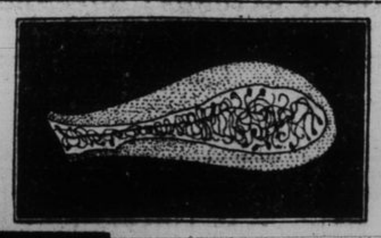
New and Interesting Facts from Science and Life

Just How You Get Your Sense of Touch

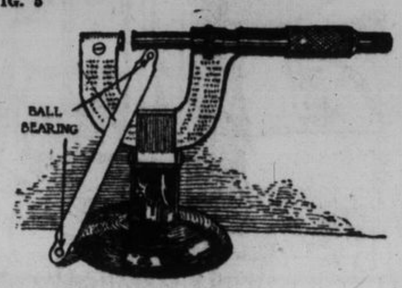
FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5

FIG. 1—Heat Spots on a Small Portion of the Palm of the Hand Are Shown by the Shaded Areas. FIG. 2—Cold Spots—The Blackened Areas Are More Sensitive Than the Lined Portions and the Latter More Sensitive Than the Dotted Ones. FIG. 3—A Hair Mounted on a Wooden Handle with a Piece of Sealing Wax for Determining the Minimum Amount of Pressure Necessarily Applied Before a Sensation Is Evoked. FIG. 4—Method of Determining the Amount of Pressure Produced by the Hair, by Pressing It Down Into One Pan of a Delicate Balance. The Hair Bends and the Point of Bending Gives the Degree of Pressure Applied by the Hair. FIG. 5—A Draftsman's Compass Fitted with Two Cork Tips Enables the Experimenter to Determine the Distance Between the Points Necessary to Produce the Sensation of Discrimination.



The Termination of a Nerve in a Touch Corpuscle.

Micrometer, and Probe Used for Testing It, by Means of Which Differences of 1-100,000 Inch Can Be Detected.



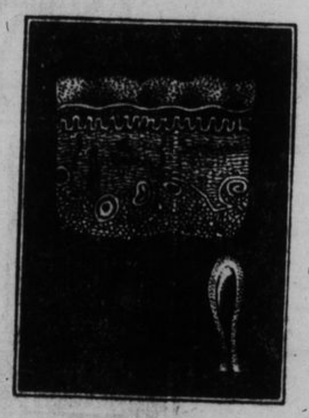
THE micrometer is so marvelous an instrument that differences of one-one hundred-thousandth of an inch can be detected. But the nerves in your finger-tips are so sensitive that they can actually check up on the accuracy of a micrometer!

The accuracy with which the nerves in the finger-tips will record small differences in dimension depends on various factors. The human equation and the thickness of the skin affect the delicacy of touch to some extent, and so does the size, the weight, and the roughness of surface of the object felt. Ordinarily, with small objects up to a pound or so in weight and a few inches in length, a discrepancy of a thousandth of an inch will be readily detected. Under proper circumstances, however, it is possible to exceed this figure. When the surfaces are polished and of small size, as with small steel balls, the fingers will notice differences of a hundred-thousandth of an inch.

A method of demonstrating the sensitiveness of touch is explained in Popular Science Monthly by C. A. Briggs, who used a machinist-micrometer and a thin aluminum handle, in which a steel ball is set at each end, as shown in one of the accompanying illustrations. In a well-made micrometer the faces on the spindle and the anvil are flat and perpendicular to the axis of the spindle, with an accuracy of between one-ten-thousandth and one-one hundred-thousandth of an inch. With a micrometer that is new or in good condition it is possible to adjust the distance between the measuring faces so that the aluminum probe will just be held in place.

The senses which you perceive through your skin are numerous and varied, such as those several qualities of sensation relating to the sense of touch and including that of discrimination, the sense of temperature and the sense of pain. A careful investigation of the skin surface bears out the idea that these three great classes of cutaneous (skin) sensations have special mechanisms or classes of mechanisms for each individual sense.

In considering these senses, it is best to take them up and deal with each separately. Through the agency of the skin and the touch-corpuscles, you are able to perceive various qualities such as shape, texture and hardness of the objects in contact with the skin. Of course, the sense of hardness also has associated with it a muscular



A Section of the Human Skin Highly Magnified and One of the Touch Corpuscles.

sense, in that you are able to tell the hardness of the object by pressure. But, the real sense of touch can be easily found and so can the location of the touch spots by the following very simple experiment which Joseph H. Kraus describes in Science and Invention:

If a hair is mounted on a wooden handle with a small piece of sealing wax and the skin pressed with this hair until the hair bends, then a certain known pressure is being applied to the skin. The skin is then gone over carefully with this hair and wherever a touch sense is indicated and the hair is felt touching the skin, a tiny cross or dot is placed on a chart.

The pressure applied by the hair is then determined by pressing down upon a balance which will register the number of grams-pressure a hair of that thickness can give, because the hair will bend at a certain point and the point of bending will give the weight the hair is capable of applying.

It appears to matter very little whether the surface of the skin is pushed downward or pulled upward by an instrument. A sense of pressure in either case is announced to the brain. Scientists find that on the tongue and nose, a pressure of only two grams per square millimeter will announce to the brain that a certain region is being touched.

On the back of the forearm it requires a pressure of 33 grams per square millimeter, and on the back of a finger only five grams. Nearly all pressure sensation localizes itself near a hair root, and in particular, on the side opposite to the direction toward which the hair slants.

"The sense of touch is greatly augmented by a profusion of hair on the skin," says Mr. Kraus. "When a slight touch is applied to the hair proper, it acts on the long lever arm of the hair and multiplies the force of pressure so applied five or more times, because the hair is pivoted at the surface of the skin and the small arm of the lever projects through the skin, into a hair follicle profusely surrounded by nerve endings.

"It has been found that before the skin was shaved, .2 milligram pressure was effective, whereas after being shaved it required a 36 milligram pressure to produce the same feeling of touch.

"A different sense is that of discrimination or what is otherwise known as the spatial quality of touch. If any part of the skin of the body is stimulated by applying a cork point to the skin, you can instantly tell the exact location of the excited spot. If now, instead of one point, two cork points are substituted in a pair of dividers, there must be a certain spatial distance between these points, varying in different parts of the body, before you are able definitely to determine whether or not there are two points or only one point in contact with the skin.

"By means of the temperature senses the skin can appreciate that a body coming in contact with it is either cold or warm. If the body is of the same temperature as the skin, no sensation is generally excited. Neither are the senses of warmth and cold produced by the same means."

The experimenter can readily determine this for himself by warming a small pointed glass rod and passing it over the palm of the hand. Certain regions in the hand will then give a sense of warmth. Others give a medium sense, while in still other spots no sensation will be evoked by touching the skin with the glass rod. If a rod is, on the other hand, cooled to a few degrees below body heat and moved over the same regions, cold spots can be definitely outlined.

"An investigation of these warm and cold spots," says Mr. Kraus, "shows that the apparatus for the appreciation of cold is much more distributed over the body than that of warmth. The cold areas are best marked on the chest, the nose, the abdomen, etc., and both cold and heat are less sensitive on the face, hands and mucous membranes. We can, therefore, drink hot drinks, which, if applied to the hand and other more sensitive parts of the body, would prove very painful.

"When the skin is very cold or very hot, it is much more difficult to recognize a change of temperature."

The New "Language of the Air"

BECAUSE of the frequency with which the "language of the air" is not only misused, but also misunderstood, the National Advisory Committee for Aeronautics has just devised and compiled a standardized set of terms which have been prescribed for use in Uncle Sam's army and naval air service. Among the new and often misunderstood terms are the following:

Aeronaut—The pilot of an aerostat (airship or balloon).

Airdrome—A landing field equipped with hangars and shops.

Aviator—The operator or pilot of heavier-than-air craft, such as airplanes and seaplanes.

Bank—To incline a plane laterally in turning to prevent skidding.

Ceiling—Maximum height to which an airplane or airship can climb.

Fuselage—Body of an airplane, including passenger seats.

Glider—An airplane without a power plant.

Helicopter—An aircraft deriving its support not from wings but the vertical thrust of propellers.

Nacelle—Enclosure for passengers or engines, but unlike the fuselage, it has no tail unit.

Ornithopter—An aircraft deriving its support and power from flapping wings.

Pancake—To land by an airplane by levelling off higher from the ground than normal, causing it to stall and descend nearly vertically.

Slide Slipping—Sliding on a bank, toward the ground.

Skids—Runners used with landing gear, also on lower wing tips, as a protection.

Skidding—Sliding sidewise away from the ground on a bank; opposite to slipping.

Soar—To fly on a level without power.

Spin—An aerial manoeuvre in which the airplane descends nearly vertically while turning rapidly in the form of a helix or a "workscrew."

Taxi—To run an airplane over the ground or a seaplane over the water under its own power without taking the air.

Zoom—To climb rapidly at a very steep angle.

According to the recent published report of the national advisory committee "aircraft" constitutes any form of craft designed to navigate the air and is divided into "aerostats" and "airplanes." Aerostats comprise lighter-than-air craft, embodying a container filled with a gas lighter than air, such as hydrogen and sustained by its buoyancy. They include "airships" and "balloons."

Aerial experts will tell you that it is customary for the public to call anything that traverses the air an "airship," whereas the word "aircraft" should be employed. They say that all balloons, rigid and non-rigid airships, or lighter-than-air craft, are constantly being termed "blimps," a slang word now obsolete, but originally used to designate a non-rigid airship, driven by an engine installed in an airplane fuselage slung beneath the gas bag.

The word "airplane" is now used to designate craft heavier than air, obtaining their support from the action of the air on the wings, and driven through the air by screw propellers. "Tractors" are airplanes having their propellers in front, "pushers" having them in the rear. Usually airplanes are equipped for land work with wheeled landing gear, but, when fitted for alighting on water, with a boar or pontoons, the term "seaplane" is used.

"Airships," as the craft formerly known as lighter-than-air are now called, are divided into three types; rigid, whose form is maintained by a metallic frame within the gas bag or envelope; non-rigid, whose envelope is kept taught by the pressure of the contained gas, and semirigid, maintained by a rigid or jointed keel and also by gas pressure. These three types are all propelled by gas engines located in a hull or car, or in individual engine houses suspended below the supporting envelope, and controlled by means of rudders and fins.

"Balloons," the second division of the aerostat class, have no power plants nor means of controlling their horizontal flight. They include free, or flight balloons of the old-style spherical type; captive ballons used in forming an aerial barrage against airplane attacks; kite, an elongated captive balloon such as the Caquot observation balloon, which has tail fins to keep it headed into the wind; nurse, a small heavily fabricated balloon used for storing gas and filling service balloons; and pilot and sounding balloons employed in securing meteorological data.

The heavier-than-air types of aircraft now officially termed airplanes, are divided into several classes according to the number of planes or wings, which are usually superimposed, namely: monoplanes, biplanes, triplanes and multiplanes. There is also the Langley type of airplane, which is still called the tandem from the arrangement of its double set of wings on approximately the same level.

The word "hydroplane" has often been misused in referring to a seaplane; "hydroplane" designates a sea sled, which planes on the surface of the water but does not take the air. An airplane has been called an "aero," which, it is explained, is as wrong as calling a boat a "water." The words "aeroplane," "hydro-aeroplane" and "dirigible" have been done away with and "airplane," "seaplane" and "airship" have taken their places.

"Seaplanes," airplanes designed to rise from or light on the water, are classified in two groups; boat seaplanes, having a central hull not unlike a boat, and float seaplanes, whose landing gear consists of one or more floats or pontoons.

Rare Sugar as Diet for Disease Germs

DELICATE tests are required for determining the purity of rare sugars, which often are sold for several hundred dollars a pound. Rare sugars are principally used in the cultivation of disease germs for study and if these are not absolutely pure, they fail of their purpose. They are made of such unusual substances as the roots of the dahlia, from the ivory nut and from manna.

An example of the extreme accuracy of the tests required is given in the Journal of Industrial and Engineering Chemistry, prepared by Drs. Carl Pfanstiehl and Robert S. Black, of Highland Park, Ill. The chemists warn their fellow-workers for instance against using in the processes any distilled water drawn from a copper faucet as the contact of the metal has been known to prevent the growth of certain organisms.

They also urge that the moisture present in these sugars be kept down to a small fraction of 1 per cent. The sugars must also be kept white as organic coloring matter interferes with the brilliancy of their solutions and the detection of delicate color reactions.

GETTING the MOST Out of MILK

MILK is one of man's most valuable foods. The baby, while he lives on mother's milk, is almost free from putrefactive bacteria in his intestine. Later, on a mixed diet, he accumulates a choice lot of bacterial enemies—unfriendly germs—and they colonize his intestine for the rest of his life.

Sour milk was lauded by Metchnikoff and others as a sort of elixir of life. It was thought that the bulgarian bacillus and the lactic acid that it formed, transformed the bacterial population of the intestine and excluded undesirable bacterial citizens. This is not now accepted as a sound scientific theory. Sour milk is a wholesome food and it helps to keep the intestine wholesome and free from unfriendly germs, but so does sweet milk, and it does it through the milk sugar upon which the real friendly germ of the intestine, the bacillus acidophilus, feeds.

You can plant the bacillus acidophilus in the intestine by feeding cultures of it, and germs of this type that are always present in a certain number will multiply if a diet rich in milk sugar is taken. It was thought by Metchnikoff that the bacillus bulgaricus could be implanted and cultivated in the intestine, but later experiments would indicate that this is not so, and that he confused the bacillus acidophilus with the bacillus bulgaricus. The practice of eating the culture tablets of bacillus bulgaricus would seem, therefore, to be of no practical benefit and the results that were sought to be obtained by this method may be obtained by drinking liberal quantities of milk, and the use of milk sugar in addition.

Milk sugar is rather expensive, but if it does the work it is cheap at the price. For so-called auto-intoxication or chronic intestinal infection, according to a bulletin of The Life Extension Institute, milk to which milk sugar has been added is well worth a trial, and on present evidence it would be good for the average individual to try to improve his intestinal condition by such method and see to it that his intestines are populated chiefly by the "best families" of germs. A mixture made by adding several ounces of sugar of milk to a quart of sweet milk is fattening and nourishing, not only to the body but to the friendly germs of the intestine. People who cannot take sweet milk often are able to take sour milk, and the milk sugar could be used in the diet in other ways as is customary with cane sugar, although it has not equal sweetening qualities. Those who suffer from diabetes, overweight, chronic rheumatism, or other conditions where sugar is not well tolerated, should, of course, avoid liberal use of any kind of sugar.

What Is Meant by Timber of "VIRGIN GROWTH"

SPECIFICATIONS often call for "virgin growth" or "second growth" timber, yet the terms are without fixed significance, and the material when delivered cannot be positively identified as belonging to one class or the other.

"Virgin growth," aso called "first growth" or "old growth," means timber which grew up in a standing forest under conditions of active competition for sunlight and moisture.

"Second growth,' which applied to a forest stand, usually means timber whose main growing period occurred under conditions of lessened competition, after all or a portion of the original stand had been removed by cutting, fire, wind, or other means. In connection with individual trees, the term is used to mean any whose growing conditions approximated those which would produce a "second growth" stand. To the wood user, "second growth" means material cut from either of these sources. In general, the term is associated with the idea of a second crop of timber, though specific applications may vary.

Virgin growth is generally thought of as slow-growing timber, while second growth, due to more favorable conditions, is relatively rapid. A faster rate of growth is evinced by wider annual rings. These are popularly supposed to indicate stronger and tougher wood in the hardwoods, such as ash, hickory, elm and oak; and weaker and brashy wood in the conifers, such as pine and fir. Hence, for uses in which strength and toughness are essential, second growth is sought among the hardwoods, whereas in conifers virgin growth is desired.

As a second growth forest attains maturity, the rate of growth slows up, and the annual rings may be no wider than in virgin-growth timber of the same size. On the other hand, when a slow-growing suppressed forest tree is freed by removing the neighboring trees, it may grow rapidly for a long period. Therefore it is possible to have some wood with the characteristics of virgin growth and some with those of second growth in the same tree. Furthermore, individual trees in a virgin growth forest may have the characteristics of second growth throughout and vice versa.

A Friendly Poison Gas

THE laity would have some difficulty in seeing any connection between a poison gas and a clear water supply, but the magic wand of the electrochemist reveals chlorine as the basis of the gas and chlorine as the safeguard of the water supplies.

A few pounds of hyperchlorite, according to the New York Medical Journal, will insure safety to troops in tropical places or alien cities. Chlorine aids in healing ghastly wounds, in sterilizing sewage. One hundred and twenty pounds of hyperchlorite will sterilize 1,000,000 gallons of screened sewage. It will flush streets and cars, sterilize dairies and so insure pure, clean milk for the babies. So a terrible poison gas is turned into a friend by science and an outlet for the excess chlorine in metallurgy and organic chemicals is found.

Making SOW'S EAR Into SILK PURSE

THAT ages-old challenge that "you cannot make a silk purse out of a sow's ear," at last has been met by 20th century science. Evidence of this fact was shown at the recent Chemistry Exposition in New York city, at which Arthur D. Little, a chemist of Cambridge, Mass., exhibited such a purse.

The announcement of the successful result of experiments, contains the explanation that the silk is not very strong and that there is no prestrand. This becomes a firm filament of silk when it coagulates on reaching the air.

Analysis of this viscous liquid showed it to be like glue and with somewhat similar chemical properties. The sow's ear being chiefly gristle and skin also has the natural elements of glue. This was obtained from the ears and it was put through several processes of preparation, filtered under pressure and placed in spinning apparatus of a special design.

The solution of glue and chemicals came out as 16 very fine colorless streams, joined into one composite fibre, treated to give it strength and color, and processed yet again to obtain the desired soft, silky feel. The weaving followed on a small hand loom, the fabric was formed and thus a silk purse was made from a sow's ear.

To Make a Silk Purse Out of a Sow's Ear, Science First Analyzed the Silkworm's Method of Making Silk, and Then Copied Its Caterpillar Chemistry in the Laboratory.