The answer to this is, yes, he concludes: "There is a mechanism in the brain for much more ample understanding of the world in which we live."

"The pessimist," says Dr. Tilney, "may have some justification for saying that there has been little real progress in man's brain during the several thousand years of historic record. But to my mind the real process of man's development, including brain power, is a matter of evolution. It is entirely demonstrable that man began with a small and poor brain, as shown in the ape-like man of 500,000 years ago. And he

has developed step by step a better brain so that the modern man has a far more efficient brain than the brain primitive man began with.

"There is no reason to believe that the brain of today is a finished product, as many people do think. It is much more likely that it represents an intermediate phase in evolution."

Besides the visible evidence of man's progress from the little 940-gram brain of his oldest known ancestor up to the modern brain which weighs some 1,300 grams, there is a new force in evolution, Dr. Tilney points out.

"For millions of years," he says, "the evolutionary process has been going on in its own way. But now, a new power has stepped in, namely, intelligent men and women have begun to recognize that there is a process of evolution. When they understand more fully the nature of the process, they may be able to apply it to the future development of the master organ of life—the human brain."

Science News-Letter, September 8, 1928

Bird life is less abundant in the wilderness than in regions cultivated by man.

A study of deaths in Illinois showed that only four diseases took more lives than accidents.

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