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MAY ALLOT PRICELESS PRIVILEGE TO USE
RADIO WAVES IN PACIFIC AT WASHINGTON CONFERENCE .

(By Science Service)

Washington, November 20.-- Electrical communications of the Pacific. That phrase, the very last on the agenda of Washington conference, promises to raise some of the most interesting questions of the conference. And it is probable that the much-talked-of Yap with its cable station will not be the principal issue.

While submarine cables have in the past borne the burden of trans-Pacific communication, radio will be the communication canal of the future. The farmer who received wireless market and weather reports, travellers on ships who are kept in constant touch with land, airplane pilots who talk together, and all of us who want to know what is going on today in Asia, Europe, Africa, and South America are vitally affected in what is likely to happen in a few weeks here. For, so far as radio is concerned, there is only one wire for everyone to use and that is the ether.

Different frequencies or wave lengths of ether vibrations provide a limited but multiple number of channels through this one great wireless ether channel. Not including the wave lengths under 3,000 meters which are suitable for short distance communication only, there are only about 300 wave lengths that can be used for long distance and trans-oceanic communication without interference. The whole world thus has only this number of radio channels, plus as many more as can be obtained by utilizing the directional properties of radio and employing the same wave lengths simultaneously in different parts of the world. But across the Pacific, it seems that the radio lines will always be limited to somewhat less than 300.

Questions such as which country shall use a particular wave length, which wave lengths shall be used between certain stations, which shall be used for meteorological work, radio beacons and other service uses, which shall be used for military work, and how undesired emissions can be suppressed are matters that must sooner or later be settled by international action.

The international agreement now in force was the result of the London convention of 1912. Since and during the war the science and practice of radio telegraphy has progressed so fast and so far that new rules and agreements are needed. A Preliminary Communications Conference of the five principal powers met here in 1920, and as a result leading wireless experts of the nations sat on the Inter-Allied Technical Committee which met in Paris last summer. These scientists and military representatives did not actually allocate the priceless privilege of using certain wave lengths, but they laid down the general principles that will be used in making an equitable distribution of the wireless waves.

Now here in Washington the electrical communications committee of the technical staff of the conference is meeting almost daily preparing the data and arguments to be used in presenting the American views on trans-Pacific communication.

Headed by Maj. Gen. George O. Squier, chief signal officer of the army, the committee consists of: W. S. Rogers, specialist in communications, and Leland Harrison, counselor of embassies, State Department; Louis Cohen, consulting engineer, War Department; Capt. Samuel W. Bryant, naval communication service, and Louis W. Austin, head, naval research laboratory, Navy Department; Dr. S. W. Stratton, director, and Dr. J. H. Dellinger, chief of the radio section, Bureau of Standards of the Department of Commerce. At their headquarters, the technical experts of the other powers are also preparing.

Out of the conference may come some agreement that will distribute the wireless wave lengths for use in the regions of the Pacific and the Far East.

Paris

The radio conference held recently declared: "The franchise to use one of the longer radio waves is considered at least as important a national asset as a cable." Briefly the technical principles adopted by that conference were: The lower frequency waves or longer wave lengths should be used for the longer distances and the higher frequency waves or shorter wave lengths for the shorter distances; stations situated in the same general locality and working at similar distances should in principle use adjacent frequencies; each nation should use only the smallest possible number of wave lengths necessary to carry on its radio communication; and use should be made of the directional properties of radio whereby the number of communications carried on in a given region may be increased by employing the same frequency a plurality of times.

If the people of different races and nations understand each other the chances of war are lessened. Easy and comparatively inexpensive communication is acknowledged to be one of the most important factors in keeping peoples in touch and nations out of war.

The Navy Department, under authority from Congress and through the use of its wireless stations in the Pacific, is providing a low-priced channel for news reports back and forth across the Pacific and many daily papers in and across the Pacific now get all their current foreign news by wireless, but this service is not yet extended to Japan and Australia. The Pan-Pacific Press Conference which met at Honolulu on October 21 passed a resolution urging that "such service be expanded and extended to all parts of the Pacific where practicable and that the charges for such service shall not exceed the amounts necessary to make such service self-supporting."

Another outgrowth of this use of the wireless is that several governments, including the British and French, have considered the establishment of an international press rate for radio communication, to apply, like the present postage rates, between any two points in their country or between points in two or more countries.

(Editors: The International Conference on the Problems of the Pacific now being held in Washington turns all eyes to the Far East, which is our Near West. To understand the questions discussed during the coming months requires an increase in our knowledge of the resources of the Pacific Ocean and of the character of the races competing for its control.

We start in this issue of the Bulletin a series of 500 word articles, giving the fundamental facts involved in the Problems of the Pacific prepared for Science Service by W. E. Allen of the Scripps Institution for Biological Research of the University of California, at La Jolla, California.

Next week's Bulletin will give an article of the same length on "The Races of the Pacific.")

WORLD PROBLEMS OF THE PACIFIC

1. Can We Hope to Compete With the Hardy Race that Farines and Hardships are Developing in the Far East?

By W. E. Allen,
Scripps Institute for Biological Research,
University of California.

We have been so accustomed to thought and contemplation of the seething cauldron of Mediterranean affairs and we have been so deeply engaged in efforts to understand the essential features of North European life and activity that we have

given scant attention to the conditions and influences to which we are exposed most directly through our western shores.

The geographic remoteness of our trans-oceanic neighbors to the west and the still greater remoteness of their racial attributes and modes of action have given ample excuse in the past for the neglect and indifference which we have shown in that direction. But under present conditions of communication such neglect and indifference is no longer permissible. Recent appliances for navigation of sea and air together with methods of instantaneous transference of news and opinion by cable or by wireless to all parts of the world render it imperative for us to heed the voice of the Pacific and for us to scrutinize those facts and conditions which will give us the best possible understanding of the resources of that area and of the constructive and destructive agencies now present or subject to development in it.

As an aid to such scrutiny this article is presented as the first of a series dealing with widely various problems of the Pacific and with various aspects of those problems. To us as a nation of mankind the most fundamental problem must be that of the human population of this area, the fact of its existence, the question of its maintenance, the possibilities of its future, the inter-relationships of its racial components, the motives of its conduct, the modes of its activities, the trend of its development. But intelligent study of that problem must be carried on through avenues of climatic influence, of food supply, of geographic location, of soil fertility, of mineral resources, of useful and injurious animals and plants and many other things.

One cannot go far in such study without realizing that not only our own nation but the whole world is deeply affected by any change in the prosperity or contentment of any people in the Pacific region. Consider, for example, the case of the Chinese famine: It is obvious superficially that failure of production in the famine district has caused heavy withdrawal of vital necessities from other parts of the world merely to sustain life in the non-producing district. This has had a marked bearing in the fixing of prices on certain commodities and has influenced decisions in manufactures to produce one line of goods rather than another. But deeper than that is the fact that the stress of famine has led to the destruction of every element in the population of the afflicted section except the one which is able to exist without shelter, without really protective clothing and by the use of amounts of food incredibly small. When a people with such powers of endurance gets on a productive basis who can hope to compete with them? Should they gain intelligent leadership what can stay their progress? Now, as always, some of the most pressing political problems center in the question as to the treatment to be accorded to a racial group or groups of tremendous physical endurance by a dominant race which has lost much of its capacity for endurance through prosperity, ease, or indulgence.

SUN'S HALF SEXTILLION HORSE-POWER MAY
COME FROM INSIDE THE ATOM.

Pittsburg, Pa., November 00.-- The source of the sun's energy remains unknown in spite of the years of speculation by astronomers and physicists. But, Dr. H. D. Curtis, of the Allegheny Observatory of the University of Pittsburg, believes that this energy may proceed from sub-atomic forces. It may result from the breaking up of atoms rather than from reactions between molecules of ordinary chemical and physical processes.

The disintegration of radium releases at least 10,000,000 times more energy than is produced by any chemical action known. In the sun there certainly is lead and helium, both of which are the radioactive children of their parent uranium. The existence of radium has been suspected in the sun.

But radium alone is not sufficient as a source of the solar energy. Were the sun composed entirely of uranium and its various radioactive products in due proportion, the heat involved would be only about one-fourth of the amount the sun loses by radiation. Uranium loses half its power in about five billion years.

Astronomers are driven thus to a confession of ignorance; they do not know precisely how the sun's heat is maintained. The most probable assumption, and it is largely an assumption as yet, is that there may well be some dissociation in the atoms of other sorts of matter, similar to that observed in uranium and radium, and that from such stores of subatomic energy comes the greater part of the sun's truly prodigal outflow of energy.

Thirty years ago, the general belief was that the heat of the sun was produced by the resistance that matter encountered as it moved gradually inward as the sun contracted through gravitation. This contraction theory rests solidly on known physical laws and because the amount of the contraction needed to produce the required heat is extremely small, only some 200 feet a year, it would take 10,000 years to produce a detectable, measurable change, so the theory could not be proved or disproved by observation. But geologists objected when Kelvin found that by the contraction theory the sun could not have existed for more than some 18,000,000 years in the past, nor last more than 10,000,000 or so years longer. They considered 10,000,000 years merely as a day in the making of this earth, and they refused to be satisfied with so picayune an allowance of time for geological development.

for

This great heat engine has been operating/certainly a billion, and more probably a hundred billion years and is, so far as we can see, giving out constantly almost the same amount of heat. The temperature of the sun is between 5,000 degrees and 8,000 degrees Centigrade, every square yard of the sun's surface is emitting energy to the amount of about 75,000 horse-power; there are few terrestrial power plants which produce as many horse-powers as does a space three feet square on the surface of the sun. To produce it would require the burning of a layer of coal twenty feet thick every hour. The sun is continually emitting about half a trillion trillion horse-power; or to use a less familiar unit, about a half a sextillion horse-power. Most of this seems to be wasted in space; our earth intercepts about one two-billionth of it, amounting to about one H. P. per square yard, if we could use it. Could we utilize all the solar energy falling on an average-sized roof, it would go far toward lighting a modern city. When the day comes of the discovery of some method to extract the greater part of this solar energy, we shall move out of the age of steel and the age of electricity into an age of energy.

This tremendous heat energy can not be caused by mere combustion. Were the sun made of solid coal, burning in oxygen, it would be black in less than 5,000 years. Emden, with true Teutonic preciseness, puts it at 2,630 years; months, days and hours omitted.

COLORADO RIVER IS COUNTRY'S GREATEST SINGLE WEALTH SOURCE.

By Charles E. Oakes,
Electrical Engineer, Federal Power Commission.
(Written especially for Science Service)

Untold wealth will be added to the nation by the agricultural and industrial development of the states within the Colorado River basin through the utilization of the Colorado River. The machinery for beginning the development of this great power source has been set in motion by the Federal Power Act of 1920.

Hydro-electric power has been running to waste. Thousands of acres of arid land which merely needed water to increase their value a hundred fold can not be developed because the flood waters of this river were not controlled.

In the spring, billions of gallons of water from the river go to waste. Steps have been taken by a number of agencies to harness this stream. The Federal Power Commission has already received five applications for the development of various power sites, one of the applications being for 3,000,000 horsepower, more than three times as much as is now developed in the State of California.

The Reclamation Service has under consideration the storage of enough water behind a reservoir which it is proposed to build at Boulder Canyon to irrigate nearly a million acres of land. The complete development of this river will furnish at

least 5,000,000 horsepower, which will represent an investment in electrical equipment for generation, transmission, and distribution of \$2,700,000,000. The improvement of the river and the installation of the machinery for merely generating the electricity will cost more than twice as much as the cost of building the Panama Canal.

To absorb this immense amount of power a market must be established. It is predicted that the far west will see a great expansion of industry in the coming decade, as it is well known that industries follow the development of power. The great strides in California are examples. The developments in the transmission of electric power have been so rapid that transmission distances of 500 miles are within the realms of possibility, and it is only necessary to establish markets within this area, in order that the power may be utilized. Power from this stream can be distributed over an area included in seven states. It is confidently expected that the recent advances in the electrical engineering industry will hasten the development of the west.

ESTABLISH FOREST EXPERIMENT STATIONS TO
TEACH HOW TO GROW WOOD LIKE OTHER CROPS.
(By Science Service)

Washington, November 00.-- Now we have experiment stations to teach us to grow our forests. For years the agricultural experiment stations have instructed the American farmer on nitrates and potash and selection of seed and animal husbandry and a thousand other things. In two generations this instruction has lifted American agriculture from a primitive art to a modern science. In North Carolina and Louisiana the first two forest experiment stations of the Department of Agriculture have just been established.

The average man does not realize that forests can be grown like other crops, and he does not know how critical the need for learning to grow these crops has become. Five-sixths of the original forests of the United States have been destroyed - most of them ruthlessly and wastefully. The pinch of the timber shortage is already felt in the high price of lumber and the lack of housing. Timber that was once abundant and near at hand is gone from the East and Middle West, and lumber must now be shipped in from great distances at large expense.

Of our vast original forest domain of more than a million and a quarter square miles, over one-tenth has been so absolutely sterilized by deforestation and fire that it produces nothing. To this scrap-heap of potentially rich land we are now adding from twelve thousand to fifteen thousand square miles every year. In addition to this idle land, there are some three hundred and eighty thousand square miles of cut over forest land now producing in second growth only a fraction of what it might yield under intensive forest management.

Growing forest crops is the only answer to the menace of a timber famine. Forest crops require from 50 to 200 years or more to grow. A mistake in methods may take decades to correct. Although wood is not so absolutely indispensable as food, and although organized society might persist without it, lack of it would make an enormously impoverished and weakened society. A nation without forests or access to forests is unthinkable.

Forests in civilized communities are rightly relegated to the poorest soils. They can not profitably be cultivated, artificially fertilized, or irrigated. Hence the art of growing them is all the more difficult, and it is necessary to study and to take advantage of every favorable factor in soil, climate, and the natural variations in the different species of trees. This is a piece of work requiring endless patient research.

How best to harvest mature timber in order to establish a young growth by natural seeding and thus eliminate the laborious and costly work of planting is another problem of major importance.

The Forest Service of the Department of Agriculture has a program that calls ultimately for at least ten forest experiment stations - 5 in the eastern forest region, 3 in the Rocky Mountains, and 2 on the Pacific Coast; in short, one station for each great group of forestry problems.

(Editors: It is suggested that this be used about December 1.)

NEWS OF THE STARS
December's Brilliant Skies.
by Isabel M. Lewis,
of the U. S. Naval Observatory.
(Science Service)

By nine o'clock in the evening in the early part of December seven first-magnitude stars, not to mention an even larger number of second magnitude, may be seen in the eastern half of the heavens.

Leading this glorious parade of brilliants is Aldebaran, the ruddy star in the V-shaped group of the Hyades, and just to the south-east of this group appears Orion, generally considered to be the finest constellation in the heavens. It contains two stars of the first magnitude; magnificent Rigel, blue-white in color, and diagonally opposite to it in the quadrilateral that outlines the constellation, deeply-glowing Betelgeuze which we now know to be one of the super-giants of creation with a volume more than twenty-five million times that of our own sun. The other two corners of the quadrilateral are occupied by the second magnitude stars, Bellatrix, a short distance to the west of Betelgeuze, and Saiph, following Rigel to the east. The Belt of Orion is outlined by three evenly-spaced second magnitude stars and the hazy group of faint stars below the belt form the Sword of Orion. In the center of this faint group also may be glimpsed the Great Nebula in Orion, a magnificent object in the telescope.

North of Orion and Taurus, with its two conspicuous groups of the Hyades and Pleiades, we find the golden-yellow first magnitude star Capella, the Goat, in the constellation of Auriga which is in the form of a pentagon, the corners marked by two second magnitude stars, Capella, and two stars of the third magnitude. Capella can also be found by the aid of the small group of three faint stars near-by known as "The Kids". Capella is a star of the same type as our own sun. We can imagine the sun presenting very much the same appearance if we were viewing it from the distance of Alpha Centauri, the nearest star, but if it were placed at the distance of Capella, which is some forty light years away, it would be just barely visible without a telescope. Capella has a companion star so close that it is just at the limit of the resolving power of our greatest telescopes. The distance between the two—only five hundredths of a second of arc—was successfully measured by the new Michelson Interferometer. In fact Capella served as a test of the power of the new instrument before an attempt was made to measure the still smaller diameters of the giant stars.

Just appearing above the southeastern horizon we may now glimpse Sirius, the brightest star in the heavens, and a little farther to the north the first magnitude star Procyon. A little to the west and north but not far from the eastern horizon at this time may be seen Castor and Pollux, the latter also a first magnitude star, in the constellation of Gemini.

With the eastern half of the heavens studded with such an array of scintillating jewels it is an indifferent eye indeed that sees nothing to admire in the evening skies on these early winter evenings.

AERIAL PHOTOS OF INDIAN MOUNDS

Washington, November 00.— (Science Service) .— For the first time an American archeologist has used aerial photography to obtain bird's eye views of the oldest man-made topographical features of America, the Indian mounds. David I. Bushnell, jr. is using such photographs of the mounds near East St. Louis to illustrate a report of the Bureau of Ethnology of the Smithsonian Institution here.

FIND NO NEW ATMOSPHERIC GAS

Geneva, Switzerland, November 00 (Science Service).— Researches made by C. Borel and A. Jaquered, and reported to the Swiss Physical Society have failed to bring to light any unknown atmospheric gas. These two scientists for two months daily diffused through hot quartz samples of air in the hope of finding a new element, but their efforts were fruitless.

(Editors: These shorts will provide a daily feature or they will come in handy as fillers.)

DO YOU KNOW THAT --

The life of an oil-well ranges from a few months to twenty or twenty-five years.

No other country has suffered so many severe earthquakes as Japan, where, in modern times, destructive shocks have occurred on an average once every two and a half years.

The railways of the United States use about 90,000,000 ties a year, for renewals and new construction. This is equivalent to 300,000,000 cubic feet of timber.

Practically all of the peppermint and spearmint grown in the United States, and half of that grown in the world, is produced in one section of the country comprising parts of northern Indiana and southern Michigan

DO YOU KNOW THAT--

A cannon-ball traveling half a mile a second would take 80,000,000,000 years to reach the most distant known object in the heavens; viz, the star cluster known as N.G.C. 7,006.

A light-year, used in astronomical measurement, is in round numbers 5,860,000,000,000 miles.

The New Madrid earthquake, which occurred in the middle Mississippi Valley early in the nineteenth century, consisted of a series of nearly 1,900 separate shocks, extending over a period of some months. Eight of these were very severe and were felt more or less distinctly over the whole of the then settled parts of the United States. Occasional aftershocks have been experienced in the same region almost every year down to the present time.

A recent law in Michigan provides for the planting, maintenance, and protection of large numbers of nut and other food producing trees along the highways.

DO YOU KNOW THAT --

Some time ago the feat of measuring the enormous star Betelgeuse, in Orion, put astronomy on the first page of the newspapers. A few other stars have since been measured, and one of them, Antares, in the constellation of Scorpio, turns out to be much bigger than Betelgeuse. Its diameter is something like 420,000,000 miles.

John Daniel, the famous gorilla that died while in the custody of Ringling Brothers, is to be mounted and preserved at the American Museum of Natural History in New York.

The finger prints of Leonardo da Vinci, who used his fingers freely in laying on paint, have been utilized to identify some of his paintings.

A German investigator reports that watering plants with a dilute solution of glycerine or wood alcohol increases their growth considerably. He experimented with cabbage, rye, beans, and some other plants; and reported an increase in yield in one case as high as 122 per cent over the untreated plants.

DO YOU KNOW THAT ---

A Russian 9 feet 3 inches in height was exhibited in London in 1905.

On April 29, 1851, an electric car was operated on a road between Washington and Bladensburg by Prof. Page, of the Smithsonian Institution. The motive power was supplied by a battery of 100 galvanic cells carried on the car, and the speed attained was 19 miles an hour.

Ornaments of jet were made in Britain in Prehistoric times. The center of the British jet industry has always been the region about Whitby, in Yorkshire, where the supply was formerly picked up in loose pieces on the sea-shore. It is now regularly mined, in the same manner as coal.

Studies conducted at Cornell University between 1915 and 1920 showed that with an average annual rainfall of 29.31 inches, the soil received from the rain an average of 12.51 pounds of nitrogen per acre, which serves as a fertilizer.

DO YOU KNOW THAT ---

Remarkable feats have been accomplished in Germany lately with motorless aeroplanes. One machine soared more than six miles, while the pilot made sharp turns, figure-eights, etc., at will. Another soaring machine remained in the air for 21 minutes, rising 450 feet above its starting point. The albatross and the turkey buzzard must look to their laurels.

Five Eiffel Towers, piled one on top of the other, would not equal in height the depth of the Red Jacket copper mine shaft in northern Michigan. A Million and a half cubic feet of material was removed in sinking this shaft.

Strong electrical currents are sometimes carried down the steel wire used in flying Weather Bureau kites. One observer was killed when lightning struck the kite wire and several have been shocked. The kites are never intentionally flown during a thunderstorm.

A small amount of copper is present in all plants grown in natural soil. It seems to have some nutritive function but not to be an essential element.

DO YOU KNOW THAT ---

The waters of the ocean contain thousands of millions of tons of gold. It has been estimated that there is something like \$50,000,000 worth for every inhabitant of the globe. The largest proportion of gold, amounting to nearly 4 grains per ton of water, has been found at great depths in the Atlantic Ocean.

Gas issuing from a seam of coal was collected in a bladder by Sir James Lowther in 1733 and burned before the Royal Society a month later. This was probably the first experiment in gas-lighting.

A French workman coupled a dynamo to a live electric circuit and was astonished to see it begin to rotate. The electric motor owes its origin to this accident, which Clerk Maxwell pronounced the most important discovery of modern times.

In an anti-malarial campaign on the Island of Cyprus, mosquitoes which were caught in caves and cisterns, were exterminated by burning.
