



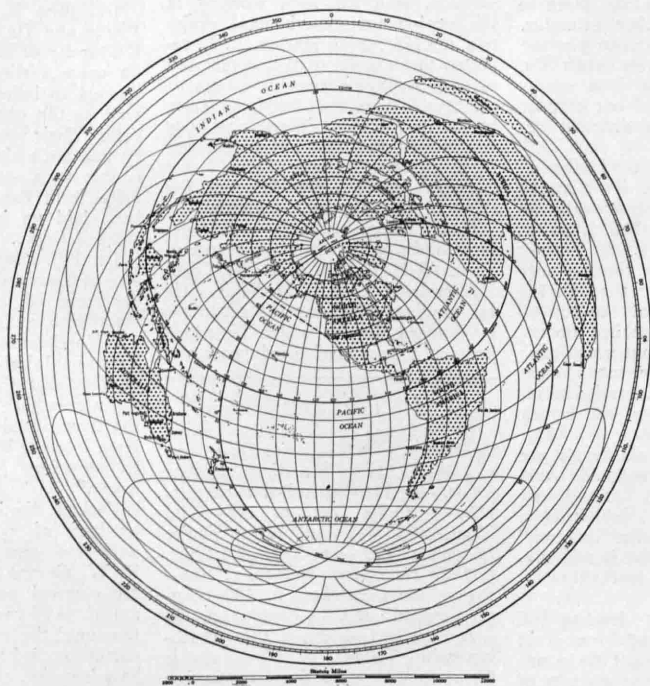
SCIENCE NEWS-LETTER

The Weekly Summary of Current Science
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August 31, 1929



THE PATH OF THE ZEPPELIN

Great Circle is Shortest Distance on Sphere

(See page 123)

Reflexes, Hormones and Enzymes

Physiology

Conditioned reflexes, the building blocks that our behavior is made out of, occupied a prominent place on the program of the Thirteenth International Physiological Congress, held in Boston recently. The famous Russian professor, Ivan Petrovich Pavlov, founder of the theory and in spite of his eighty years still its most vigorous exponent, led the discussion with an account of his most recent investigations.

The simplest act in response to a stimulus is a reflex. For example, your mouth "waters" when you put food into it. That is a simple reflex. A reflex becomes "conditioned" when it has been trained to take place in response to some other stimulus. If your mouth waters when you see or smell food, or even when the dinner bell rings, that is a conditioned reflex. Most of our simpler acts, at least, are conditioned reflexes.

A conditioned reflex is "inhibited" when something about its stimulus fails to fit into the accustomed action pattern. If the bell rings at the wrong time, or if the wrong bell rings at the right time, a sort of censor, acting in or through the higher nerve centers at the top of the brain, signals "nothing doing" and the reflex act is not completed. These inhibitions save much wear and tear that would otherwise be incurred through acting on wrong stimuli.

When the upper brain levels are over-stimulated, or rendered oversensitive to ordinary stimuli by drugs such as caffeine, inhibition is interfered with. But if a "quieting" drug, such as a bromide, is administered, inhibition is markedly increased.

Professor Pavlov's fundamental work has been accepted by a great body of physiologists, but there are disagreements over some matters of detail. For instance, he holds that when an inhibition becomes very powerful, its effect spreads through the brain and causes sleep. But Dr.

Nathaniel Kleitman of the University of Chicago cited experiments indicative, in his opinion, that the sleep comes first and puts a stop to the inhibitory process. Drs. H. S. Liddell, O. D. Anderson and W. T. James of Cornell University also reported experiments not in full agreement with Professor Pavlov's theory of sleep.

The thyroid, the throat gland whose extract is sometimes given to persons anxious to reduce their weight, has an enemy in the body. This antagonist is the thymus, another of the ductless glands. Dr. Jaroslav Krizenecky of Brno, Czechoslovakia, who has been working at the station for experimental evolution at Cold Spring Harbor, L. I., reported that extract of the thymus fed to ringdoves together with extract of the thyroid prevented the latter from having its full effect in reducing body weight. All the birds lost weight, but those on the "straight thyroid" diet lost more rapidly than those on the "thyroid plus thymus" regimen.

Yeast eaters will get encouragement and comfort from the report of Prof. W. H. Griffith of the St. Louis University School of Medicine. He fed numbers of young white rats on a standard diet to which he added varying amounts of dried yeast and

in some cases liver extract as well. On small amounts of yeast the rats did not show normal increase in weight, but on the larger amounts their growth was rapid. The liver extract increased the appetite of the animals, but did not show the same efficiency in fattening them up as did the yeast.

The first great "push" in the battle against diabetes was won with the discovery of insulin; but the campaign still goes on, with ever increasing numbers of recruits in the scientific regiments. Twelve physiologists, representing six countries, reported recent advances.

Dr. John R. Murlin, Dr. H. B. Pierce and Dr. D. E. Gregg of the University of Rochester threw doubt on some earlier experiments which seemed to indicate that the liver as well as the pancreas can supply insulin. Their results suggested strongly that such aid as the liver renders is due to a stock of insulin, originally from the pancreas, which has been laid up in this great internal storage organ.

Dr. J. J. Douckaert of the University of Louvain succeeded in producing some of the symptoms of diabetes with a drug bearing the formidable chemical name of beta-tetrahydro-naphthylamine. He is of the opinion that this substance acts on the nerves that control the action of the liver, causing that organ to release into the blood stream a part of its stored-up glycogen, or "animal sugar."

Carbon dioxide, the gaseous by-product of respiration, "deadens" nerves to some types of stimuli, Dr. R. W. Gerard of Chicago reported. He exposed nerve fibers to an atmosphere of carbon dioxide and then measured the strength of an electric current needed to stimulate them to a certain point. He found that it required an increase of from one hundred to three hundred per cent. in the current.

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First Round-World Flight Not Yet Made!

Aviation—Geography

By JAMES STOKLEY

The world has been thrilled in recent weeks by the exploits of the Graf Zeppelin, as it traversed the dreary wastes of Siberia to Tokio; then crossed the Pacific in the path that appears curved on ordinary maps, but that appears straight on the U. S. Navy map on our cover. For this path is a great circle—the shortest distance between two points on a sphere.

But great as was the achievement of Capt. Hugo Eckener, former psychologist, student of Wilhelm Wundt and newspaperman, it is incorrect to call the voyage of the dirigible a "round the world flight."

The army flyers did not go "around the world" in 1924.

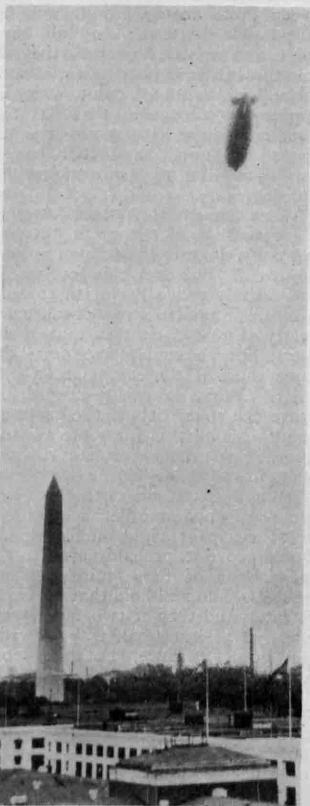
Neither have most of the people who have "gone round" in 80 days or less, from the days of Phineas Fogg to the time of Mears and Collyer.

What constitutes a trip "around the world?"

To answer this question, one must consider the shape of the earth. Geodesists, the scientists who deal with the shape of the earth, have found that it is what they call an oblate spheroid. A spheroid is the apparent solid figure you would get, if you were to cut an ellipse out of tin and to spin it around either the short way or the long way. If you take your tin ellipse and pivot it at the farthest side, then spin it around, the resulting figure is the shape of a football. The mathematician calls this a prolate spheroid. But if you spin the tin ellipse around the shortest straight line that can be drawn on it from one side to other, then you have a figure the shape of a door-knob, which is the oblate spheroid. This is the shape of the earth.

This fact, that the earth is not a sphere, is due to the fact that it is turning. If the earth were stationary in space and at rest, and had no other bodies acting upon it by their gravitational attraction, it would be practically a perfect sphere. A simple, but interesting experiment, will show this.

Oil will float on water, it will sink in alcohol. But it will dissolve in neither. It is very difficult to mix the right proportion of water and alcohol so that a drop of oil will neither float nor sink in it, but will remain in the mixture in any position



THE GRAF ZEPPELIN as it flew over Washington, seen from Science Service's home, the building of the National Academy of Sciences

in which it is placed. Such a drop of oil then floats entirely free from gravity, and becomes a perfect sphere. This is similar to what the earth would be if it were entirely isolated and floating free in space.

But the earth is turning. Just as mud flies from a spinning wheel, the part of the earth at the equator, which is moving faster, tries to go off into space. Gravitational attraction, however, is sufficient to hold it on, and the only effect is that the part of the earth near the equator moves a little farther from its center than that at the North Pole.

Incidentally, this centrifugal force, generated by the turning of the

earth, makes objects weigh less at the equator than they do at the pole. For instance, a man weighs less in Brazil than he does in Spitzbergen. The ordinary scales would not show the difference because the weights, too, would weigh less. Only by a very delicate spring balance could the difference be detected.

In the case of Jupiter, the bulge at the equator is much more marked. Jupiter is a much bigger planet than the earth, and turns much faster. Instead of turning once in twenty-four hours, it turns once in nine hours and fifty-five minutes. As the planet is so much larger, the speed at the equator is much greater. The diameter of the earth at the equator is only twenty-six and a half miles more than from pole to pole, but Jupiter is about six thousand miles broader across its waist than it is tall, from pole to pole.

If the earth turned as fast as this, there would be a noticeable difference in the force of gravity at the equator from that near the pole. And if the earth revolved still faster it would be unsafe to venture near the equator. Suppose the earth turned once in eighty-five minutes instead of twenty-four hours, then the centrifugal force at the equator would be equal to that of gravity. Therefore, an object at the equator would not be attracted to the earth at all, but would float in the air, just as the drop of oil floats anywhere that it is placed in the mixture of alcohol and water. If the earth turned faster than once in eighty-five minutes then a person at the equator would be thrown off into space, just as a person is thrown off one of the human roulette wheels that are such popular amusement devices in our summer parks. The only safe place on such a wheel is at the exact center, and under the suggested conditions the only safe places on the earth would be on the poles.

But that the earth is round there is no question. Many different kinds of observations have given a very exact idea of its shape. Magellan did not prove it was this shape by sailing around the earth, but the time is coming, and probably within the next few years, when the airplane will prove this very thing.

When the army fliers in 1924 flew "around" the (Turn to next page)

First Round-World Flight Not Yet Made—Continued

earth, they first skirted the Pacific, by the Aleutian Islands, then crossed Asia and Europe, went around the northern edge of the Atlantic by way of Greenland, and then back to the United States. At no place did they cross the equator.

What do we mean when we speak of going "around" a sphere?

To go around a sphere one must go along a "great circle." This is defined as the intersection with a sphere as a plane passing through its center. If you cut a ball into equal halves and put the halves together, the cut forms a great circle. Any number of smaller circles can be drawn on a sphere but they do not go "around" it.

The army fliers did not go around the earth in a great circle. Neither did any of the record breaking "around the world" travelers from Phineas Fogg up to the present. All have gone around a smaller circle and the only reason that they may be said to have gone around the earth at all is the fact that they have gone around the North Pole. But if this is the criterion, then the record for circumnavigating the globe belongs to Commander Byrd and the late Floyd Bennett. They went around the pole in a few hours.

The question then arises: "How does one have to go to go around the world? Must one cover the equator?"

Of course, such a rule would not be practicable because of the fact that much of the territory along the equator is inaccessible to ordinary means of transportation and dangerous for the aviator. Also, the equator is not the only great circle on the earth. Starting from your home town, you could travel around the earth in an infinite number of great circles. You might go along a meridian. This would be directly north, or south, to one pole, then around the other side to the other pole and back to your starting point. Or, you might go around a great circle at right angles to the meridian. Then you would start, let us say, directly west, gradually turning to the southwest, crossing the equator in the middle of the Pacific ocean and then gradually turning to the west again, crossing Australia, going due west over the Indian ocean, turning gradually to the northwest crossing Africa, then turning back to a due west direction as you reached the United States. From the United

States, the great circle routes by way of the pole, and by way of the Indian ocean are the extremes. Between these are an infinite number of possible routes. They all have one characteristic, however—they all pass through your home town, as well through an antipodal point, which is a place on the earth that has the same latitude as you have, but south instead of north, and that has a longitude differing from yours by 180 degrees.

When an aviator travels around a great circle of the earth, then he can truly claim to have flown around the earth. But even this feat would not entirely prove the earth to be a sphere. Magellan's route was more nearly a great circle than that of the fliers, but he could have done the same thing if the earth was a cylinder. What is really needed, to prove the sphericity of the earth by going around it, is for some aviator, or group of aviators, to make a series of at least two flights.

A flight around the earth by way of the poles, and another around the great circle at right angles to it, would prove it, probably even to the satisfaction of those misguided individuals who still hold that the earth is flat. And then if two more were made, at positions half way between, for good measure, nothing more would be desired.

Of course, the exigencies of the flight might prevent a course exactly along the great circle, but a little leeway might be allowed. A deviation of perhaps ten degrees on either side of the great circle might be allowed; but with the proviso that the great circle itself be crossed at least twice at points 180 degrees apart.

It is quite certain that such a series of flights is not at all beyond the realm of possibility. By refueling, it might even be possible to make them non-stop flights. With stops permitted, two flights around great circles at right angles to each other, could probably be planned that would involve no single hop much greater than those already made.

A part of the flight, over the poles, would probably only anticipate what many of us will be doing before a great number of years have elapsed. The shortest distance from New York to China, for instance, is almost directly over the North Pole. Even from New York to Europe, the shortest path is well to the north.

To travel over the shortest distance from Chicago to Stockholm, one would cross Labrador, Greenland and Iceland. Lindbergh's flight to Paris is still fresh enough in our memories to recall how he went to Paris by way of Newfoundland.

These directions seem strange to us, because we were brought up on a distorted map of the world. The earth being a sphere—a three-dimensional figure—it is impossible to represent it accurately on a two-dimensional map. Some maps represent directions correctly, some relative areas, some shape, and some the distances between parts of the earth. No map can represent all four of these factors at the same time. It takes a globe, a three-dimensional figure, like the earth itself, to represent all of them. As globes are bulky and hard to handle, conventional maps, despite their distortions, have been adopted. Most popular for representation of the entire earth, is that first used in the year 1569 by Gerhard Krämer, which is now known as the Mercator projection. This projection has the advantage that directions are easily represented on it. Thus, north is to the top, northeast to the upper right, east to the right, and so on. It has the disadvantage that areas near the poles are greatly magnified. The Mercator projection shows Greenland as large as South America, thought actually it is much smaller. What the Mercator map really represents is a cylindrical earth. This is obvious from an examination of the meridians of longitude. As everyone knows, they meet at both poles, yet on the Mercator projection they are parallel.

The Mercator projection has come into such wide use that many people think of it as an accurate representation of the earth. In the past, even navigators believed this. Since the shortest distance between two points is a straight line, it seemed to them that the shortest distance between two points on the earth would be a straight line on the chart. And the fact is, that if you plot a straight line on the Mercator chart, and follow it, you will reach your destination safely. But the only line that is undistorted is the equator. If you are going to sail on the great circle around the equator, then you can follow such a chart with accuracy. But any other great circle path is distorted. Thus, (*Turn to next page*)

Adjustable Propellers Seen for Airplanes

Aviation

Propellers for airplanes, made adjustable so that their pitch, or "pulling power," can be adjusted in flight as the occasion arises, will soon come into extensive use, believe engineers attending the Aeronautic meeting of the Society of Automotive Engineers at Cleveland. Two separate papers were presented on the subject. One was by T. P. Wright and W. R. Turnbull, engineers of the Curtiss Aeroplane and Motor Co., the other by Frank W. Caldwell, chief engineer of the Standard Steel Propeller Co. All three agreed that the controllable pitch propeller is well worth the added cost for many types of airplane.

The propeller acts in the air like a screw in wood, and its pitch is the same as the pitch of a screw. That is, it is the distance that the screw will advance when turned once. As the air is a less substantial medium than a piece of wood, however, the propeller slips a bit, and the practical pitch is somewhat less than what it would be theoretically. The greater the angle the blades of the propeller make with the path in which they turn, the larger is the pitch.

All present-day propellers in general use are of fixed pitch; they can not be changed while the plane is in

the air, though some can be adjusted between flights.

In such a propeller, said Mr. Wright and Mr. Turnbull, "assuming good design, the propeller will be just right for the case of top-speed level flying and full-open throttle, with the engine running at its normal rated number of revolutions per minute and the efficiency of the propeller will be the maximum for this one condition of flight. For any other condition of flight, the propeller will be less efficient and the over-all efficiency of the airplane will decrease, and, under some conditions, to a very considerable extent."

Various methods have been tried for controlling the blades, but these two engineers expressed the opinion that the best type is one in which a small electric motor, operated by a storage battery, is geared to the propeller and controls it. They predicted that it could be designed so that the weight of the rotating parts would be no more than 20 to 30 per cent. greater than with ordinary propellers. This electric control makes possible a close control of the angle of the blades.

"If the added weight can be kept reasonably low, the great advantages in performances resulting from the use of a propeller that will give

good efficiency at all conditions of flight and also allow the full power of an engine to be delivered when most needed will offset many times the disadvantage of a heavier propeller," they said.

Gearing of aircraft propellers was another problem to engage the attention of the engineers. Mr. Wright, and his associate, R. E. Johnson, told the engineers that the use of gearing to reduce the speed of the engines as applied to the propeller will come into wide use in heavy multi-engined transport planes. On lighter engines, giving less than 400 horsepower, and in airplanes weighing less than 4,000 pounds, their experience has shown that the gain in performance with gearing is not worth the added weight.

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Radium In Plants

Biophysics

Radium, in almost infinitesimal amounts, is to be found in all living plants and animals. It is gathered up by them and concentrated from its even thinner distribution in natural soils and waters. This is the claim advanced by Prof. V. J. Verنادsky, after investigations conducted at the Russian State Radium Institute and the Biogeochemical Laboratory.

Surface water from a freshwater pond tested at the laboratory showed the presence of radium in almost inconceivably small amounts. Its concentration would be represented by the fraction $68/100,000,000,000,000$, or 68 one-hundred-trillionths of one per cent. A sample from a deeper part of the pool contained somewhat more.

But two species of floating duckweed scooped off the pond's surface showed the presence of 39 one-hundred-billionths of a per cent. of radium, or over 56 times as great a concentration as was found in the water; and this in spite of the fact that over 90 per cent. of the plant itself consists of water. Different species were found to have characteristic concentrations of radium peculiar to themselves.

Tests of land plants and water animals showed rather less radium than was present in the water plants. In them the average concentration was of the order of one one-hundred-billionths of one per cent.

First Round-World Flight Not Yet Made—Continued

in the imaginary world flight, mentioned before, we started west and turned to southwest, then west and northwest and then west again. If this path were plotted on a Mercator chart, it would seem to be unnecessarily devious, but on a globe it would be seen to be the most direct between the opposite points on the earth.

A story has been told of the navigators who a century or more ago sailed between England and Australia. With the sailing ships then in use, the voyage took several months, but as the cargoes were valuable it was desirable to travel as quickly as possible. Most of the captains were following a straight line on their chart from Australia to Cape Horn, and then another straight line up the Atlantic to England. This appeared to be the shortest route.

It was noted, however, that one skipper consistently arrived a month or more before his rivals. His ship seemed no faster, so the others

watched his procedure. They found that as soon as he left Australia, he headed almost south, and skirted the Antarctic ice pack, finally getting up towards Cape Horn and then to England. This path was as nearly as possible along the great circle route, and over a thousand miles shorter than the route taken by believers in the accuracy of the Mercator chart.

The skipper was kept from following the exact great circle path by the ice pack and the land areas. A ship cannot travel across a continent if it gets in the way of the great circle path, but an airplane can. Thus, in the future we may expect to fly from New York to London by way of Newfoundland, from California to Europe by way of Labrador and Greenland and from New York to Seattle by way of Toronto. Then, and only then, will we take full advantage of the fact that we live on a spherical earth.

Science News-Letter, August 31, 1929

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Railroad Cause of Chinese Trouble

Geography

A railway track eleven hundred miles long is the immediate cause of the war menace that hangs over northeastern Asia.

The present Sino-Soviet difficulty has developed in the controversy over control of the Chinese Eastern Railway.

This railway, actually 1,069 miles in length, is located in Manchuria. Its headquarters are at Harbin, a junction city in the heart of Manchuria, and it stretches eastward to the Siberian frontier by way of Gaolin and Pogranitchnaya to Vladivostok on the Pacific and westward to Manchuria on the border of Asiatic Russia.

It was built by the Russians under the Czarist regime. Until recently it has been operated by treaty agreement under the joint control of Russia and China. A few weeks ago the Nationalist Government of Nanking took over the entire administration of the railway and ejected from Manchuria all the Russian officials. They claimed as their justification for this seizure that the Soviet Government of Russia, in spite of numerous peaceful protests, persisted in spreading communistic propaganda among Chinese Nationals.

The importance of this railway is significant inasmuch as it provides quick transportation from China on the Siberian line via Harbin to Mukden and Dairen, thus saving the trans-Siberian passenger many hours of valuable time, and often extreme discomfort, travelling the northern route to Vladivostok. Furthermore, its economic value is enormous, for with the exception of the slower and more or less unreliable river transportation it gives sole conveyance to the products of 50 million acres of highly fertile arable land. According to the authority of the United States Bureau of Commerce the exports of Manchuria exceed \$500,000,000 annually. And what is of more importance at the present, it takes from the seaboard ports to the rapidly developing centers of Manchuria the vast imports of machinery, household necessities and personal requirements of half a million emigrants every year. It is estimated that the population of Manchuria has increased 15 million during the last twelve years.

Manchuria is being rightly called the new land of promise. Early in

the century the Russians began to penetrate into Manchuria from the north. Ever since the Russo-Japan war, millions of Chinese have been pouring in from the south. A million Japanese have settled in its rich fertile valleys. In 1905 the estimated population of Manchuria was eight million. Today the various estimates range from 27 to 30 million. It is a matter of easy conjecture to say that with a persistence of present conditions within the palisades of China the population of Manchuria will double within a decade.

The following are some of the more strategic Manchurian and Siberian points that are finding their names in the news dispatches from the troubled area:

Mukden (Moukden) the capital of Manchuria situated on the south Manchurian railway.

Harbin (Kharbin) situated on the Sungari River. It is located in central Manchuria and almost on the border of Mongolia. It is the headquarters for all the Manchurian railway systems and is certainly the most strategic center in Northeastern Asia.

Vladivostok—Eastern terminus of the Siberian Railway, capital of the coast province of Siberia.

Harbarovsk (Kharbaroski)—Railway center on the Siberian-Manchurian frontier. Located at the juncture of the Sungari and Amur Rivers.

Blagovieschensk—Capital of the Amur province in Siberia.

Grafskaya—Situated on the Usari River where the Trans-Siberian Railway touches the border.

Busse—Trans-Siberian Railway Division on the Manchurian frontier.

Manchuli (Manchurija)—Key railway center situated on the Northwestern border of Manchuria.

Novgorod—Southernmost Siberian Port on Japan Sea.

Pogranitchnaya—Key railway center on the Northeastern frontier.

Grotekow—Near Vladivostok on the Japan Sea. This town is now the Pacific Soviet Army Headquarters.

Ninguta on the Vladivostok Harbin Railway.

Stuigenko on the Vladivostok Harbin Railway.

San Fen-Ho—A coast town on the sea of Japan.

Mikolsk (Nikolskoje) North of Vladivostok—Junction of Trans-Si-

berian Railway and Chinese Eastern in Siberia. Important Division Port.

Olagoveski (Olagoveschensk)—A border town railway division.

Chita—To the northwest—Important railway center in the Baikal (Siberian) province. Junction of the Chinese Eastern Railway with the Trans-Siberian.

Sungari River—A water highway which penetrates right into the heart of Manchuria from Siberia on the northeast Manchurian boundary.

Amur River—Touches the frontier at Harbarovsk. It is called the great black river and is 2,700 miles long.

But though the Chinese Eastern Railway is the immediate cause of the present trouble in Manchuria it is only a single red chip in the exciting game that is being played. The stakes are enormously higher.

The game is being played in Asia, a territory of over 17 million square miles, populated by 920 million people.

The chief players at present are, on the one hand, China, a republic, consisting of 18 provinces within the Palisades and four outside provinces namely, Manchuria, Mongolia, Sinkiang and Tibet. The Chinese Republic has an estimated area of 4,277,170 square miles and 320,110,000 population. On the other hand, Russia, a union of Socialist Soviet Republics whose territory extends from the Baltic Sea to the Pacific Ocean and from the Black Sea to the Arctic Ocean, stretching nearly half way around the globe, with an estimated area of 8,500,000 square miles and a population of 140,931,600.

Japan, who is also tremendously, almost vitally interested, is an empire whose estimated mainland and adjacent island area is 148,756 square miles with a population of 58,769,570 inhabitants. According to latest Japanese official figures there are over one million Japanese nationals living in Manchuria, and more than five billion yen capital invested. (A yen is roughly equivalent to 50 cents United States money.)

Manchuria, which is generally recognized as the rich stake stimulating the controversy, is a province of the Chinese Republic. It was absorbed by Russia in the later days of the last century. After the Russo-Japan War it came under the control of the Japanese. The Japanese allowed the original rulers to maintain local authority in (*Turn to next page*)

Crystal May Make More Accurate Clocks

Physica

A crystal of quartz, similar to those used in radio stations to keep the wavelength constant, may make possible a new era of accurate clock making. Experiments at the Bell Telephone Laboratories by Dr. W. A. Marrison, have shown that such a crystal may be made to perform the work of a clock pendulum. Already he has constructed a time-piece that compares in accuracy with the very best of observatory clocks until a few years ago. Since a pendulum is not required, the crystal clock does not require the firm pier on which observatory clocks must be mounted. The crystal clock could be used in a tall office building, on shipboard, or even in aircraft if needed.

When a quartz crystal, properly cut, is placed between two metal plates, and a vibrating electric current applied to them, the crystal can be made to oscillate at a certain rate. By varying the size of the crystal, the rate at which it vibrates can be regulated, and the crystal maintains the same rate with great accuracy. This is used in crystal controlled radio stations.

But a much higher accuracy is needed for a laboratory standard, and this has been attained by Dr. Marrison. His apparatus has been developed primarily as a standard of frequency. The application as a

clock is a by-product, but one which may eventually prove of even more practical importance.

Three crystals are used by Dr. Marrison, each vibrating 100,000 times a second. Each crystal is enclosed in a thickly padded chamber, to prevent temperature changes, and the whole is covered with a glass bell jar, so that the air pressure and humidity may also be kept constant. Three separate oscillating electric circuits from vacuum tubes keep the crystals running, so from each unit there comes an alternating electric current, changing exactly 100,000 times a second. Any one of these three crystals can be connected with the clock, through the medium of another electrical circuit called a "submultiple generator," also using vacuum tubes. One of these takes in the 100,000 cycle current and gives out current alternating 1,000 times a second. This current operates a motor, geared to the clock face in such a way that it keeps accurate time when the crystal vibrates accurately. A contact on this clock gives an electrical impulse every second.

Though the clock has not been running long enough to check its accuracy over long periods, shorter observations show it to keep a constant rate within about a hundredth of a second a day. This is compar-

able in accuracy with the Riefler clocks that were the most accurate available until a few years ago, and which are still used as the U. S. Government standard in Washington. A new clock recently developed in England, however, known as the "Synchronome," is still more accurate, and is now coming into extensive use in observatories and laboratories. Dr. Marrison hopes by future refinements to be able to make the crystal clock as accurate.

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ONE HUNDRED POPULAR SCIENCE BOOKS

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SCIENCE SERVICE

Book Department

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Railroad Cause of Chinese Trouble—Continued

Manchuria, but kept the province under their sphere of influence, giving aid to the native rulers to keep out the aggressive Chinese war lords. With the tragic death of Governor-General Chang Tso Lin in 1928 the Nationalist Government of Nanking became the dominant authority. Its status at the present time is a semi-independent republic. Its government is administered by Chang Hseuh-Liang, son of the noted Manchurian War Lord Chang Tso Lin, who is under the nominal and civil authority of Chian Kai-Shek, President of Nationalist Government of Nanking.

It has an estimated area of 363,610 square miles, over 100,000 of which is highly fertile arable land. The large valleys of the Sungari and the Amur Rivers are comparable in rich potentiality with our own Mississippi. The estimated population ranges from 27 to 30 million people, and it is claimed that the land is fertile

enough to furnish a good living to tens of millions more. Last year's exports exceeded \$500,000,000. The capital of Manchuria is Mukden.

The immediate neighbors of Manchuria are Mongolia to the west and Siberia to the north.

Mongolia is a Chinese republic under the Russian sphere of influence. Its capital is Urga. Its population is approximately 2,600,000. It has an estimated area of 1,367,600 square miles, a large part of which is taken up by the Gobi or Shamo desert.

Siberia is one of the seven Socialist Republics of Russia. Its capital is Tomsk. It has an area of 4,831,882 square miles and an estimated population of 10,377,900.

The de facto authority of China is now established at Nanking, the new capital, and it is called the Nationalist Government of China. The head of the Chinese Government

is Chiang Kai-Shek.

The political title of Russia is now the Russian Soviet-Federation of Socialist Republics, or "Union of Socialist Soviet Republics." The government is vested in local, regional, and central Soviets or councils of workers and soldiers' delegates. The capital is situated at Moscow. Alexie Rykoff is the President of the Soviet Council. Other leaders in the Sino-Soviet situation are as follows: Chang Hseuh Liang—War Lord of Manchuria; C. T. Wang—Foreign Minister of the Nationalist Government; Chu Zao Yang—Negotiator Late Chinese Charge d'Affairs, Moscow; Atamon Semanof—Leader of White Russians in Manchuria who are on the side of Chinese; Commissioner Jan Rudzutuk—Acting head of the Soviet Government; Vice-Commissioner L. M. Karakhan—Foreign Affairs Secretary for Russia.

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Hunger Measured by Balloons

Physiology

Swallowing small rubber balloons after fasting from 15 to 44 hours, and then causing intense pangs of hunger by taking an insulin injection, sounds like making a martyr of oneself for science. Yet this is the program submitted to by a number of men in the laboratory of Prof. A. J. Carlson and Dr. P. Quigley, of the University of Chicago, as reported before the Thirteenth International Physiological Congress.

The insubstantial meal of balloons was taken so that the movements of the digestive tract might be measured. The rubber bubbles were connected with the outside by means of slender tubes, to which instruments were attached for the measurement of changes of pressure in the balloons caused by contractions of the stomach and intestine.

After an injection of insulin, the pressure gauges indicated a rise in tone of the muscles of the digestive tract, and then rapid contractions. This was followed by an unusually prolonged hunger period, lasting in some cases as much as five hours. The intensity of this activity was not decreased by smoking or by either unpleasant or pleasant emotions. Bodily discomfort had no effect, neither had a feeling of mild nausea. Taking food into the mouth did not stop it, and even swallowing a considerable quantity of sugar and water left the reactions unchanged.

But the hunger activity could be promptly inhibited by drugs. Atropin or epinephrine injected under the skin took effect very quickly.

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Starvation Increases Effects of Poisons

Toxicology

If you are thinking of poisoning yourself, take a Hollywood eighteen-day diet course first. Many poisons work quicker when the "poisoner" is partly starved.

This fact has been developed as the result of research by Dr. William Salant of the Cold Spring Harbor Biological Station. Not that Dr. Salant desired to give aid and discomfort to would-be suicides. His objective was to discover the physiological effects of certain drugs as they affected well-fed and fasting animals and persons, with a view to making their administration safer.

Oil of chenopodium, or wormseed oil, is somewhat poisonous, and its toxic effect is greater on the fasting patient. Caffein, the stuff that puts

the "kick" in coffee and keeps you awake all night, is more poisonous to a hungry animal than to a fed one. Chloroform is a safer anesthetic if the patient has a good reserve stock of carbohydrate food material. Certain poisons that act by irritating the kidneys have their toxicity notably reduced by feeding carrots, sweet potatoes, or other vegetables rich in carbohydrates.

Not all poisons and poisons are offset by food, however. Some act in a directly opposite fashion, and are less effective on a fasting man or animal. Atropin and quinine are in this class. Fasting also decreases the ill effects of phosphorus poisoning.

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The Analysis of a Shirt

Physiology

Nothing is safe from a chemist with an inquiring mind, not even a man's shirt. He'll analyze it to find out what your physiological processes have been during a football game or a race.

At the meeting of the Thirteenth International Physiological Congress Prof. I. Snapper and Prof. A. Grunbaum of the University of Amsterdam told how they had to do some scholarly Chinaman-work to carry out their studies on the physiology of athletes at the Olympic games and other contests.

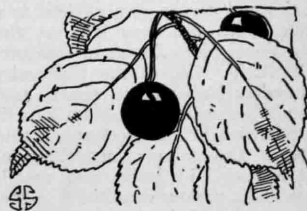
They were interested primarily in the presence of lactic acid in perspiration and in liquid body excretions.

Lactic acid is a product of all normal muscular exertion, but does not ordinarily come out of the body as such, being further broken down inside and finally appearing as carbon dioxide and water vapor in the breath. But during a time of great exertion this waste product may be piled up in the blood and tissues faster than it can be completely oxidized, and so will be excreted "as is." It was during a study of this lactic acid excretion that the two Dutch scientists found it necessary to search the shirts of the athletes with chemical reagents.

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NATURE RAMBLINGS

By FRANK THONE



Wild Plum

There is a theory, now fairly well accepted among agricultural and horticultural scientists, that many, perhaps all, of our common crop and fruit plants must have been found by primitive man in approximately the same conditions as we now know them, or at least in such a state as to make their utilization for food obvious and not too difficult. Subsequent selection and other improvements would then make them bigger and better.

Support for this theory could be found without difficulty in the common wild plums of this country. In their native state, without any hints of cultivation or improvement, they are highly palatable when ripe, and there is enough pulp in proportion to seed and skin to make eating them worth the effort. As a matter of fact, there are thousands of small farm orchards in which wild plum trees, picked up at random in the woods, are given their regular places.

The commonest of American wild plums, the black plum, reaches small-tree size, and when cultivated solitary or in a properly spaced orchard develops a good, fairly symmetrical head, although the branches tend to the sudden crooks and angles in which Japanese gardeners delight. In its native state it more frequently grows in dense thickets, forming gorgeous snowy masses when in bloom, but preventing the full development of any individual tree.

There are two other very worthy wild plums that, as a rule, do not get to be more than bushes. These are the beach plum of the coastal region and the sand cherry of the drier Northwest. The latter, an exceedingly hardy shrub, has been used to great advantage in crosses with the less hardy but larger-fruited Japanese plums.

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Heat From Nerves

Physiology

We "warm up" when we are working or exercising; everybody has made this fundamental physiological observation. But just how fast our muscles and nerves give off heat is a matter which has been left for the professional physiologist to measure.

Dr. A. V. Hill, of the University of London, Nobel Prize winner, told of some exceedingly delicate experiments which he has performed, that measure the minute quantities of heat liberated by nerve and muscle fibers under various conditions. Nerve fibers, he found, lose most heat during the process of recovery from fatigue; only about five per cent. of the total heat lost goes out during the time before the recovery begins.

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Cancer Growth Checked

Physiology

A new clue to the long-sought cure for cancer was presented to the Thirteenth International Physiological Congress by Dr. Boris Sokoloff, of Prague. A compound containing iron and extract of suprarenal gland has arrested the progress of malignant growths in about ten per cent. of all attempts on over a thousand experimental animals, he reported.

When the compound is injected into an animal afflicted with a cancerous growth it causes the malignant cells to liquefy, but has no effect on the healthy body cells. In his experiments the results were obtained very rapidly; in small tumors palpable effects were discernible in from three to five days, while in larger growths the process was a little more slow, requiring about fifteen days.

Thus far, the treatment has been used only on transplanted tumors in mice and rats. What its effects will be on spontaneous tumors has yet to be observed.

An overdose of the treatment carries its own danger, the Prague physiologist stated. Some of his rats got too much, their tumors liquefied too rapidly, and they died. By decreasing the size of the dose and giving repeated injections this unfavorable action was avoided.

The action of the remedy seems to be permanent. Out of 200 rats cured of cancerous tumors over two months ago, only five have suffered a relapse.

The first hints of the possibility

Carbon Dioxide Checks Pneumonia

Physiology

The collapse of a lung that sometimes follows a surgical operation and ends in death by pneumonia, can be prevented by giving the patient carbon dioxide to breathe. This gas, the normal waste-product of respiration, induces deep breathing and so expands the lung again, preventing its becoming clogged with fluid, or, if the fatal blocking has already begun, clearing it up again.

Report of a cooperative research undertaken demonstrating these points was made before the Thirteenth International Physiological Congress. Dogs suffering from severe pulmonary collapses and accompanying pneumonia had their breathing stimulated with "doses" of carbon dioxide. X-ray photographs showed how the collapsed

lungs were redistended and the pneumonia cleared up. Evidence from patients shows that pneumonia following influenza can be cured by this inhalation. It likewise saves many hundreds of lives each year, of persons asphyxiated by illuminating gas and automobile fumes.

The experiments were conducted by Doctors Pol N. Coryllos and G. L. Birnbaum of New York City, and Doctors Yandell H. Henderson, H. W. Haggard and E. M. Radloff of Yale University.

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Adrenalin Causes Fever

Physiology

When we develop a fever, is the immediate cause of our discomfort to be sought in the activity of the adrenal glands? These small but highly important organs, situated just above the kidneys, are regarded as the originators of fever as well as of many of the more normal functions of the body, by Dr. Ulf von Euler, of Stockholm, who spoke before the Thirteenth International Physiological Congress.

Dr. von Euler pointed out that the symptoms of fever can be produced by injecting adrenalin into the blood, and also that human and animal subjects with over-active adrenal glands are feverish. Tests on the stimulation of frog's and rabbit's muscle with the blood of fever patients and with adrenalin showed a close parallelism in effect. Finally, the Swedish scientist reminded his hearers, it is impossible to cause fever in an animal which has lost its adrenal glands.

The activity of the adrenal glands, has been made visible through the microscope by a method developed by Dr. W. Cramer of London.

The method consists in treating the gland with the vapor of osmic acid, a powerful chemical which darkens the grains of adrenalin, its secretion. These can then be seen in the outer portion of the gland, and when it is stimulated to action they can be watched as they move from their place and enter the blood stream in the veins.

The studies of the activities of the adrenal gland have hitherto been conducted only by observing their effects, such as the release of more sugar into the blood stream, the dilation of the pupil of the eye, the tensing of certain muscles, etc.

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of the new treatment were obtained, curiously enough, on organisms at the very bottom of the evolutionary scale. It was found that an iron-suprarenal compound regulated the mutual proportions of the parts of the unicellular animal *Amoeba*, and that an increase in the concentration caused the outer protoplasm to liquefy, killing the organism. The possibility of applying the same treatment to cancer cells, which are essentially normal cells gone crazy about increasing and multiplying, suggested itself to Dr. Sokoloff, resulting in the researches reported.

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Faraday Centenary

Electricity

Electrical scientists and engineers from England as well as other countries will join in London in 1931 to celebrate the hundredth anniversary of Michael Faraday's discovery of electromagnetic induction. This discovery, that when a magnet was thrust into a coil of wire an electrical current could be detected from the ends, is at the basis of modern electrical science. The Royal Society, the British Association for the Advancement of Science, the Royal Institution and other organizations are cooperating in preparations for the exercises, which will be held in London, commencing on September 21. The British Association will also hold its own centenary meeting in London during the week beginning September 23.

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One Hundred Popular Science Books

Bibliography

In 1921 the Washington Academy of Sciences was requested by Dr. George F. Bowerman, librarian of the Public Library of the District of Columbia, to compile a list of scientific books that could be recommended for popular use. The committee of the Academy appointed for this purpose aimed to select books that would be attractive to the general reader and at the same time authoritative and modern in their treatment of the subject.

The first list of 100 books proved so useful that a revision was published in the *Journal of the Washington Academy of Sciences* for June 4, 1929. It has been reprinted in pamphlet form with brief descriptions of the books, by the American Library Association, Chicago, under the title "Popular Books in Science." Copies may be obtained from them.

Following is the complete list of books, with publishers, dates and prices, as ascertained by Science Service's librarian. A few of the books, now out of print, are so marked.

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(Turn to next page)

Talkies To Teach History

Pedagogy

The first educational talking movie to be produced for the general use of schools and colleges is now in preparation. This announcement was made by the University Film Foundation, which is associated with Harvard University. The film, which will inaugurate a series of educational talking movies, will be entitled "The Corner Stone of the Nation," and will relate the history of Massachusetts from the founding to the present.

Camermen are now taking the pictures on the actual spots in which

history was made, with actors, dressed in authentic costumes of the period, to play the historical characters.

The talking part of the film will consist of a lecture on the scenes, delivered by Prof. Albert Bushnell Hart, famous Harvard historian. When the photography is complete, Prof. Hart will deliver the lecture into a microphone as the film is shown before him. His words will be recorded on film, and then printed along the side of the pictures.

When these films are shown in a sound movie projector, such as is

used in the theaters, Prof. Hart's lecture will be reproduced as the film is shown. In this way schools throughout the country may have both the pictures and the talk.

A portable sound movie projector, for use with this sound on film method of recording, which is used by most of the commercial producers, is about to be placed on the market. This will consist of the projector, amplifiers, loud speaker and screen. It will be small enough to carry around in a small automobile.

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One Hundred Popular Science Books—Continued

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\$150 Radio to Talk Abroad

Radio

With home-made radio telephone transmitters, costing \$150 or less, thousands of American radio amateurs may soon be able to converse by voice with their co-workers in foreign countries.

For years, these "hams," as they call themselves, have been talking back and forth across the Atlantic and Pacific in code, with sets that draw less power than an electric desk light. Now many of them are planning to duplicate this with voice, according to Kenneth B. Warner, secretary of the American Radio Relay League and editor of *QST*, its official journal.

"We have not yet received the requisite authority from the government," he said, "but this is expected to issue within a very few weeks

and there is a very considerable amateur interest in preparing for the new opportunities."

The current issue of *QST* contains an account of the new transmitter, by James J. Lamb and Beverly Dudley. Ordinary short wave receivers, with which the amateurs are already equipped, will serve in listening to the voice of other amateur operators.

The new transmitter, say the authors, gives maximum effective power output with minimum cost. This is accomplished by using the inexpensive tubes of the type used in ordinary radio receivers, instead of the expensive transmitting tubes used in commercial stations. Use of receiving tubes simplifies the operation and lowers the cost of the other parts, because they require lower

plate voltages than the transmitting tubes. The transmitter is made in three parts, an oscillator buffer-amplifier unit, a modulated amplifier unit and a speech amplifier and modulator unit.

At regular retail prices for the parts, it is said, the total outlay, including plate supply, filament transformer and bias batteries, should not exceed \$150.

The power of the set for telephone transmission is seven watts for the carrier output. This, when modulated by the voice currents from the microphone, gives a maximum output of 25 watts. When the transmitter is used for code transmission by the continuous wave system, it permits a power output of 15 watts.

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Medical Standards Higher

Medicine

Some 4,446 new doctors were graduated during the year ending June 30, 1929, according to figures just made public by the American Medical Association.

Of these 66.4 per cent. held collegiate degrees as well as medical, as opposed to only 15.3 per cent. in 1915. All the better medical schools are requiring two or more years of college work for admission, a condition which brings more students within reach of the combined courses for the B. S. and M. D. degrees. Obviously, increasing numbers of students feel the desirability of sound collegiate preparation before entering upon merely medical training.

New York furnished the largest number of medical graduates, 2,994, followed by Pennsylvania with 1,820.

Only 214 of the new physicians are women. The total number of women studying medicine during the past year was 925, or 4.43 per cent. of all the medical students in the country.

Eleven medical colleges now require a fifth year of internship in an approved hospital or clinical work before the medical degree is granted.

Science News-Letter, August 31, 1929

Chemical analysis of bread found in an ancient Egyptian tomb shows that the loaf was sweetened with honey.

Natives of Bengal believe that evil spirits will not touch anyone who is protected by wearing a piece of iron.

Radio Station to Check Frequencies

Radio

Radio stations of ships, broadcasters or amateurs will have little excuse for departing from their assigned frequency or wave length after December. Then the constant frequency station of the Department of Commerce will be in operation at Grand Island, Nebraska. Engineers will listen in to all kinds of stations, and check their frequency. Whenever one is found to be deviating from the place assigned, the operators will be immediately notified. Or if the station operators believe their station to be deviating, a telephoned request to the constant frequency station will result in an immediate test and report.

The instruments of the station will be installed in a two-story brick structure on a 50-acre tract and will be operated by a staff of about 20 men. The antennae will be 70 feet high and will stretch in all directions.

Some will be as long as two miles. One, especially for receiving signals from European and Asiatic stations, will run east and west.

With this equipment it will be possible to check the country's 600 broadcasting stations, 2,000 ship stations, all of the commercial transoceanic and trans-continental services, the short line point-to-point services, 16,000 amateur transmitters, a thousand government stations and about a thousand transmitters of other types. These operate on wavelengths between 7 and 30,000 meters. Foreign stations will also be given the benefit of the service, if desired.

The station will be directly on the line of the air lines from Omaha to the west coast, and as it will be brightly marked day and night, will serve as an excellent landmark.

Science News-Letter, August 31, 1929

New Anesthetic

Medicine

Gas anesthetics have become quite the mode in surgical circles lately. A new possibility in this field was presented by Dr. G. W. H. Lucas of Philadelphia and Dr. V. E. Henderson of Toronto. Their gas is known as cyclopropane. Anesthesia of surgical degree can be caused by a mixture of eleven per cent. of this in oxygen. The discoverers claim that it is easy to take, leaves blood pressure and respiration practically normal while it is in action and has no bad after effects.

Feeding the Fishes

Physiology

You can't feed your goldfish by putting sugar in his bowl. Prof. August Krogh of the University of Copenhagen wanted to know whether by any chance aquatic animals could "soak in" dissolved nourishment, so he tried it on some fish, and also on tadpoles and a small relative of the lobster known as *Daphnia*. The quantities of glucose these absorbed were too small to be of any physiological use to the animals.

Science News-Letter, August 31, 1929

Science News-Letter, August 31, 1929

"Smoke" is Cold

Meteorology

Every so often Mount McKinley, in Alaska's national park of that name, is accused of smoking. Observers declare that the old mountain has turned volcanic, and is erupting fire and brimstone, not to mention clouds of smoke. Such tales, however, are erroneous. McKinley is always accused of doing its smoking in the winter during especially cold weather. This would seem to be the sensible time to smoke, if smoke the mountain must.

Old-timers in the North, however, explain the "smoking" phenomenon as anything but "hot". They say that during periods of very high winds and low temperature, dry, loose snow, crystallized by the extreme cold, is picked up by the wind, and if the mountain is encountered in its course the snow is hurled up and over its crest in such a manner that, under certain conditions of light, the flying mass takes on the color of dark slate as it streams off over the top into space. From a distance this strongly resembles smoke. Mount McKinley has been known to throw off a "smoke-screen" of this type estimated to be from twenty to fifty miles long.

Science News-Letter, August 31, 1929

Extra Vitamin and Milk

Physiology

The milk of nursing mothers is little affected in its chemical makeup by an over-supply of vitamins in their daily food. This was disclosed by experiments performed on human volunteers by Dr. I. Greiner and Dr. J. Mosonyi, of Budapest, who reported on their researches before the Thirteenth International Physiological Congress.

A number of women with nursing children were given a diet with an excess amount of vitamins. Samples of the milk which they secreted for their infants were analyzed chemically for nitrogen, fat and sugar contents, as well as for total solids. The diet had no discoverable effect on the nitrogen and sugar content. The results of the analyses for fat were discrepant, with increases in some cases, decreases in others, and no changes at all in a third group.

The vitamin-rich diet was, however, not without effect on the growth rate of the babies. Their gains in weight were compared with those of a similar group of children fed by mothers on ordinary diet, and it was found that they grew about fifteen per cent. faster than the latter.

Science News-Letter, August 31, 1929

Understanding Insanity in Children

Psychiatry

Children who become mentally ill are rare, but cases that do occur show more clearly than cases of adult patients what are the underlying factors that cause mental and emotional breakdowns. This is pointed out by Dr. J. Kasanin of the Boston Psychopathic Hospital, who has been studying mental diseases in children under sixteen years of age.

The personalities of children are relatively far less complicated than those of adults, and in the child's brief experience with life the factors that make trouble can be sorted out with comparative certainty.

"The insanity of the child is somewhat like that of the primitive man," Dr. Kasanin states in describing his investigations. "The child is seized by unrestrained and emotional outbursts rather than by the strange ideas that so often characterize mental disorder in the civilized adult."

Children suffering from serious

Ant Has Brain Tumor

Entomology

Ants rival humans not only in the complexity of their social structure but in the intricacy of their ailments. An insane ant, a unique phenomenon in scientific annals, has been reported by Dr. Robert Staeger.

While observing a colony of a common European species of ants, Dr. Staeger noticed one individual running around and around in circles. It attacked members of its own colony that came in its way and behaved in an otherwise abnormal fashion. The circles always bore to the right and after a few days the insect's feet and antenna began to drag.

Circumstances came about that made it impossible for Dr. Staeger to watch the ant any longer, so he killed it and sent it to Dr. Rudolf Brun of Zurich, a specialist interested in such matters. Microscopic dissection revealed a tumor on the left side of the insect's brain, a condition that apparently has not been reported in scientific literature before. In this brain, no bigger than a small pin head, the nerve fibers crossed each other just as they do in man's, so that injury on the left side caused difficulties with the members on the right side of the body.

Science News-Letter, August 31, 1929

Some low-hung types of automobile can be tipped at an angle of more than 50 degrees without upsetting.

mental conditions were frequently found to have been subjected to extremely difficult situations, such as being a foster child or witnessing a suicide. Sordid home environment and sexual entanglements played major roles in driving some of the children into abnormal mental states. Lately it has been discovered that a good many cases of insanity in children are due to a previous attack of sleeping sickness.

The rarity of mental disease in children is shown by the fact that out of 6,000 patients admitted to the hospital, 160 were children under 16 years, and of these only 65 were diagnosed as psychotic, that is suffering from pronounced mental diseases. The rest of the 160 were mentally deficient, or psychopathic personality cases, or merely problem children whose behavior while erratic was relatively normal.

Science News-Letter, August 31, 1929

Suicidal Ducks

Physiology

Diving animals like ducks and muskrats can be induced to hold their breath until they die from lack of oxygen. This strange phenomenon was described at the Thirteenth International Physiological Congress by Dr. Theodore Koppanyi of Syracuse University.

The nerve endings of the reflex that control holding the breath are in the nostrils, Dr. Koppanyi said, since pouring water over the nostrils induces it in both the duck and the muskrat. Besides this submergence apnea, as the feat of holding the breath is technically known, there is another respiratory adaptation in diving birds and animals by which apnea can be brought about by bending the head back on the neck while the animal is lying on its back. Complete suspension of breath for ten minutes has been observed in this position, the scientist declared.

"It is actually possible," he added, "to kill the duck by maintaining this postural apnea until the animal dies from lack of oxygen. It is indeed a remarkable fact that inhibitory nervous influences can counteract the chemical stimulation of the respiratory center by the accumulated carbon dioxide in the blood."

Science News-Letter, August 31, 1929

The amount of irrigated land under cultivation in the world has doubled in the past ten years.

FIRST GLANCES AT NEW BOOKS

QUALITATIVE ANALYSIS—J. S. Long, D. S. Chamberlin, D. I. C. and H. V. Anderson—*Prentice-Hall* (\$2.25). This book, which has been in successful use, makes qualitative analysis interesting to the student. It does not limit the subject to a mere recitation of the necessary tests, held together by a "scheme" of procedure. While the usual analytical thread is employed, the authors have written this book around substances selected on a basis of scientific usefulness, and the points of interest concerning each are stated as the substance presents itself. This inclusion of a generous amount of descriptive chemistry broadens the scope of work, without in any way impairing its main purpose.

Chemistry

Science News-Letter, August 31, 1929

PHOTOGRAPHIC EMULSIONS—E. J. Wall—*American Photographic Pub. Co.* (\$5). Most amateur photographers are content to let their films be developed at the corner drug store, or if they do their own work, at most merely mix their own solutions. But to the amateur looking for new worlds to conquer, the preparation of his own emulsions, as described in this book, offers a fascinating field. "As a means for spending money," says the author, "it is equalled only by dabbling in stocks. In both cases one has the excitement of waiting for results, which may be all that one desires or merely a loss of time and money."

Photography

Science News-Letter, August 31, 1929

THE PIONEER PHOTOGRAPHER—William H. Jackson and Howard R. Driggs—*World Book Co.* (\$1.40). So easy is it nowadays to take a snapshot and leave the film at the corner drug store to be developed and printed that we are apt to forget the days of wet plates when it was necessary to carry around a complete darkroom equipment in order to take pictures and to prepare and develop the plates on the spot. This interesting addition to the publisher's Pioneer Life Series tells of the work of Mr. Jackson, who photographed the Yellowstone and other parts of the West for the Geological Survey back in sixties and seventies.

Photography

Science News-Letter, August 31, 1929

A HISTORY OF MECHANICAL INVENTIONS—Abbott Payson Usher—*McGraw-Hill* (\$5). To describe in a single volume work the history of mechanical inventions and their effect on human history is certainly an ambitious project, and as every reader will have his own ideas of what should be included, the result is hard to judge. But Prof. Usher has succeeded in compiling, within the space of 401 octavo pages, a very readable summary of some of the important inventions from the earliest times. Separate chapters deal specifically with water wheels and windmills, water clocks, mechanical clocks, printing, textile industries, power, machine tools, etc. A number of the half-tone illustrations, which are really too few, leave much to be desired.

Invention

Science News-Letter, August 31, 1929

SCIENTIFIC METHOD—Truman L. Kelley—*Ohio State University Press* (\$2.50). A series of lectures delivered last winter at Ohio State University. The volume will be of particular interest to educators and others interested in mental testing.

Education

Science News-Letter, August 31, 1929

PLANE TRIGONOMETRY—Ernest Jackson Oglesby and Hollis Raymond Cooley—*Prentice-Hall* (\$1.60). A new college trigonometry text that introduces new topics by means of preliminary questions and exercises in a new way that should greatly aid the student in acquiring a clear comprehension of the subject. A five place table of logarithms and functions is included.

Trigonometry

Science News-Letter, August 31, 1929

COLUMBIA RESEARCH BUREAU CHEMISTRY TEST—Eric R. Jette, Samuel R. Powers, and Ben D. Wood—*World Book Co.* (20c.). A chemistry test in the short-answer form for use in high schools and colleges.

Education

Science News-Letter, August 31, 1929

SCIENCE OF THE HOME—Nathan B. Giles and Dorothy S. Ellis—*Wiley* (\$1.50). Evidently meant for a manual for home economics students but actually a fine companion piece, as well, for the housewife's cookbook on the kitchen shelf.

General Science

Science News-Letter, August 31, 1929

THE VATICAN LIBRARY—Monsignor Eugène Tisserant and Theodore Wesley Koch—*Snead and Co., Jersey City* (Gratis). An interesting and beautifully printed pamphlet describing the history and present condition of one of the greatest libraries of the world. People of learning, whatever their religion, will be glad to know that American funds and equipment are helping to make its treasures available to scholars of all lands and faiths.

Library Science

Science News-Letter, August 31, 1929

DIRECT CURRENT ELECTRICITY—L. Raymond Smith—*McGraw-Hill* (\$2). This is the third volume in the publisher's Industrial Physics series and is an excellent addition to the battery of textbooks available on this subject. The authors have written a classroom book, and not a reference book; it assumes no previous electrical knowledge on the part of the student.

Electricity

Science News-Letter, August 31, 1929

THE PHYSICAL PRINCIPLES OF WIRELESS—J. A. Ratcliffe—*Dutton* (\$1.15). A little English book (104 pages) that gives in an admirably concise manner the fundamental principles of physics that make radio possible. The author does not hesitate to use mathematical notations occasionally, but this should scare no one away.

Radio

Science News-Letter, August 31, 1929

AERIAL NAVIGATION AND METEOROLOGY—Lewis A. Yancey—*Henry* (\$4). A simple yet complete book of instruction on how to navigate an airplane by the man who showed his practical knowledge by taking the "Yellow Bird" safely from Old Orchard to Rome.

Ariation

Science News-Letter, August 31, 1929

COMMERCE YEARBOOK: Vol. I, United States—Dept. of Commerce—*Government Printing Office* (\$1). The new edition of this invaluable work contains all sorts of useful information on construction materials, natural gas and gasoline, coal and coke, agricultural products, industrial machinery, textiles, etc.

Economics

Science News-Letter, August 31, 1929

First Glances at New Books—Continued

RADIO RECEIVING TUBES—James A. Moyer and John F. Wostrel—*McGraw-Hill* (\$2.50). Receiving broadcast programs is not the only function of radio receiving tubes, and while this most familiar function of them is fully covered in this book, it also tells of some of the less familiar applications of two and three element tubes. Such applications are the remote control of airplanes and boats, the remote control of humidity, etc. The book is intended for the general reader as well as the student.

Radio
Science News-Letter, August 31, 1929

EXPERIMENTAL OPTICS—Albert F. Wagner—*Wiley* (\$3.25). This book by a professor at the U. S. Navy Postgraduate School at Annapolis embodies the work in optics given to junior naval officers at that institution. It contains such experiments as infrared spectrometry, measurement of the focal lengths of microscope objectives and oculars, testing of prisms, use of the Macbeth illuminometer and determination of aberration in lens systems.

Optics
Science News-Letter, August 31, 1929

PHYSIOGRAPHY—Arthur H. Killen—*Oxford Book Co.* (68c.). This volume in the Oxford Review Series contains a complete summary of physical geography, and is intended to help the student who is reviewing the subject in preparation for a college entrance examination. Copies of questions in recent examinations are given in an appendix.

Physiography
Science News-Letter, August 31, 1929

SEX IN CIVILIZATION—Edited by V. F. Calverton and Samuel D. Schmalhausen—*Macaulay* (\$5). A symposium on sex by 32 distinguished contributors, including Judge Ben Lindsey, Margaret Sanger, and Mary Ware Dennett, with an introduction by the veteran Havelock Ellis.

Sociology
Science News-Letter, August 31, 1929

HUMAN HELMINTHOLOGY—Ernest Carroll Faust—*Lea and Febiger* (\$8). A most valuable manual, profusely illustrated, on parasitic worms that infest human beings. The book is too technical for the average reader but will be extremely useful to physicians, sanitarians and public health workers.

Medicine
Science News-Letter, August 31, 1929

CAPITAL PUNISHMENT IN NORTH CAROLINA—*North Carolina State Board of Charities and Public Welfare, Raleigh, N. C.* This is a "case book" on the question of capital punishment, giving twenty-six cases of criminals convicted of capital crimes in North Carolina; the family history, physical characteristics, home conditions, education, habits, story of the crime, and punishment of the crime, with portraits of the criminal. Besides this, information is given as to the history and statistics of inflictions of the death penalty in North Carolina from the earliest times to the present.

Sociology
Science News-Letter, August 31, 1929

TEXTBOOK OF PHYSIOLOGY—Albert P. Brubaker—*Blakiston* (\$5). In this eighth edition a standard work on physiology is brought up to date and is furnished with a section on physiologic apparatus. Designed primarily for medical students and practitioners.

Physiology
Science News-Letter, August 31, 1929

THE IMPOTENCE OF MAN—Charles Richet—*The Stratford Company* (\$2). An excellent translation by Lloyd Harvey of the French "L'Homme Impuisant." This is the type of book which cannot easily be laid aside without a complete reading. It is a philosophy which is inspiring and, despite the rather depressing title, encouraging.

Philosophy
Science News-Letter, August 31, 1929

YOUR NOSE, THROAT AND EARS—L. W. Oaks and H. G. Merrill—*Appleton* (\$1.50). The belief that ignorance of the nature and care of these organs is responsible for much of the widespread incidence of respiratory infections, has moved these authors to set down lucid, simple descriptions of the organs themselves, their care, results of abuse and similar problems.

Hygiene
Science News-Letter, August 31, 1929

HEALTH EDUCATION TESTS—Raymond Franzen—*American Child Health Association*—(Cl., 90c.; Pa., 60c.). The first of a series of school health research monographs. This volume gives a description of the tests used in a survey of child health, norms for fifth and sixth grade children, directions for giving and interpreting the tests, and samples of the questions.

Public Health
Science News-Letter, August 31, 1929

THE HISTORY OF NURSING—James J. Walsh—*Kennedy* (\$2). An account of nursing from the early Christian era to the present time with special attention to the part played in its development by Catholic sisterhoods.

Nursing
Science News-Letter, August 31, 1929

PUBLIC HEALTH AND HYGIENE—C. F. Boldau—*Saunders* (\$2.75). A handy little volume for anyone's private book shelf as well as the student's for which it is intended. Gives needed historical background usually lacking in the more commonly met with treatises on health.

Hygiene
Science News-Letter, August 31, 1929

IN TRAINING FOR HEALTH—C. E. Turner and Jeanie M. Pinckney—*Heath* (72c.). A health textbook for children of the primary grades.

Hygiene
Science News-Letter, August 31, 1929

MUSIC IN INDUSTRY—Kenneth S. Clark—*National Bureau for the Advancement of Music* (\$3). Describing some of the ways in which industries have used music in an attempt to "pep up" their employees.

Industrial Psychology
Science News-Letter, August 31, 1929

THE ADOLESCENT—Sidney I. Schwab and Borden S. Veeder—*Appleton* (\$3). Two physicians, one a pediatrician and the other a neurologist, tackle the problem of explaining the most trying phase of human existence. Good background for parents and teachers.

Pediatrics
Science News-Letter, August 31, 1929

THE WATERS OF AFRICA—Alfred Aloysius Horn and Ethelreda Lewis—*Moyon and Shuster* (\$3.50). Lovers of the quaint philosophy of Trader Horn will find pleasure in this story of a treasure ship in Africa and in the "conversations" which follow each chapter.

Fiction—Travel
Science News-Letter, August 31, 1929

THE EUROPEAN STARLING ON HIS WESTWARD WAY—Marcia Brownell Bready—*The Knickerbocker Press* (\$2). The European starling has been called a second English sparrow and its introduction into this country has been regretted in ornithological circles. But this book is a defense of a bird that has found America to its liking.

Ornithology
Science News-Letter, August 31, 1929