SCIENCE NEWS-LETTER

A weekly summary of current science, for personal use or use in classes, study clubs or libraries. Publication of the articles contained is expressly prohibited. $5 a year, postpaid.

SCIENCE SERVICE
1701 MASSACHUSETTS AVENUE
TELEPHONE, MAIN 2615
WASHINGTON, D. C.
EDWIN E. SLOSSON, EDITOR
HOWARD D. WHEELER, MANAGER

No. 61 Edited by Watson Davis May 29, 1922

LONG BUT BUSY TRIP FOR SCIENTISTS WITH AMUNDSEN

Seattle, Wash. May 00.- "What do you do when you get frozen in the ice? Play cards or smoke, if you are not asleep?" These are the questions most often asked of Dr. H. U. Sverdrup in charge of the scientific work of the Amundsen polar expedition, that leaves here for the north on June 1.

Dr. Sverdrup smiles in answer. For months he and Capt. Roald Amundsen, discoverer of the South Pole, have been planning the scientific work of this venture that may last six or seven years and will result, if all goes well, in their ice-bound vessel the "Maud" drifting with the arctic ice across the North Pole to the Atlantic. After Dr. Sverdrup has told the inquirers of the thousands of scientific observations that are contemplated, they wonder why the "Maud" carries a piano, phonograph, and other recreational facilities. "The only thing I am afraid of regarding the expedition is that we will not be able to accomplish more than a fraction of what we want to do, because the work ahead of us does not stand in a reasonable relation to the personnel which has to carry it out," says Dr. Sverdrup.

Since the "Maud" arrived at Seattle on August 31 of last year, after three years of isolation from civilization, Dr. Sverdrup has been arranging for the scientific equipment of the coming expedition and he and Capt. Amundsen have enlisted the support of many scientists and research institutions of this country.

The principal object of the Amundsen expedition is to study the physical condition of the 2000 fathoms Arctic sea, and much time will be consumed by determining the depths, temperatures, salinities and currents of that great ocean. But along with the oceanographic work, observations on weather conditions both at the surface of the ice and in the upper air will be made, the magnetism of that part of the earth will be recorded by laborious and delicate methods, and even the solar radiation

during the arctic day, the ice radiation during the arctic night, and the temperature variation of the ice covering the sea will be studied. The scientific staff of the Maud will have the unique opportunity of making exact observations of gravity over a very deep sea by methods that are as exact as those made on land.

Radio and the airplane will aid the exploration. Wireless will keep the explorers in touch with civilization, and beginning in October when the vessel reaches far enough north, a daily weather radiogram will be sent to the U. S. Weather Bureau in Washington. Radio time signals from America will replace elaborate astronomical observations formerly necessary to determine longitude. Capt. Amundsen will have an airplane and expert aviator on board. By air more geographic exploration will be accomplished in a few hours than would be possible in days of sledging. It is planned to extend the flights 200 miles each side of the vessel, and the flying will take place in the summer or the first part of the summer, when the temperature is agreeable.

AMUNDSEN'S PRESENT VENTURE
FOLLOWS FOUR YEARS' ARCTIC VOYAGE

This is not the first venture of the "Maud" carrying Capt. Roald Amundsen and his party into the arctic.

Captain Amundsen's expedition left Norway in July 1918. The plan was to follow the Russian and Siberian coast eastward to about 150° to 180° east longitude, to penetrate as far north as possible in this longitude, and let the "Maud", especially built for this expedition, freeze in there. The vessel was then to be carried by the drifting ice fields across the Polar Sea until it was released from the grip of the ice between Spitsbergen and Greenland, where the ice masses from the Arctic are slowly drifting south to the Atlantic Ocean. Amundsen's plan is not new in the history of arctic exploring; the drift across the Polar Sea was, as is well known, accomplished by Fritjof Nansen with the "Fram" in 1893-1896.

The greatest discovery made by Fritjof Nansen was, no doubt, that that the Polar Sea, contrary to the common belief, was a very deep sea, 2000 fathoms or more. This discovery opened a large field for important oceanographical investigations, but unfortunately Nansen was not prepared upon meeting with these great depths, so his oceanographical observations, although extremely valuable, are not entirely satisfactory.

Capt. Amundsen's plans for this expedition were published in 1908, two years

after his accomplishment of the Northwest Passage. Many circumstances, however, delayed the execution of his plans, but, finally, Amundsen was able to leave Norway on board his new vessel, with a personnel in all of ten men. He found that it is considerably easier to follow the north coast of Siberia on a map than actually to do it. The "Maud" soon met heavy ice, but succeeded in penetrating to Cape Chelyuskin, the north point of the continent, where further progress was stopped absolutely by the ice and the expedition had to seek winter quarters close to the coast. Although this meant a prolongation of the Expedition for at least one year, the explorers greeted it with enthusiasm, because wintering there enabled them to carry out a number of investigations in a place which had hardly been touched by former expeditions.

During the winter they made observations of barometric pressure, temperature, humidity, and wind, and the magnetic declination, and the tides. They succeeded in constructing from miscellaneous material on board a tidal gauge which operated satisfactorily.

The ice held the expedition bound for a whole year, less one day, at Cape Chelyuskin. Then Capt. Amundsen hoped to succeed in beginning to drift. He wanted, however, to send the scientific observations home, to prevent their loss in case the vessel was crushed by the ice. They were entrusted to two men, who were to bring the them to the nearest settlement, the Russian wireless station at Dickson Island, about 600 miles to the southwest. Along the coast, which they were to follow, three caches with provisions had been left by former expeditions. The plan seemed safe, but unexpected events happened. Capt. Amundsen did not succeed in beginning the drift, and the "Maud" reached Nome safely in July, 1920, but the two men who carried our observations lost their lives. With them all the records from the self-registering instruments were lost, but copies of the absolute observations fortunately had been made and kept on board the vessel.

In September, 1919, when the "Maud" proceeded to the east, the ice conditions were still more unfavorable than in the summer of 1918. Every attempt to penetrate to the North was frustrated, and at the end of the month there was nothing left but to seek a new place for winter quarters at the coast. Thus it happened that the "Maud", in the winter 1919-1920, was frozen in about 700 miles from Bering Straits at the island Ayon.

It was during this winter that Dr. H. U. Sverdrup, in charge of the scientific work of the expedition, lived seven and one-half months the only white man among a

little known tribe of natives, called the dear-Chukchi who are a nomad race following their herds of domesticated reindeer.

In July 1920 the "Maud" was released from the ice, and Capt. Amundsen proceeded to Nome to get additional equipment for the drift. Here four men left. The expedition had already lasted almost as long as they expected when leaving Norway. With three companions, Amundsen left Nome on August 8, 1920, with the intention of taking some natives on board from the Siberian coast, and, if possible, begin the drift. But now the ice hardly permitted him to get inside the Bering Strait. Eighty miles from the Strait, the "Maud" was closed in, and had to winter for the third time. The scientific work during this last wintering was hampered, partly on account of the small number, partly by the severe weather conditions. Registrations of the meteorological elements and the tides were kept up, and in addition, magnetic, astronomic, hydrographic, and pilot-balloon observations were carried out. The main results, perhaps, were attained on a sledge trip which two members made along the coast. They were away from the "Maud" for two and one-half months, and covered about 1200 miles.

In September 1920, the propeller was broken and the shaft damaged in the struggle against the ice, so that in the summer of 1921 the "Maud" had to be sailed to Seattle for repairs.

Now Capt. Amundsen is making another attempt at placing the "Maud" in the northward-moving arctic ice and this time he hopes to be successful.

BALLOON RACE BLENDS
SCIENCE WITH CHANCE

I

Milwaukee, Wis. The winning of the national balloon race starting here May 31 will be largely a matter of skill in applying meteorological science, according to Lt. William E. Connoly of the Army Air Service, operations officer for the three army balloons which will compete with two navy and eight civilian gas bags for national honors and to represent this country in the international race at Geneva in August.

This is the first race in the United States to start so far north and all the teams are eagerly awaiting the final observations of the government experts which will furnish the data upon which the aeronauts will work to outwit the weather. This information may decide whether they are to be swept into the wilds of Canada to meet hardships like those which last year befell Lieuts. Kloor, Hinton, and Farrell, or are to be carried further back into this country to encounter other dangers.

The winning balloon is the one which lands farthest from the starting point. Any intentional stoppage constitutes the final landing. In cases of unintentional stoppage the flight must be resumed within 15 minutes while any descent on water and help from a boat disqualifies.

The balloons are all of the same capacity, made of standard material, and according to the rules are required to use coal gas, but special permission has been given the Navy to use helium in one of its entries. The performance of this balloon will be watched with special interest as this is the first time helium gas has been used in such a competition.

The equality in regard to size, design, and equipment of the big bags makes the race largely a question of skill in handling in relation to the air currents. While the design of the free balloon has changed but little in over one hundred years, great advances have been made in meteorological science. The 1920 winner was a trained meteorologist who completely outdistanced the other contestants although he landed sooner than any of them.

NEWS OF THE STARS

How Hot are the Stars?

By Isabel M. Lewis,
of U.S. Naval Observatory.

The photosphere, or radiating surface of the sun, it has been estimated, has a temperature of 6000 degrees Centigrade and even at very moderate solar depths this increases to 10,000 degrees Centigrade. In the cyclonic whirls of sunspot vortices the temperature of the rising columns of gas drops as a result of rapid expansion to something like 3,000 degrees Centigrade. Yet at the base of these whirling vortices it is believed that the temperature lies in the neighborhood of 20,000 degrees Centigrade, and in the depths of the sun a temperature of millions of degrees is probably attained.

In the comparatively cool sunspot regions where the temperature is approximately that of the hottest source of terrestrial heat,-the electric furnace-certain refractory chemical compounds exist, such as the oxides of titanium and magnesium. The red giant stars, Betelgeuse and Antares among others, at one end of the chain of stellar evolution and the red dwarf stars at the other end have spectra that are very similar in some respects to the spectra of sunspots. They reveal the presence in these stars of oxides, chiefly of titanium, and of carbon compounds. The temperatures

of these stars are estimated to be about that of the sunspot regions or between 3,000 degrees and 4,000 degrees Centigrade.

Stars that show numerous metallic lines in their spectra, such as Pollux and Arcturus, come midway between the deep red giants and dwarfs and the solar type stars of which our sun is one. They average about 4,000 degrees or 5,000 degrees Centigrade in surface temperature.

Stars of the so-called solar type such as Capella and the sun average about 6,000 degrees Centigrade in temperature. The metallic lines in the spectra of these stars are less pronounced than in the later metallic types, and consequently the stars are hotter.

The hottest of all stars are the white hydrogen stars and the intensely luminous helium stars. Among these stars we number the well-known Sirius and Vega and Rigel. Their temperatures lie between 10,000 degrees and 12,000 degrees centigrade.

In all instances these are the temperatures that prevail at the radiating surfaces of the stars. How high the temperature rises within the depths of the star's interior where abnormal conditions of pressure and temperature must exist it is more difficult to determine but it is believed that it must run as high as several million degrees.

The range of the surface temperatures of all the stars appears to be confined between the comparatively narrow limits of 3,000 degrees to 12,000 degrees Centigrade. Stars below 3,000 degrees in surface temperature would probably fail to shine as luminous bodies while stars with surface temperature in excess of about 12,000 degrees Centigrade would be so excessively hot that they would suffer disintegration as a result of the intensity of radiation pressure. Such stars would soon be surrounded with nebulosity as so many of the intensely brilliant helium stars are or unstable internal conditions might result in the production of a Nova.

BROADCASTS

Radio News of the Week

RARE METAL TANTALUM
APPLIED TO RADIO

Chicago. Discovery of hitherto unknown properties of the metal tantalum and of a way to work this formerly baffling element, which may find commercial application in the apparatus used in charging storage batteries and the perfection of vacuum tubes for radio sets, has been made after six years experimentation by Prof. Clarence W. Balke, formerly of the University of Illinois, in the Research Laboratory

of the Fansteel Products Company, according to Roland Webster, secretary of the company in North Chicago.

The four outstanding features of this metal which have attracted attention in scientific circles as offering an advantageous substitute for tungsten and molybdenum in many classes of work are its high melting point, its resistance to the strongest acids, its ability to rectify electric currents, and its absorption of gases.

Do not rely on the books for the properties of tantalum, Mr. Webster warns. The tables say this metal is hard, while Prof. Balke has found that it is relatively soft. Several of the other physical constants are shown to be in error because of these investigations.

Experiments are now being made to determine the practicability of using this metal in making vacuum tubes. The trouble with the present vacuum tube is that the air is not completely exhausted and gasses are formed within the lamp which reduce its efficiency. It is claimed, these interfering gases would be absorbed by the tantalum or converted into non-gaseous compounds and a more efficient tube produced. This would probably extend the range of the radio and improve the quality of the tone.

Storage batteries could be charged with an alternating current which would be changed into a direct current by means of this metal.

Tantalum was produced in Germany before the war, but the German patents taken over by this government did not reveal the real secret of how to handle it. Some of the difficulties of working it may be seen from the fact that it has to be produced in a vacuum and that at its high melting point, about 2,750 degrees Centigrade, there is no container which can withstand the heat necessary to reduce it.

These difficulties gave the element the name of tantalum because it had the same tantalizing effect upon scientists who tried to work it as did the receding water and lucious fruit which were always just out of reach of that mythological sufferer Tantalus.

The ores from which the new metal is obtained formerly were secured from Australia, but have been found in North Dakota, South Dakota, North Carolina, and Kentucky.

(This is Dr. Slosson's weekly Chat on Science Simplified.)

BYRON'S BLUNDER

By Dr. E.E. Slosson

Ridicule is the handiest weapon for knocking a new idea on the head and it is often effective. Yet sometimes it may survive or in later times revive and then the ridiculer becomes ridiculous.

A curious instance of this is the attempt of Lord Byron to laugh out of life certain infant ideas that were beginning to attract attention in his time.

In his outburst of poetic spleen, "English Bards and Scotch Reviewers" he undertakes to expose four popular fallacies in four lines:

> "What varied wonders tempt us as we pass.'
> The cowpox, tractors, galvanism and gas,
> In turns appear, to make the vulgar stare,
> Till the swollen bubble bursts and all is air!"

Lord Byron, being above the vulgar throng, was not to be taken in by such nonsense and pointed out that they were mere passing fads.

Yet, somehow, they did not turn out to be altogether hot air but have settled down into sober science. In the cowpox inocculation we see the beginning of a new era in medicine in which diseases were to be fought with nature's own antidotes; the first attempt to attack a specific malady with a specific preventative. Today we have many cases where the physician can hit directly at an invading virus with a counteractant. But opponents of vaccination still survive although smallpox, thanks to vaccination, has become largely extinct.

What Byron called tractors have long since gone out of fashion. Even the word is now applied to something much more recent. Tractors then were apparatus used to fix the attention of men and women and throw them into a sort of trance. This is what we now call "hypnotism". It has been shorn of its early accentricities and extravagancies and is now admitted to the most respectable of psychologies. Its fundamental principle, auto-suggestion, has been found to be the key to many a mental mystery.

What galvanism has done for the world we all know. The galvanic cell is part of our daily life and we could hardly do without it. It runs our electric automobiles and doorbells, our telegraphs and telephones. It produces the soap and bleaching powder that clean our clothes.

What a chorus of laughter greeted the suggestion that London might be lighted by coal gas! Sir Walter Scott called it a "pestilential innovation" that nobody

but a "madman" would propose. Napoleon who usually turned a kindly ear to scientific novelties said it was "une grande folie". Anybody with common sense could see that it was absurd to think of lighting a city with something that could not be seen, felt or weighed.

Yet gas came in and illuminated our lives for a hundred years until it was superseded by something still more intangible - electricity - which could not even be smelled. Although gas has now gone rather out of fashion as an illuminant, it is being used more than ever as a fuel and may in time displace the heavy and dirty lumps of coal in power plants and homes.

These were the four permanent contributions of science to civilization which Byron picked out as follies of the day soon to be exploded. As old De Morgan said in his fascinating "Bundle of Paradoxes": "It was hard lines to select four candidates for oblivion not one of whom got there".

But before you get too contemptuous of Byron see if you are any better in the valuation of contemporary achievement. Write down four ideas and innovations of the present day that you regard as bubbles that will soon burst and four that you think will persist and grow in importance. Put your prophesies in an envelop and place it in the hands of your children or a library to be opened in 2022. At that time you will either be hailed as a wonderful prophet or be made the text of a screed like this.

What we should learn from Byron's blunder is not credulity, not incredulity, not that intermediate and lazy state of mind which says of every novelty "there seems to be something in it". Our mental attitude should be that of skepticism; not in its modern meaning of"distrust" but in its original sense of "examination". When the Greeks invented the term "skeptic" they meant a man who used his eyes to look into things, not one who sut his eyes to any innovation.

RECLAIM ALKALI LAND
BY USE OF ALUM

Washington. Many tracts of fertile land in the West which have become unproductive after a few years of irrigation because the water no longer soaks into them may be reclaimed by the use of alum to neutralize the alkalinity of the soil, Carl S. Scofield of the Bureau of Plant Industry has discovered.

This refusal of the soil to take water is due to gelatinous silacates, chiefly sodium silicate or water glass, in the soil and is overcome by treating with alum which occurs in extensive deposits in several places in the West. Alkaline soils have been treated with as much as one per cent of crystalline alum without bad effect on plant growth.

ALL FORMS OF MATTER
MADE OF TWO ELECTRICAL UNITS

A new picture of the elements is being painted. Two simple units, the positive and the negative electron, are the only components of the myriads of complicated substances in the world about us. Dr. W. R. Whitney, director, Research Laboratory, General Electric Company, in a publication of the Engineering Foundation to be issued soon, explains man's new conception of stuff and the simplification of the idea of seventy or eighty distinct atoms.

Such names as electrons and atomic structure do not convey to the mind inherent relationship with radio, radium and X-rays; but a proper view of matter as it is now understood can most readily be pictured by getting the connection among some such group of present-day subjects, says Dr. Whitney. We are now forced to look at all matter as composed of identical, small, electrical charges, which determine the nature of chemical elements and compounds by their numbers and arrangements. An atom the ultimate particle of a particular substance - becomes more like a solar system than like a solid. The volume of the atomic space is mainly unoccupied, but through it the forces act which are attributable to electric charges within.

Becquerel, who found that a certain uranium ore emitted an invisible ray capable of passing through black paper and still affecting a photographic plate, was partly responsible for our new views. Soon afterward the Curies discovered radium, and this was shown later to be a naturally decomposing atom. Several other decaying elements were also found. During decomposition small electrical quantities were continually discharged.

Similar discharges had already been observed in other fields, but were not understood. For example, when the filament of a lamp is heated in a high vacuum, negative electrical charges are emitted and current thus crosses the empty space. This had early been noticed by Edison. It was not until after discovery of radium that the true nature of these "electrons" was perceived.

When these little units of negative electricity flow within a wire, they constitute the electric current. When, by high temperature, they are emitted from a metal, they are called thermions. When they pass through a gas with sufficient velocity, their impacts decompose molecules, and the greatly augmented flow of the resulting charged particles produce the common electric arc. When they flow through a vacuous space, under the influence of a high electric force, they are called cathode rays. When their motion is stopped by impact in the surface of a solid, the sudden

change of motion starts an electro-magnetic wave, - an X-ray (just as a drum beat sets up a sound wave in air), and when they surge up and down a wireless antennae, they produce the long wireless waves through space.

When constituent electrons are arranged in the groups called atoms, all properties seem determined merely by geography, or orientation. Apparently such old established things as chemical activity and valence are due to the number of electrons which occupy the outer surfaces of the groups. The shooting electrons of the cathode ray, stopped by the platinum or tungsten target, produce the X-rays, which by reflection in crystallized matter, disclose its atomic arrangement and thus lead to better understanding of many physical properties.

Since decomposing elements emit electrons, since heat drives them from filaments, since gases and air yield them on impact in arcs, since statically charged bodies carry them and lose them (as a car gains or loses passengers), it is logical that all electric currents are attributed to their motion, all static charges to differences in concentration, and all matter to balanced combinations of them.

GAS FROM SEWAGE
RUNS ENGINES

Washington. Gas produced from sewage is being used to run engines at the sewage disposal works of Birmingham, England. Experiments made by John D. Watson, chief engineer, have proved successful, according to reports transmitted through consular channels.

The sludge from the sewage, after it has undergone a certain amount of sedimentation, is fed into a septic gas producing tank, which is furnished with an air relief valve. The sludge is not aerated before it is used. The gas thus obtained contains about 60 per cent of methane or marsh gas, and is of high calerific value. It averages as much as 675 British Thermal Units per cubic foot, which compares very favorably with coal gas with 600 British Thermal Units per cubic foot.

Mr. Watson calculates that two tons of sludge will produce the gas required to give 150 horse-power hours, and that the total power available at that particular station could be raised, if necessary, to 6000 horse-power hours daily. The gas produced at the plant is employed in driving a twenty-five horse-power gas engine, which in its turn, works a centrifugal sludge pump. The exhaust from the engine is passed through pipes traversing the septic tank to supply heat and hasten the formation of gas. Samples of gas taken for analysis in cold weather had a higher calorific value than those taken in warmer weather, a fact which would seem to indicate that a warm climate is not essential for gas production.

DO YOU KNOW THAT -

The white fur with black tipped tail known as "ermine" comes from the mountain weasel, an animal which lives by sucking the blood of the animals it kills.

The average production of the cows of the United States is about 4,000 pounds of milk and 160 pounds of butterfact a year, while the average cow in some other countries produces almost twice as much.

The total Korean silk cocoon crop for 1921 amounted to 663,265 bushels.

Small water-fleas have been known to lie for forty years in dried mud, without losing their power of actively living when the mud was again moistened.

DO YOU KNOW THAT -

Farm work generally throughout the United States has been delayed this spring one to three weeks on account of unfavorable weather and flood conditions.

In the United States thirty different states have one or more oil refineries. Texas leads with 118 refineries completed or in process of construction.

While we think of cave-men as rough customers, naturalists tell us that most of the cave dwelling animals are weakly, nervous, and delicate.

The average quantity of cabbage seed required for the production of a carload of cabbage is about one pound.

DO YOU KNOW THAT -

From the roots of the dahlia a sugar is obtained which is sixty per cent sweeter than cane sugar.

A new record of twenty-five feet per day advancing an eleven foot, three inch section tunnel has been established at Priest Heading on the Hetch Hetchy, California water supply project.

If the microscopic blood cells of a healthy adult were arranged side by side they would make a ribbon that would completely encircle the earth.

When the President takes a cruise on the "Mayflower" a weather map made up entirely of radio bulletins is prepared for him each day.

DO YOU KNOW THAT -

Tars and tar products are fast replacing mineral oil for surfacing roads.

The Entomological Club of Madison, Wisconsin, recently"attended" a radio lecture on "Bugs and Antennae", delivered by the State Entomologist of New York at Schenectady.

There are thirty million grade and scrub dairy animals in this country and less than a million purebreds.

Railroads of the United States receive from mining nearly six times as much freight as from agriculture, nearly four times as much as from manufactures, and between six and seven times as much as from the products of forests.

DO YOU KNOW THAT -

The oldest aeronautical laboratory in the United States from the point of view of continuous service is that of the Massachusetts Institute of Technology.

Health score charts are being used in school rooms for the determination of the physical condition of the children attending school.

The forests of Eastern Poland contain 3,500,000,000 cubic feet of timber available for exploitation.

The big wheel-shaped fan placed at the top of the air-shaft of a coal mine for ventilating the mine is sometimes designed for blowing air into the mine and sometimes for drawing it out.

DO YOU KNOW THAT -

The copper roof on old Christ Church in Philadelphia is in as good condition today as when puton in 1749.

The manufacture of wooden heels in Chile is an industry of increasing importance.

The typical clover region of the United States occupies the northeastern part, extending west into Minnesota and south approximately to the Ohio River and Mason and Dixon's line.

Alaskan salmon fisheries yield products worth about $40,000,000 annually, give employment in normal seasons to about 20,000 persons, and represent an investment of approximately $70,000,000.

READING REFERENCES TO NEWS LETTER ARTICLES

LONG BUT BUSY TRIP FOR SCIENTISTS WITH AMUNDSEN, page 1-2
AMUNDSEN'S PRESENT VENTURE FOLLOWS FOUR YEARS' ARCTIC VOYAGE, page 2-4

Amundsen, Roald. To the north magnetic pole and through the northwest passage. Smithsonian Institution Annual report 1907. p. 249 - 273. Wordie, J.M. Undiscovered north. Bibl. map. Discovery 2:88-91 Apr. 1921. Wright, Helen S. The Great white north, The story of polar exploration from the earliest times to the discovery of the pole. N.Y. Macmillan 1910.

BALLOON RACE BLENDS SCIENCE WITH CHANCE, page 4.

Dines,W.H. Meteorology and aviation. Nature 99:424-6 July 26, 1917. Talman, C.F. Realm of the air. P.F. Collier and Son, 1921.

NEWS OF THE STARS, page 5.

Lewis, Isabel M. Splendors of the sky. N.Y. Duffield and Company, 1919. Kippax, John R. The call of the stars. A popular introduction to knowledge of the starry skies. N.Y. G.P. Putnam's Sons 1919.

BYRON'S BLUNDER, page 8.

Byron. English Bards and Scotch Reviewers. De Morgan, Augustus. Bundle of Paradoxes.

RADIO NEWS OF THE WEEK, page 6.
ALL FORMS OF MATTER MADE OF TWO ELECTRICAL UNITS, page 10.
RULES FOR INSTALLING RADIO OUTFITS, page 12.

Bucher, E. E. Wireless experimenters manual. N.Y. Wireless press Inc. 1920. Lescarboura, A.C. Radio for everybody. N.Y. Scientific American Publishing Co.1922. Rutherford, Sir Ernest. Radium and the electron. Smithsonian Institution Annual report 1919, page 177 - 203. Strother, F. Unfolding marvels of wireless. Worlds work 43: 647-61 April 1922.

RECLAIM ALKALI LAND BY USE OF ALUM, page 9.

Scofield, C. S. The effect of alum on silicate colloids. Journal of the Washington Academy of Science 11:438-9 no. 18 Nov. 4, 1921.

FRAGMENTS OF SCIENCE

No animal has been so highly extolled on the one hand as a paragon of virtue, and on the other so roundly condemned as an unmitigated nuisance as the domestic cat, which has been associated with man for upwards of three thousand years. -- Prof. Francis H. Herrick.

By studying fish, we may be enabled to sustain or transform existing industries or develop new ones, thus adding enormously to the resources of society, we may throw additional or even new light upon problems of development, animal distribution and evolution, and we may help to diffuse more generally interest in and knowledge of a group of animals second only to the domestic animals in importance and, taken in connection with their setting, unsurpassed in beauty and esthetic interest.-- Albert W. C. T. Herre.

The effective power of a great number of scientific men may be increased by organization, just as the effective power of a great number of laborers may be increased by military discipline.-- Elihu Root.

Lack of good English, of business sense, and of understanding of men are most frequently mentioned by practising engineers as points of weakness in the graduates of the engineering schools.--Charles Riborg Mann.
