legal fights that have tested the validity of the patents.

When the returns are in and digested, the report will make illuminating reading.

All who have been granted patents are being urged to respond to the inquiries.

Science News Letter, August 19, 1939

PHYSICS

New Experiments Make Water Flow Uphill

WATER is flowing uphill at the General Electric Research Laboratory in experiments studying the surface tension of liquids. When a cold glass rod, chilled in liquid air, is touched to the bottom of a thin glass slide, on the upper surface of which is a layer of liquid, a small mound of water piled up over the cold spot, reports Allen V. Hershey (*Physical Review*, July 15). By putting tiny particles of bentonite clays in the liquid the flow of liquid to make the mound can be traced. At the free surface the fluid is found to move toward the center of the mound while on the under surface it flows away from the mound. The surface tension forces make the liquid flow uphill.

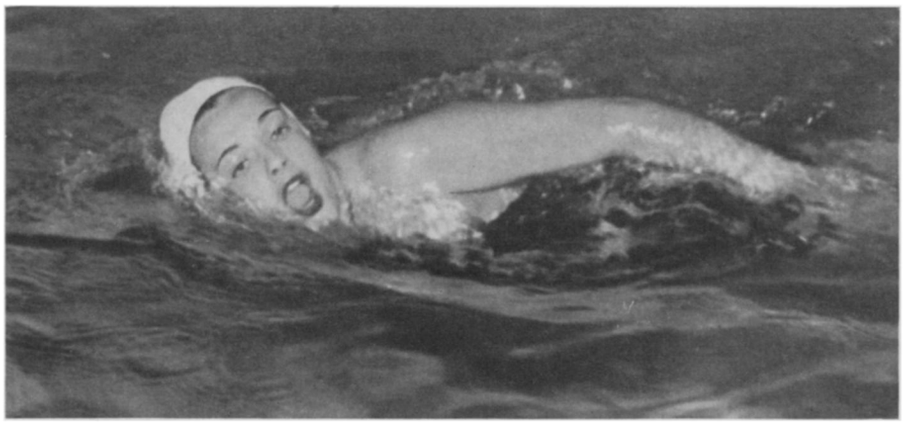
Surface tension is the molecular force which makes liquid drops form into spherical shape. It also makes possible capillary action by which trees and plants get nourishment from the ground up into their leaves.

The new happening is related to the well-known but little-noted phenomenon of "tears" in strong wine. These tears can be found on the sides of a wine glass above the surface of the wine, where they form in seemingly mystical fashion and grow larger until they flow down again to the surface of the wine, Mr. Hershey reported.

Tears arise because there is a greater evaporation of alcohol from the wine at the rim of the glass than at the center. This lowers the temperature, increases the surface tension at the rim and continually pulls the wine slightly up the surface of the glass. There the wine forms into drops and falls back down as tears. The cold glass rod in Mr. Hershey's experiment likewise lowers the temperature and increases surface tension sufficient to make the liquid flow uphill.

Science News Letter, August 19, 1939

An alligator killed long ago by an Indian's arrow and a white man's musket ball combined was recently dug up near the San Antonio River in Texas.



SPACE FOR AIR

Eleanor Holm's grace in the water shows the art of the successful swimmer. Good swimmers have deeper chests and broader shoulders than poor swimmers, new scientific measurements show.

ANATOMY

What Makes A Girl Excel at Dancing, Swimming, Tennis?

Scientist With Calipers and Tape Measure Discovers Certain Physical Reasons for Success in Sports

See Front Cover

WHAT makes a girl a good dancer? You probably have your own ideas, derived from experiences under a midsummer moon when the orchestra was "sending" its sweetest, or from a critical eye turned on Ginger Rogers or Mary Wigman.

A scientific eye has lately been turned on the subject and along with tape measure and calipers and other measuring instruments has given at least part of the answer to why one girl is a better dancer than another—or a better swimmer or tennis player or a star on her school basketball team.

The dancing in this case was not the jitterbug variety, although it is likely that the dancers—sophomores and juniors at five leading women's colleges—can hold up their end successfully in jitterbug activities as well as in the more classical forms of the modern dance. So far as this latter type of dancing is concerned, and perhaps it is true for other types also, the girl with long upper arms and long thighs is at a disadvantage.

Physical measurements of girls who were the best and the poorest in modern dance classes at Barnard, Goucher, Smith, Vassar and Wellesley showed this. The findings and their significance have been reported by Dr. Elizabeth Beall, of Teachers College, Columbia University, New York.

Dr. Beall started her studies because she thought she might find information about girls which would be useful in guiding them into physical activities for which they were particularly suited.

"The emphasis today in physical education in women's colleges," she points out, "is on the adaptation of the program to the individual. Since enjoyment of physical activity is largely dependent upon the success gained in pursuit of it, it is of prime importance to know what factors are related to achievement. Physical educators have increasingly felt the need for more scientific evidence along these lines in order adequately to guide students in their selection of activities."

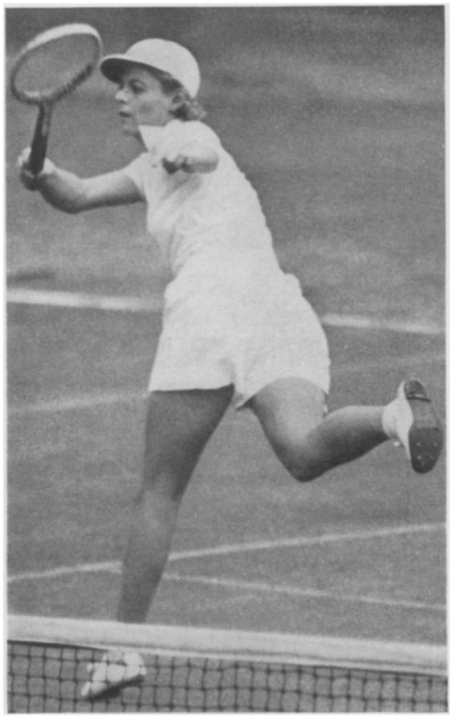
The relation between stature or body build and success in various forms of athletics has long been studied for men. The girls, apparently, have been rather neglected in this respect. Dr. Beall's studies do not furnish a basis for advising a girl to engage in one or another of the various activities on the basis of body build. She has found certain measure-

ments, however, which indicate that a girl will be more or less successful in a certain line of activity.

"The successful swimmers," she reports, "are heavier, have broader hands, hips and shoulders, deeper chests and a larger chest circumference than the unsuccessful swimmers."

This is perhaps what you might expect and Dr. Beall points out that it bears out the findings of two other scientists who have studied the problem, F. A. Schmidt and W. Kohlrausch, in their study of German men athletes.

Whether the extra weight the successful swimmers carried was due to larger bones, bigger muscles or more fat could not be told from Dr. Beall's measurements. Ability to float, she points out, is undoubtedly an advantage in swimming. Some authorities believe that this ability depends on fat and on the amount of air or gas in the lungs and other body tissues. The deeper chest and larger chest circumference found in the successful swimmers would give them a greater chest capacity with more room for expansion of the lungs and hence a greater volume of air in the lungs to increase floating ability. Ability to float would also be helped by the broad hips because this would give a larger surface area and more soft tissue across the lower back. Broad hands give more area for resistance to the water which should help the swimmer pull or push her way through it.



COVERING COURT

Tops in tennis grace, and one of the world's best woman players, is America's Alice Marble. Good tennis players, says scientist, need long legs to cover the court. Broad feet help too for balance.

Successful tennis players, Dr. Beall found, differed from the unsuccessful ones in only four measurements, as compared with the six significantly different measurements found in successful and unsuccessful swimmers and basketball players.

A long body and broad feet apparently are what a girl needs to be a tennis star, so far as physical measurements are concerned. The successful players were taller, both standing and sitting, than the unsuccessful ones. They had longer legs (both thighs and from the knee down) and broader feet. The broad foot helps maintain balance by giving greater leverage between the axis of inversion and eversion, Dr. Beall says. The long legs help the player to cover the court quickly, an important factor for good tennis playing.

Racket Aids Arms

You might think the tennis player would need long arms and big hands, but she does not, apparently, and the reason Dr. Beall suggests is that the racket adds to the arm leverage. The only difference between the successful tennis players and the good swimmers is that the swimmers have broader hips.

The star of the basketball team has longer arms, longer and broader feet and wider shoulders than the poor players. The entire length of the arm is important in this game, but the length of the hand is of even greater importance. This is probably because the 30-inch basketball can be caught more securely and handled more easily by a girl with a long hand than by one with a short hand.

For some reason not easy to explain, a long upper arm is more important to success in basketball than a long forearm. Greater length of arm, of course, makes it possible to reach a greater distance which helps decidedly both in catching the ball and in throwing it when closely guarded. Wide shoulders help by increasing the length of the arm as a lever and increasing the range of arm movement.

Longer and broader feet probably help the player keep her balance, which is important in a game like basketball involving a great deal of running and jumping with sudden stops and changes in direction.

When it comes to the modern dance, it is harder to figure out what physical measurements help toward success, chiefly because it is hard to measure success in this activity objectively.

"Modern dance," Dr. Beall explains, "is an art which is concerned with the communication of ideas and feeling through rhythmic movement. The body is the instrument, movement is the medium of expression. Dance involves subjective motor activity, whereas basketball and tennis make use of movement to control an external object. This distinction made it more difficult to select the dance groups, since there is no objective way of determining dancing skill.

"Trunk swings, oppositional arm and leg movements and various types of falls and recovery are a part of dance technique. Long segments of the arms and legs may impede successful execution of this technique, especially in the case of recovery from a fall. It is more difficult for a person with long thighs to rise from the floor than for one with short thighs, because the center of gravity (the hips) is farther removed from the axis (the knees)."

Long thighs and long upper arms therefore are considered a disadvantage for the modern dance. These two measurements were the only ones in which Dr. Beall found a significant difference between the good and poor dancers and it was the girls with the long upper arms and thighs who were found in the unsuccessful groups. Three other measurements were almost significantly different: weight, length of entire arm and chest circumference. The good dancers were just a bit lighter in weight, their entire arms were just a little shorter and their chest circumference a little less.

In the cover illustration of this week's SCIENCE NEWS LETTER, Evelyn Davis, Washington, D. C., dancer, typifies the grace characteristic of the modern dance. Fremont Davis, Science Service staff photographer, took this action picture.

Not the Only Factor

These physical measurements, Dr. Beall points out, are of course not entirely responsible for a girl's success in sports or dancing. They may not even be the most important factor, though it would seem that they do play an important part.

Temperament, skillful brain and nerve work in directing muscles for efficient action, heart function and such other physiological qualities as chemical changes in the blood and tissues all contribute to success in athletics and the dance, as does proper technique.