PHYSIOLOGY

Body Cells Follow Pattern Seen in the Bees' Honeycomb

By DR. FREDERICK T. LEWIS
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(In presidential address before the American Association of Anatomists at Toronto.)

THE bodies of animals and plants are built of cells which are primarily liquid drops. We begin our existence—turning a deaf ear to Aristotelian and scholastic dialectic—as a spherical drop of liquid. We arise as a cell which has the form of a soap bubble or rain drop. The wonderful globular form of a drop of rain is due to an enveloping skin, which has the properties of a stretched elastic membrane. Robert Boyle, in 1676, warily let fall some drops of oil into rectified spirit supernatant to a solution of niter, thinking to explain the structure of the universe. It was the beginning of physical and chemical studies of the tension which abides in the external layer of the drop, whereby the drop constantly strives to contract and occupy the least possible space. It makes a handsome sphere of the egg yolk or the smaller rabbit's ovum, both of which are single initial cells.

The first drop then divides into a pair, Siamese twinned, joined to one another by a membrane of the same tension as that which covers their exterior. More divisions follow, resulting in a cluster of liquid drops, arranged in accordance with laws established by the Belgian physicist, Plateau, in his masterly study of soap suds (Statique des liquides, 1873). Three films, belonging to three bubbles, meet along every edge: six films, belonging to four bubbles meet at every corner. Hence, as shown by Lord Kelvin, an entire bubble, surrounded by other bubbles of the same size and filling space without interstices, will have 14 facets of contact with its neighbors. If the tension of its walls keeps its surface minimal, it will have eight hexagonal facets and six square facets. Cells of elder pith show a recognizable approach to this ideal pattern. Other cells of plants and animals, more irregular in size and arrangement, likewise present the average of 14 facets, though diverse in outline. There are many pentagonal faces. This outcome is a mathematical necessity for liquid drops in masses when obedient to Plateau's laws.

When tension causes three facets to meet at every corner of the faceted drop (and any other arrangement is unstable) then the total number of sides of the polygons covering a cell will be twelve less than if they were all hexagons. In a cube, three faces meet at every corner; the six squares which bound the cube have twelve sides less than six hexagons. This will apply to every cell with 3-rayed vertices, as, for example, to the 14-hedron with its eight hexagonal and six square faces. It is a corollary of Euler's famous theorem for all polyhedra, invented by the eminent Swiss mathematician in 1752.

Under these conditions the cellular mosaic, forming, for example, the epidermis of a cucumber, or lining the human intestine, will approach the hexangular pattern of honeycomb. As the cells grow and divide, pentagonal and heptagonal elements are introduced, but the average of six sides is maintained along the tube. Whenever an element is pushed out, regardless of its number of sides, and the gap is closed with none but 3-rayed vertices, the mosaic loses just six sides. When, by division, a new cell is added, having any number of sides but making 3-rayed vertices only, the mosaic will gain six sides. Under these stringent mathematical requirements, cells present an array of beautiful patterns, complicated by the development of spaces at the corners and edges, where the tension that makes cells round prompts them to separate most readily. For all these patterns there is a simple hydrostatic basis. Cells are fundamentally liquid drops—gland lobules and vascular units are larger drops—all subject to Plateau's law and to the corollary of Euler's theorem for polyhedra. Thus neatly, in making cells and glands, "nature Geometrizeth and observeth order."

Science News Letter, May 1, 1937

MEDICINE

Mass Attack on Cancer Will Be Made by New Foundation

A MASS attack on cancer is now in prospect as a result of the creation of the Finney-Howell Cancer Foundation in Baltimore.

This research foundation, provided for in the will of Dr. George Walker, eminent cancer researcher who was himself a victim of the disease, is unlike most other foundations for scientific research. Instead of perpetuating itself and devoting only the income of the fund for research, the entire principal and income of the foundation is to be spent within ten years.

The foundation is not a cancer institute. It will have no laboratories of its own. Its money, according to the terms of Dr. Walker's will, is to be used to establish a number of fellowships in cancer research, each with an annual stipend of $2,000. The fellowships will be established in whatever laboratories or universities the world over are approved by the board of directors. Wherever a hopeful idea on cancer research and the man to carry it out can be found, the foundation will be ready to give support in the shape of either a fellowship or a grant-in-aid.

Man's fight against cancer will therefore be given the added impetus of a body of scientific shock troops destined for destruction within ten years.

Hope that these shock troops or cancer workers elsewhere will turn the tide of victory over cancer is seen in the fact that Dr. Walker provided for other use for the funds if a successful treatment of the disease is found by these or any other researchers within the ten-year

period. In this event, the remaining funds are to be used for fellowships for study of either streptococcus infections in man or of high blood pressure.

The foundation is named for Dr. J. M. T. Finney, eminent Baltimore surgeon, professor emeritus of surgery in the Johns Hopkins University Medical School, and chief consultant in surgery to the A. E. F., and for Dr. William H. Howell, professor emeritus of physiology in the Johns Hopkins University, former director of the Johns Hopkins School of Hygiene and Public Health, and vice president of the board of trustees of Science Service.

Dr. Finney, chairman of the board of directors, has not yet set the date for the board's first meeting and no definite plans beyond those outlined in Dr. Walker's will have been made. According to the will, however, the work of the foundation must be started within one year. First step will probably be to canvass leaders in cancer research all over the world to find which of them need additional men on their staffs to carry forward promising research already under way.

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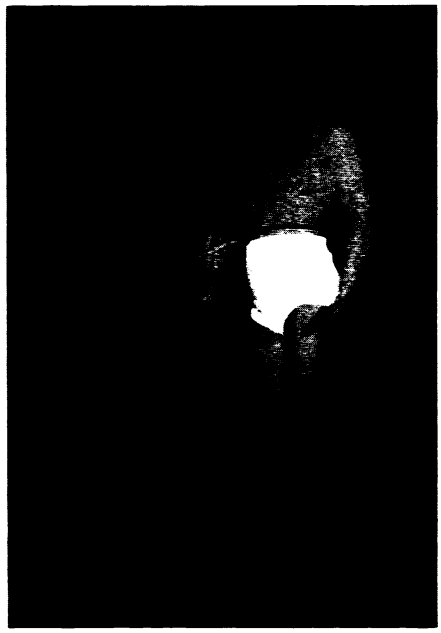
of the anthropologist—a spreading caliper, anthropometer, and an accurate tape line.

Children are harder to measure than adults, says Dr. Eleanor Hunt, associate anthropometrist in charge of body measurements for the project.

"Children are more flexible, and tend to stretch and wriggle," she finds. "But when they understand the purpose of what we are trying to do, they are usually cooperative. We explain to each child that we are measuring him, or her, in order to make clothing more comfortable to wear. And they understand they are helping to bring this about."

It takes about 20 minutes to measure a child, Dr. Hunt finds. But that does not mean 20 minutes of standing stiffly at attention, or in uncomfortable poses. The children move about a good deal during the measuring, and there is no strain or fatigue.



SO BIG!

For a long time, Miss O'Brien of the Bureau of Home Economics has been saying that American clothes should be made to fit real Americans. The Bureau receives thousands of letters from clothing manufacturers, pattern makers, people who sew clothes at home, and people who buy clothes. For years all these classes have been plaintively asking why sizes of real Americans are not available, so that clothes will fit better.

The clothing industry is still in the experimental stage, as Miss O'Brien sees it. After all, she explains, it is only about a century since clothes were first made in quantities, in the expectation that they would fit unknown individuals who might buy them.

Before that revolutionary idea was launched, clothes had always been either simple draperies or made-to-measure for a given individual, throughout world history. Now an attempt is to be made to bring order out of what is plainly called chaos, for young America, at least.

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Bruising a plant leaf or bending it will greatly increase the plant's respiration, experiments show.

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This common germ produces a poison which has lately been incriminated as the cause of food poisoning. Now the Yale scientists report that this poison, when injected in certain doses into the veins of rabbits, kills the animals in from one and one-half to 20 minutes. Death in these cases was due to poisoning of the heart muscle with resulting failure of its ability to contract and force blood into the body. The fatal doses were from one drop upward for every 2.2 pounds of body weight of the animal.

Ultraviolet Causes Cataract

The gradual hardening of the eye lens as people grow older with the development of farsightedness and even of cataract in old age is the result of the action on the lens of the small amount of ultraviolet light in daylight and artificial light. This theory and experiments supporting it were reported by Drs. W. E. Burge, G. C. Wickwire, H. W. Neild, and F. M. Hilpert of the University of Illinois.

This theory also accounts for the prevalence of cataracts in the tropics, since the sunlight there is relatively rich in ultraviolet radiation.

Chemical reactions in the eye lens under the influence of ultraviolet light produce hardening or calcification of the lens. As a result, it loses the crystal clearness necessary for vision, as in cataract of old age, and cannot be adjusted for seeing near objects. The latter condition is the farsightedness that makes many people over 40 years need glasses for reading.

Experiments with the lens material from pigs' eyes showed that short ultraviolet waves caused the lens material to become electro-negative. Weak solutions of calcium chloride abolish this electro-negativity and sodium phosphate restores it. Calcium and phosphate are both present in the eye lens, so the Illinois scientists assume that the ultraviolet light ionizes the lens material, particularly the phosphate, which then combines with the calcium to precipitate insoluble calcium phosphate. This produces calcification of the lens.

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In a ruined palace at Megiddo, Palestine, archaeologists have unearthed a hoard of Egyptian gold objects, apparently buried there in the fourteenth century B. C. when the region was under the Egyptian Empire, near the time of Israelite invasion.