

## SCIENCE NEWS

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## THE 1940 ICE PATROL SEASON

THE 1940 ice patrol season is beginning in the North Atlantic, with four U. S. Coast Guard cutters on duty. The *Chelan*, *Cayuga* and *Ponchartrain* will ply the steamer tracks, looking for icebergs and other menaces to navigation, while the *General Greene* will gather oceanographic and other scientific data.

Because of the European war, difficulties have been multiplied for the ice patrol. In normal times, its vessels base at St. John's, Newfoundland, thus saving a great deal of time and fuel in getting to and from their stations at sea. However, because the cutters are armed, it has been considered best for them to keep away from ports of belligerent powers, and they will base in Boston and New York. Only the *General Greene*, whose exceedingly light armament "doesn't count," will continue to use the Newfoundland port.

Even more serious will be the absence of cooperation by freight and passenger vessels. In peace time, any ship that sights an iceberg radios its location at once to the ice patrol vessel on duty, which collates all such information and sends out general ice broadcasts for the benefit of all shipping. Now, however, all shipping of belligerent powers, and most neutral vessels as well, are keeping a strict radio silence lest they betray their positions to Nazi submarines. So the ice patrol will have to find all its own icebergs.

The radio silence will help in just one respect. Ordinarily it is necessary to request all shipping to suspend radio sending while the ice broadcasts are on the air. Now they have the whole air to themselves without asking for it.

From such meager information as it has been possible to obtain so far, it appears that the 1940 ice season is starting in more or less normal fashion. Very little ice has been reported. Last spring was one of the heaviest ice years of record; the ice patrol had to go on duty nearly a month early. It is fervently hoped that 1940 will be a low ice year, because with cooperation from shipping wiped out by the war, and convoys taking unorthodox tracks to keep away from possible submarines, the menace from any given iceberg will be increased many fold.

In addition to the ice broadcasts, the vessels of the ice patrol also send frequent weather reports to the U. S. Weather Bureau. This part of their activity is not particularly relished by the British Admiralty, because Britain is doing its best to maintain a "weather blockade" of Germany, and of course Nazi antennae can also pick up these North Atlantic weather reports. However, since the information is particularly desired in this country for its usefulness to the navigation of the clipper planes, the messages will continue to be sent, regardless of objections.

## A REMOTE ACTING THERMOMETER

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A NEW kind of remote acting thermometer, that can

measure the temperature of distant objects without going near them, has been developed by Dr. John Strong, of the California Institute of Technology.

The new device is a pyrometer. This name is a misnomer, in part, for ordinary pyrometers are commonly used only for measurements of temperatures of extremely hot objects such as the molten metal of an open hearth furnace in a steel mill.

As a metal gets hotter and hotter, it turns to dull red, bright red and finally virtually white in color. An ordinary pyrometer uses this change of radiation wave-length (for that is what the different colors mean) to determine temperature.

Dr. Strong's new instrument simply applies this procedure to invisible radiation wave-lengths in the very far infra-red region of the spectrum. His pyrometer is useful in the temperature range from minus 100 degrees Centigrade to the temperature of boiling water, with an accuracy of 0.1 of a degree Centigrade.

To measure temperatures with the new pyrometer a small telescope attached to the device is pointed into the wide-mouthed neck of a jug of melting, cracked ice. This gives a reading on the scale of the instrument corresponding to a temperature of zero degrees Centigrade.

Next the telescope is pointed at an opening in an ordinary five-gallon oil can containing live steam. The reading on the instrument is noted for this known temperature of 100 degrees Centigrade. Finally the object, whose temperature is to be measured, is picked up in the telescope and it produces a given reading on the instrument.

Knowing the two fixed temperature point readings (melting ice and steam at 100 degrees) one needs only to look on a conversion chart at the point observed by the instrument for the given object and its temperature can be read off.

In principle the new pyrometer is an infra-red spectrometer which—by means of a grating and multiple reflections off suitable crystal surfaces—picks out the single infra-red radiation wave-length of 8.8  $\mu$  (1,000 mu corresponds to wave-lengths one millimeter long). The emission of this particular wave-length in the infra-red region by the ice, the steam and the object whose temperature is being measured, is used and correlated into a final temperature reading.

Important applications await the new instrument. It can be applied for temperature measurements on objects that are inaccessible for ordinary thermometer devices.

It can be used, too, in meteorology to make determinations of the water vapor content of the atmosphere. In astronomical and terrestrial physics new uses are being studied.

## THE PRODUCTION OF MAGNESIUM AND MANGANESE

Two metals, magnesium and manganese, not now plentifully used in their pure state by American industry, promise to be available at reasonable prices as the result of production of cheap electrical power by Grand Coulee and

Bonneville dams in the Pacific Northwest. Promising deposits of ores of those metals occur in that region.

As a metal, magnesium has been known in the past as "old-fashioned flashlight powder." But it is a true metal of the future because it weighs two thirds as much as aluminum and less than a fourth as much as steel, yet its alloys of extremely light weight have working properties similar to steel. Ultralight magnesium alloys promise to find extensive use in the construction of airplanes and automobiles, portable tools, and all sorts of machinery, furniture, novelties, etc., as soon as the price becomes less as it promises to do when hopes for its production in the Pacific Northwest are realized.

Processes for extracting metallic magnesium using cheap electrical power have been under development jointly by the State College of Washington and the U. S. Bureau of Mines at Pullman. From Washington magnesite, the magnesium metal can be produced by two different processes, one of which is similar to an Austrian process of direct carbon reduction the details of which are a closely guarded military secret. The cost of producing on a large scale of operation high-purity magnesium metal would be only 8 to 10 cents per pound compared with the selling price of about 28 to 30 cents per pound now in carload lots and \$5 per pound in 1915.

High-purity metallic manganese, useful for steel alloying and the nonferrous alloy industry, can be produced from the high silica manganese ore of the state of Washington. Already in pilot plant production at Boulder Dam by the U. S. Bureau of Mines, it has been estimated that commercial production on a large scale would see manganese metal at 7 to 9 cents per pound compared with the present 40 to 50 cents per pound.

High manganese alloys are reported to have a springiness unrivaled by any other metal, a vibration damping capacity more than 100 times that of steel. Copper alloys that can be hardened depend on a content of manganese for this property. The greatest use of pure manganese would be in making many alloy steels, to which manganese is already essential without adding to them other elements such as carbon, aluminum and silicon, hitherto present in available forms of manganese.—WATSON DAVIS.

### MORE EFFICIENT STEAM TURBINES

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MORE efficient and safer steam turbines, meaning cheaper electricity for every one, should come from the new, full-sized but completely experimental turbine installation displayed at the Schuylkill Generating Station of the Philadelphia Electric Company.

The man behind this research, expected to furnish the bedrock of experience for to-morrow's sources of power, is F. T. Hague, engineer of the Westinghouse Electric and Manufacturing Company. In his laboratory studies he had pushed turbine steam operating characteristics up from 250 pounds to the square inch of pressure and temperatures of 600 degrees Fahrenheit (1920) to 1,250 pounds pressure and temperatures of 900 degrees—hot enough to melt lead. What he needed for a final test was a life-sized installation and a plant boiler capacity which could create the 125 tons of steam needed, each

hour, to run such an installation. The plant of the Philadelphia Electric Company provided such capacity.

Moreover, this installation had to have some means of looking inside it and seeing how the turbine blades were vibrating under the extreme shock. "To form a mental picture of this shock," Mr. Hague explains, "imagine a turbine blade moving 350 miles an hour abruptly entering a steam jet density moving 1,200 miles an hour." Oscillations at the rate of 126,000 times a minute occur in the blades, or 181,440,000 per 24-hour day.

Just as trees sway in a gale, so too do the turbine blades sway and vibrate under this super-hurricane of hot, "live" steam. If the vibrations are just right the blades enter into what engineers call resonance. Eventually they break off as their sway becomes greater and greater. If conditions are properly arranged, however, the vibrations can be kept out of resonance and the blades will not break. But to determine this resonance and non-resonance condition engineers have to be able to look inside and see what is happening. While the turbine blades are whirling some 60 revolutions a second around the turbine shaft an automatic camera takes pictures through a tiny quartz window in the shaft at the rate of two a second.

"With this new apparatus," Mr. Hague explains, "a beam of light is carried through the shaft of the turbine and up into the blade itself, where mirrors reflect it out again, faithfully recording all vibrations. In this manner the harmonic movement of the blade can be recorded on film for any stated condition of operation. The light beam, supplied by an arc lamp, is deflected by a stationary mirror into the rotating shaft," he pointed out. "A slanted mirror inside the shaft throws the light beam through a hole in the rotor disc and then through a smaller hole inside the blade, towards a small curved mirror on the end of the blade. This curved mirror sends back the light by way of the slanted mirror in the shaft, to a screen. When the turbine rotates without vibration, the light point on the screen describes a circular path. But when the blade vibrates, the curved mirror mounted on the end of the blade deflects the light beam away from this path and waves or notches appear on the circle. The wavy circle described by the light is recorded on film by a specially designed speed camera. By study of the resulting pictures the stresses on the blades are deduced directly from the magnitude of the waves by proper calibration. By shifting the mirrors, it is possible to measure side-to-side as well as back-and-forth vibrations."

### THE CHEMICAL CONTROL OF CANCER

A STEP toward the control of cancer by chemical treatment is announced by Dr. Leonell C. Strong, of Yale University School of Medicine, in a report published in *The American Journal of Cancer*.

So far the results apply only to mice, but they indicate the possibility of success in chemical treatment of cancer in other species, because they show that the same chemicals can affect cancers, leaving adjacent normal cells untouched, regardless of the genetic origin of the mouse.

Growth of spontaneous cancers in six different strains of mice was slowed, and in some cases the cancers liquefied, while in others they disappeared completely, when the two

chemicals, methyl salicylate and heptyl aldehyde, were added to the animal's food. This shows, Dr. Strong explains, that tissue specificity, a fundamental factor in cancer development, will not impede chemical control of the malignant disease if a chemical that will check or reverse the malignant process can be found. In other words, even though there is an intrinsic genetic factor which plays a part in predisposing an individual to cancer, the cancer can be controlled by chemical attack. The chemicals probably could not change the genetic factor predisposing to cancer, but by their effect on other fundamental aspects of the cancer, they could check the malignancy.

This work is the logical development of similar work on the use of true oil of Gaultheria and of heptyl aldehyde used alone, which has been reported by Dr. Strong during the past several years. The next step toward the chemical control of cancer, Dr. Strong says, will be to find a combination of pure chemicals which have the maximum effect on cancers in laboratory animals. After that it may be time to talk about the chemical control of human cancers.

### ITEMS

FINLAND, to-day in the limelight as a country which has done well with meager resources, appears to owe its success partly to a declining birth rate and emigration, both of which have kept down the crowding of farm population. A report to the *Population Index*, published at Princeton, N. J., shows that the Finnish birth rate has tobogganed an irregular but mainly downward course for two centuries. From 45 births per 1,000 population in mid-eighteenth century, the birth rate stood at 20 per 1,000 in 1937. Thanks to the Swedish parish system of registering vital statistics, Finland has a continuous record of births and deaths from 1750, to show trends. Characterizing Finland as predominantly rural, though with a strong recent trend toward city and industrial development, the report says that most of Finland's farmers hold small land areas, but three fifths of the farm families own their land. Only seven per cent. of the land is cultivated. The soil is thin, deficient in lime and phosphorus. Marshlands are so acid that it takes generations of cultivation to make them productive. Factors which have enabled the Finns to achieve a reasonably satisfactory adjustment of population to their resources without extreme wealth or extreme poverty include intelligent use of these meager resources, the cultural level of the people, forward-looking social legislation.

DISCOVERY of what makes the prick when you stick yourself with a pin, or what makes the hurt of a small cut, has been announced by Drs. Sol Roy Rosenthal and David Minard, of the Municipal Tuberculosis Sanitarium and the University of Illinois College of Medicine. The pricking sensation, the hurt of a cut and the pain of a skin burn or a playful pinch are due to a chemical, called histamine, which is liberated when the skin is injured and which then acts directly on the endings of the sensory nerves, causing them to send the pain or prick message to the brain. The discovery is reported in the current issue of the *Journal of Experimental Medicine*. The superficial layers of skin were removed over a small area,

and about an hour later the chemical, histamine, was dropped onto the surface. Very weak histamine solutions, of a dilution of 1: 60,000, gave a slight tingling, pricking or burning sensation. With more histamine in the solution, the burning or pricking sensation was more marked and acute pain was felt. Injecting histamine into the skin gave the same results. When tissue-paper-thin layers of skin, shaved off, were stimulated by 10-second electric shocks, histamine was liberated, as shown by finding it in washings from the skin.

BLACK ducks can dive for food on the bottom of water as much as ten feet deep, it has been demonstrated by Harry Leon Kutz, of Cornell University. Mr. Kutz will report his observations in the forthcoming issue of the *Journal of Wildlife Management*. The feat of this common wild duck species is all the more remarkable because as a rule black ducks do not dive for their food at all, preferring to gather their food ashore. However, when Mr. Kutz dropped corn in water at depths of five, seven and ten feet, the black ducks competed successfully for it with mallards at the two shallower depths, and monopolized it at the ten-foot level. That such a dive was not easy for the black ducks is evident from Mr. Kutz's description: "Preceding each dive a bird would assume a definite stance with neck fully extended upward and muscles tensed. Then with a powerful kick from both feet it would disappear beneath the surface of the water, the kick causing a splash of no inconsiderable proportions."

SUCCESS in the treatment of abscessed teeth with the chemical remedy, sulfanilamide, was reported by Dr. Fred R. Adams, of New York, to the recent Philadelphia Dental Meeting. One injection of a hot sulfanilamide solution directly into the abscess killed all the trouble-making germs in every case but two. One case required two such treatments and another, three. Some of the abscesses that were cleaned up in one treatment had persisted for 10 years. X-ray pictures of these cases showed that after a few months new bone had grown to fill the area formerly occupied by the abscess. Heating the sulfanilamide solution for treatment is important. A stronger concentration of the drug can be obtained in hot water and the heat reinforces the chemical's action on the germs. This method of using a hot sulfanilamide solution for irrigation should, in Dr. Adams' opinion, be useful in treating infections in other parts of the body, such as sinus infections and the bone diseases osteomyelitis and osteitis and in cellulitis involving bone.

A NEW kind of printer's ink that is sold in chunks, looks like coal when broken up for use, and may revolutionize printing by speeding up the process and turning out clearer print for reading, was described recently. A "cold setting" ink, the new printing material dries instantly on paper as it comes through the presses, according to Frank B. Breyer, chemical engineer of New York City, who spoke before the Technical Association of the Pulp and Paper Industry. Cold setting, he explained, reverses usual tactics of heating the paper, in order to dry the ink when the printed sheet runs over high speed rotary presses.