SCIENCE

NEW YORK, FEBRUARY 26, 1892.

RECENT WORK ON PLANT DISEASES BY THE DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 5, on "Treatment of Smuts of Oats and Wheat," is in press and will shortly be issued by the Department of Agriculture. It has been written by W. T. Swingle, a special agent of the Division of Vegetable Pathology, who has studied the subject for three or four years past. After describing the loose smut of oats and the stinking smuts of wheat, there is given a statement of the loss resulting from the diseases. That from the former is estimated at from 5 to 10 per cent of the crop, but from the latter as much as 40 to 50 per cent. The author calculates that if the oats had been treated as now recommended, there would have been saved to the country between 1880 and 1890 over $162,000,000.

The treatment, however, now used to prevent smut was only discovered in 1887, and it is known as the Jensen hot-water treatment. The process given is to immerse the seed to be treated, placed previously in a wire-netted receptacle or some other perforated vessel so that the water percolates freely, in a kettle of water at a temperature of 110° F., until all the grains are thoroughly wetted. Then plunge them into a second vessel, with the water heated to 132½°, for fifteen minutes, dipping up and down and twirling around so that the hot water comes into contact with all the grains. They are then taken out and dried thoroughly if not sown immediately, but only partially dried if the grain is not to be kept. The treatment for wheat is similar, but the water should be heated to a temperature of 143½°, and the seed immersed only five minutes.

Potassium sulphide, in the proportions of 1 pound to 24 gallons of water, in which the oats are soaked for 24 hours, is also recommended. If made of double strength, an immersion of 12 hours will be sufficient. For wheat a solution of 1 pound of copper sulphate to 24 gallons of water, soaking 12 hours, and then leaving for 5 or 10 minutes in lime-water made by slaking 1 pound of lime in 10 gallons of water, is considered beneficial in preventing stinking smut of wheat.

This bulletin is directly in the line of work now being actively pursued by the Department of Agriculture, and especially by the Division of Vegetable Pathology. It is the business of this division to investigate the diseases of plants due to fungi, and the work of the past year has been of such a practical character, that in the treatment of one disease alone, black-rot of the grape, it is calculated to have saved grape-growers between $75,000 and $100,000, or about four times the total amount of the annual appropriation for the whole division. When this is remembered, and it is known that many other diseases, such as pear leaf-bright, apple scab, potato rot and blight, powdery mildew of the grape and apple, celery blight, etc., have been studied, and remedies or preventives suggested, the valuable character of the work of the division will be readily seen.

During 1891 experiments were conducted on an extensive scale in western New York in the treatment of nursery stock, several million trees having been treated with success in preventing the attacks of fungi. The practical character of the work of the division is further shown in its action during the "grape scare" in New York City. Last fall the Board of Health of the city seized a small consignment of grapes that had been sprayed with a solution containing a small amount of copper. This solution, known as Bordeaux mixture, had been found effectual in preventing black-rot, and had been extensively used. When the graves were seized, exaggerated reports of the bad effects resulting from the use of sprayed fruit were telegraphed far and wide, and the grape market was demoralized. As soon as the situation became known in Washington, the chief of the division was sent to New York, and by explaining to the Board of Health the harmlessness of the small amount of copper that properly sprayed grapes received, he allayed the excitement and the market was restored to its previous condition. There is no doubt but that this prompt action saved thousands of dollars to the vineyardists of New York and other States. The amount of copper which the sprayed grapes contain has been shown to be less than that normally present in many of the articles of ordinary diet.

Besides the bulletin mentioned in the first part of this article there is ready for the press a report on the virulent vine disease of California, which, appearing near Anaheim about 1884 or 1885, has caused widespread destruction of vines in that vicinity. The causes and cure or prevention of this disease are at present unknown, but are being diligently studied with the hope of finding some remedy. There is also in preparation a report upon the work done by the division during the past year, and this will be issued as soon as circumstances permit. Finally, a new number of the *Journal of Mycology* will be issued soon, which will contain valuable and interesting matter. One article is upon an Almond Disease in California, caused by a fungus attacking the leaves and making them drop prematurely. This article is illustrated by four plates, and is followed by a statement of how to prevent the attack of the fungus. Another article is on Club-Root, a disease caused by a fungus which attacks the roots of cabbages, turnips, etc. This is also illustrated. Other articles deal with descriptions of new species, or notes upon old ones. An important portion of the number will be the "Index to Literature." This covers the whole subject of diseases of plants, and embraces the literature of the entire world. It is the intention to give a brief notice or abstract of the contents of each paper. These notices are arranged under subjects, so that it will be possible for one interested in any special subject to find the articles treating of that subject without wading through the entire index. There will be over three hundred articles indexed in this single index, and an earnest endeavor will be made to have it as complete as possible.

JOSEPH F. JAMES, M.SC.

Washington, D.C, Feb. 17.

A NEW COLOR SCHEME.

EVERY student of botany, ornithology, or entomology, has found the lack of any well-defined standard or credited nomenclature of color a prolific source of trial and perplexity, while to the common eye there is nothing but confusion in our present methods of designating color. No stronger proof of this is needed than some of the terms used to designate fashionable colors, such as "crushed strawberry," "ashes of roses," "elephant's breath," etc. What more absurd terms could one easily choose to express an intelligible conception. This is no doubt largely due to the fact that there has been no channel through which to introduce reform. It must be done through those who deal largely in material where there is frequent occasion to designate colors. The naturalist might fix his standards and nomenclature, as he has already done, but the great world would go on just the same, ignoring him and his little clique till the end of time. The physicist may speculate and dogmatize on the theories of color and reach admirable results, but find himself unable to alter the nomenclature of either commerce or every-day life. Manufacturers, who depend upon the demands of trade, must provide what is called for in the market or have their wares left on their hands, and find themselves the losers thereby. The ever changing fashions seem almost to necessitate the use of new and striking names for things even themselves very ancient. These facts leave little ground for hope that any reform can be expected through the ordinary channels of trade.

It is very refreshing, however, to find now and then a man who, in the midst of commercial competition, is willing to give some thought to the propagation of scientific truth. About twelve or thirteen years since Mr. Milton Bradley of Springfield, Mass., who was engaged in the manufacture of kindergarten supplies, conceived the idea of reducing the making of colored papers to some method which would be practical and at the same time sufficiently accurate to be of value as a means of education. At my suggestion the solar spectrum was taken as the basis of his scheme. The difficulty of reproducing the beautiful colors of the spectrum in pigments seemed at first almost insurmountable, but after long experiment, and the expenditure of much time and money, it was found that colors could be produced in papers which fairly approximate the colors of the spectrum.

The scheme adopted by Mr. Bradley contains six standard colors, viz., red, orange, yellow, green, blue, violet — colors generally recognized and readily distinguished in the solar spectrum. It was found that, combining these colors in the Maxwell disks, a neutral grey could be produced, while with a less number this would be impossible. These, together with a white and a black, constitute the basis of the system. If a disk of one of these standard colors be placed upon the wheel together with a white disk, and the proportion of the exposed surfaces of the two disks varied, a number of modifications of the color varying from the standard to pure white will be obtained. These are called tints. Similar combinations of the standards with black produce what are called shades. Each of the standard colors is treated in the same manner. If a disk a little larger than the regular size with a border graduated into 100 degrees, be placed behind the disks to be used in combination, the exact proportion of each disk can be determined. The first letter of each color is used as its symbol, except that for black N. (niger) is used to avoid the repetition of B. If we combine red and black in equal proportions, thus, R.50 N.50, we shall get a shade of red. We may designate this as red shade No. 1. In a similar way each color would be treated. Each may be combined with other colors and the symbols written in a similar manner. Red and orange, the former predominating, would be called orange red, written O.R. A given combination of these two colors would be expressed by O.25 R.75. This would in turn have its tints and shades. When the proportions are not needed, R.T., R.S., O.Y., G.B.S., would very simply indicate red tint, red shade, orange yellow, green blue shade, respectively. Thus simply is the eye trained to discern the components of each hue by the aid of the symbols. The simplicity of the system and surpassing beauty and number of hues obtained is striking.

A large series of papers manufactured according to this scheme is already used in kindergartens and many primary schools. One manufacturing firm proposes to use the wheel and disks in connection with the coloring of textile fabrics. The disks are also used in ordering new colors from the factory, where a duplicate set of the disks is used to translate the symbol into the visible effect desired. Architects and artisans find the scheme convenient in studying the effect of adjacent colors. Indeed, a system of color harmonies has already been partly elaborated with this scheme as its basis.

The next most important step is for the physicists to establish the location of these six colors within certain limits of wave-lengths, and then secure some material in which the standard color can be permanently preserved for comparison. What a saving of confusion in the use of color names is thus gained we are hardly able to realize. The following quotation from a pamphlet issued by the Milton Bradley Company, explaining the scheme, will indicate one of the many applications of the scheme:—

"A careful study of these representative combinations of disks will suggest numerous possibilities not mentioned here. One of these is the giving of exact and definite names in the terms of our standards to the common colors. For example, it is well known that under the same name different manufacturers make pigments varying very largely in color.

"If, having a small tablet of millboard or other suitable substance painted with an even coat of Windsor & Newton's light red tube color, we match the color with our disks, we find the nomenclature to be O.24, N.76; while a German color with the same name gives O.18, N.82, both being shades of orange, although the German color is much darker than the other.

"The same test with two tubes of cinnabar green gives Windsor & Newton's, Y.14, G.11½, N.74½; the German, Y.12½, G.11, W.2, N.74½, the first being a shade of a green yellow, and the second a broken green yellow; the shade contains black with the yellow and green, and the broken color has both black and white.

"In Windsor & Newton's chrome yellow we have O.29, Y.71; the German, O.35, Y.45, N.20; the first a pure orange yellow; and the second a shade of a much more orange yellow.

"The following analysis of some other common colors may be interesting, as showing how simple and practical our nomenclature is: —

"Chinese vermillion — R.77, O.23.
"Yellow ochre — O.24, Y.24, N.52.
"Indian red — R.7½, O.17½, N.75.
"Emerald green — G.63, B.14½, N.22½.
"Deep cadmium yellow — R.5½, O.67, Y.20.
"Chrome green, No. 2 — G.16½, Y.5, N.78½."

J. H. PILLSBURY.
Smith College, Feb. 18.

THE DECLINE OF SWAGGER.[1]

WE shall not, we hope, be accused of knocking another nail into the coffin of Respectability if we venture to point to the decline of swagger as one of the signs of the times. No doubt the change is somewhat recent, and the transition hardly complete. But we may take it as established that, for the moment at any rate, swagger is not the fashion. No doubt the consciousness of personal merit and possible superiority is as strong in human nature as ever. But most people are contented to acquiesce in the knowledge of the fact, and are willing not only to forego the particular form of its expression which is known as "swagger," but even to live without expressing it visibly at all. The most obvious and disagreeable form of self-assertion, which consists in making other people conscious of their inferiority by intensely unpleasant and supercilious behavior, has, of course, been dead and done with as a social claim for half a generation. High-born and wealthy heroes of the old novelists, who were too great to speak at the breakfast-table, and "turned to fling a morsel to their dogs with an air of high-bred nonchalance," exist no longer in fiction, and very rarely in life. Mr. Grandcourt was perhaps the last of them. But swagger in its minor and more amusing manifestations is also dying; and though it is premature to write its epitaph, we may call attention to some of the symptoms of its decay. One of the later forms of swagger, much affected by men of the bachelor leisured class, and especially by the much-abused "lotus-eaters" of club-land, was the *nil admirari* attitude. It had quite a vogue for a time, and in addition to conveying an impression of superiority, saved a great deal of trouble. Older men who had seen life were spared the effort of hearing about it again; and young men who had not were able to convey the impression that they had. This form of swagger had positive merits in a negative form. It is still in use as a weapon against a bore, but as a fashionable cult it exists no longer. It is as dead as wigs and powder.

Soldiers, for instance, are now among the quietest of men, not marked off by any mannerisms of dress or demeanor from other well-bred and agreeable gentlemen. No doubt "competition," in place of purchase, has somewhat reduced the number of men of private fortune who hold her Majesty's commission. But even if that consideration could account for the difference, the change is only partial, and the cavalry is still a service mainly officered by men of means. But the heavy "plunger" swagger which once distinguished these gentlemen in their relations to men in less fashionable professions has almost disappeared, except among a few of the very old stagers who cannot unlearn, and the very young ones who have not learned better. Some evidence of the change of manner among soldiers may be found in their increased popularity in general society—among men, that is; for it may be doubted whether the other sex quite shares the satisfaction with which men hail the absence of the military swagger. Sir Thomas de Boots no longer comes in "scowling round the room according to his fashion, and a face which is kind enough to assume an expression which seems to ask, 'And who the devil are you, sir?' as clearly as if the General had himself given utterance to the words." On the contrary, he as a rule makes himself exceedingly pleasant, claims no more attention than is spontaneously rendered to him and his known position in the service, and perhaps forgets to fill his glass while engaged in explaining the theory of the *Kriegspiel* to some inquiring youngster.

[1] London Spectator.

Among minor types we may notice that the scholastic swaggerer whom Thackeray denounced among his university snobs has almost, if not quite, disappeared — partly, perhaps, because scholars are now turned out by the hundred instead of by half-dozens, and their monopoly of a certain kind of knowledge is broken; partly because good taste has grown with knowledge, and scholars may also be men of the world. No doubt, with wisdom cometh understanding; but we wish that those men of the age, the "scientific gentlemen" — scholars are rather down in the world just now — could discern the signs of the times in the matter of swagger. At present they possess, with Jews, mushroom financiers, and very successful tradesmen — the Egerton Bompuses of the day — almost a monopoly of the amount of obvious and positive swagger visible. Whether in public controversy or social intercourse, the scientific person sometimes swaggers with unquenchable energy. In those public discussions which lend such piquancy to the columns of the *Times* in the dull season, he still delights to pounce from his hygienic mountain home on some wretched disputant, and show him up as an ass — and a fraudulent ass — in that strong native Saxon, undimmed by "pedantry" and "silly compliance," which less gifted minds call education and courtesy. And if some weak controversialist writes in the victim's defence to say that, after all, what was in the poor man's mind was perhaps so-and-so, how promptly some other scientific person takes up the cudgels and knocks the nonsense out of him! These sterling qualities have so endeared him to the social circle that the mere reference to a "professor" — an honorable title which seems to be monopolized by the expounders of natural science — is usually enough to drive any number of plain men half frantic. No doubt society has itself to blame in a measure for the tyranny of the professors. It overestimated the value of the "facts" which they knew, before they could be weighed and compared with other forms of information. The modesty of Faraday, with his mild formula, "It may be so," and of Darwin — who was a country squire as well as a biologist — are forgotten in the swagger of the new men. But swagger, though not confined to parvenus, is, after all, the parvenu's besetting temptation; and the "scientific men" are the parvenus of knowledge.

Swagger, nowadays, is mainly limited to people living in little worlds of their own. Contact with the big world and realities rubs it away. Petty country squires, buried in remote neighborhoods, often give themselves airs most comical to behold by those capable of comparing what they are with what they claim to be. The bumptious scientific gentlemen who have made their class a byword, the bloated financier, and the overgrown shop-keeper, even when success is attained, are only on the verge of the world where their training should begin. Their time has been otherwise, and, let us hope, more profitably, occupied; and if they do not reform, their children probably will, and will do their best to reclaim their erring parents. For there is no lesson which that increasingly wise young person, the young man on his promotion, has laid more to heart than that "swagger," or, as he prefers to call it, "side," does not pay; and whatever his private opinion as to his own merits, he distinguishes very clearly between the swagger which does not pay and judicous self-advertisement which does. Moreover, being an educated young person with some claims to good taste, he is discriminating even in the means he takes to advertise himself, having recourse only as a last and doubtful resource to self-assertion or eccentricities of dress and manner.

MARINE ENGINEERING AND NAVAL ARCHITECTURE AT CORNELL.

IN October, 1890, the Board of Trustees of Cornell University authorized the director of Sibley College, Dr. R. H. Thurston, to organize a graduate school of marine engineering and naval architecture as a department of that college. Owing to the difficulty of obtaining suitable officers, no appointments were made until September, 1891, when Professor W. F. Durand, late of the Engineer Corps of the United States Navy, was appointed principal. This appointment was followed some months later by that of Professor G. R. McDermott, late with J. & G. Thompson, Clydebank, as assistant in naval architecture.

The object of the school is to provide courses, both practical and theoretical, where any one possessed of a good general engineering knowledge may learn of the applications of engineering and science to the design, building, powering, and propulsion of vessels of all types. The courses as at present offered cover two years, and are designed to thoroughly ground the student in the fundamental principles of the science, and to give him a large amount of practical application by the study and analysis of existing designs, and the subsequent preparation of designs of an original character.

The present year is considered as formative, but regular courses are given in marine engineering, naval architecture, and shipbuilding, the work being taken by from twelve to fifteen students. During the coming spring and summer Professor Durand will visit the schools of similar kind in Europe, studying their organization, methods, equipment, and objects, in order that the school may have the advantage, as far as the differing conditions will admit, of the results of experience in these older schools.

The work at the university may be supplemented by an annual excursion or inspection tour of from ten days to two weeks, in which the leading ship-yards and marine-engine shops of the Atlantic coast are visited, in company with one of the teachers. By means of these visits the student is brought into immediate contact with the actual fulfilment of the various problems which he has been studying from lecture, text book, and drawing-board. The practical methods of work are examined, notes and sketches are taken, and a written report on the trip is prepared and submitted.

In the arrangement of the subjects and in the division of time for the professional work, it is intended to give sufficient time to theory and general principles to furnish a good general grasp of the subject, such theoretical work being always illustrated and impressed by applications to practice, and supplemented by a large amount of work more purely practical in character.

The objects to be kept in view are considered as two-fold. First, the power to deal intelligently with the actual problems of ship and power design and construction as they present themselves in practice. Second, the fostering and development of that originality of thought which, under proper control and with other gifts, may form the suggestiveness of mind characteristic of those qualified to aid in the continual advancement of engineering and scientific work.

Of special equipment the school is provided with the following: Several hundred photographs and drawings, both general and detail, illustrative of marine construction of all forms. A number of half-breadth models of ships, including some of the more noted Atlantic liners. A complete set of Copenhagen ship curves, with battens, special drawing-boards, and all appliances for ship drawing. An Amsler integrator of the latest type Large additions are being made to the books and other professional literature already in the library, and no pains will be spared to make the library equipment as complete as possible in every form of literature relating to marine engineering and naval architecture. The equipment of the general mechanical laboratory, unexcelled in extent by that of any laboratory in the world, is also available for use by the student, and every related department of the university will offer its best facilities for such work as students in the School of Marine Engineering and Naval Architecture may find desirable.

NOTES AND NEWS.

PROFESSOR CRAGIN, in charge of the Department of Geology and Palæontology in Colorado College, Colorado Springs, is now absent on leave in the service of the Geological Survey of Texas, under State Geologist Dumble. His work will be largely palæontological. His headquarters and address are Austin, Texas.

— The committee on the memorial to be erected to the memory of the late G. A. Hirn, the eminent engineer and physicist, composed of selected representative men in his department of research throughout the world, has just issued, through its president, M. G. Kern, a circular inviting contributions from all who desire to aid in this work, and who appreciate the contributions made to science and to the arts by that great man. M. Hirn died at Colmar, Alsace, January, 1890, and this committee was very soon afterward formed for this especial purpose. Its plan is to erect at Colmar a monument, to be designed by his friend, M. Bartholdi, a statue in bronze, the pedestal to be inscribed with the simple words:

G. A. HIRN,
1815–1890.

It is expected that the monument will be erected mainly by contributions from the citizens of his native town; but the voluntary contributions of friends all over the world will be gladly received as tokens of the respect and affection which the man and his work have earned for him. Such funds as may be given for this object may be sent directly to the treasurer, M. Georges Baer, Colmar, and to any member of the committee in this country. Professors Asaph Hall, L. S. Holden, W. B. Taylor, and Dr. Thurston will gladly take charge of them and forward with suitable acknowledgments to the donors.

— At the August meeting, in Washington, of the Society for the Promotion of Agricultural Science, a paper was presented on "Eastern and Western Weeds," by Byron D. Halsted, New Brunswick, N.J. His remarks were founded upon the reports of a large number of botanists and crop growers throughout the United States, received in response to letters sent to them or questions asked through the public press. Having lived for four years in Iowa, and being now a resident of New Jersey, the weeds of these two States have received personal consideration, and therefore these widely separated States will furnish a basis for a comparison of the weeds of the East and the West, not being unmindful of the fact that Iowa represents the central part of our continent, while the West, strictly speaking, reaches beyond the Sierras. The New Jersey list can be made up from the one for Iowa by omitting seventy-five of the native prairie plants, mostly perennials, and adding forty-three, a large percentage of which are annuals. The only single weed of the first rank stricken from the Iowa list in adapting it for New Jersey is a species of pig weed, but even this within the last year has been found within the latter State. On the other hand there are several first-class weeds that are added in the adoption of the western list to the East. Of such, for example, are: a pepper grass, the wild radish, two kinds of cocklebur, feverfew, wild onion, wild leek, nut-grass, Bermuda grass, and a kind of chess, or a total of ten of the worst weeds. That which is true of New Jersey and Iowa likewise holds good for the whole East compared with the whole West. The East is overrun with a larger number of the most aggressive weeds; weeds that assert their ability to resist the forces of the cultivator and plant their banners upon the tilled ground, likewise annual weeds that stock the soil with a multitude of seeds, ready to spring into life whenever an opportunity offers. Some species of weeds are found everywhere, from Maine to California, as Chenopodium album, Amarantus retroflexus, Xanthium Canadense, Plantago lanceolata, Capsella Bursa-pastoris, and Portulaca oleracea. There are others prominent on the Pacific Coast and not elsewhere, as the Hordeum murinum, Silybum Marianum, and Malva borealis. Likewise there are weeds peculiar to the Rocky Mountain region, as the Iva axillaris, Franseria tomentosa, while on the prairies, especially in Kansas and Nebraska, the following head the list: Cenchrus tribuloides, Asclepias Syriaca, Solanum rostratum, and Helianthus

annuus. In the middle prairie States it is mostly the members of the sunflower family, as the ragweeds and cockleburs, that prevail. Coming into the central States the list is led by Canada thistle, quackgrass, docks, daisy, chess, plantain, and purslane. If to this list we add wild carrot, onion, and parsnip, and the like old foreign enemies, we have the extensive catalogue of these plant pests that prey upon the lands of New England. Of the weeds of the South as compared with those of the North it has not been the purpose here to speak, nor of the migration of weeds.

— At a meeting of the Chemical Society of Washington, Feb. 11, W. H. Krug read a paper on "The Behavior of Sugar Solutions with Acetone." Acetone and water are miscible in all proportions at ordinary temperatures. If a mixture is prepared containing more than ten per cent acetone, and sugar added in small quantities dissolving after each addition, a point will be reached where the further addition of sugar causes a separation of acetone. We can continue adding sugar until the water is saturated. It will then still contain a small percentage of acetone. At 25° C. this is approximately 9.5 per cent. On account of the highly viscous nature of a saturated sugar solution it is impossible to determine this figure accurately. It is thus necessary to reverse the problem, determining the solubility of acetone in sugar solutions of varying strength. Sucrose is absolutely insoluble in pure acetone. The acetone used boiled at 57.5° C. The following method was used for determining the solubility of acetone in sugar solutions. Twenty-five grams of a sugar solution of known strength were rapidly weighed into a flask, a small thermometer inserted and the flask closed with a rubber stopper. The whole apparatus was then weighed. It was brought to the required temperature and acetone added in small quantities from a burette, the flask being stoppered and shaken before each addition. The flask and contents were carefully kept at the same temperature. As soon as the saturation point was reached the next drop of acetone produced a milkiness, which on standing resolved itself into minute drops of acetone. The flask was then weighed again, and the weight of acetone added determined in this manner. The results were very satisfactory. The solubility of acetone in sugar solutions decreases as we raise the temperature. The curves of solubility were determined for three temperatures, 20°, 25°, and 30° C. From 40 to 50 per cent sugar they are practically parallel, and from 50 per cent they approach each other. It seems probable that they meet at 75 per cent.

Table of Solubility.

One hundred grams sugar solution dissolve per cent acetone at —

Per Cent Sugar.	20° C.	25° C.	30° C.
40	96 44	92.76	89 84
45	71.92	68.81	65 72
50	50.83	48.13	45.85
55	35.78	33.81	32 54
60	25.17	24.18	23.35
65	18.33	17.68	17.09
70	13.22	12.82	12.53

— According to a report recently published in Germany, there were, in 1889, 5,260 workmen killed in accidents, and 35,392 seriously injured. These losses do not vary much from one year to another. *Nature* compares the figures with those of the killed and wounded at Gravelotte — one of the most murderous battles in this century — which were 4,449 and 20,977. The industries furnishing most accidents were as follows, in descending order: mines, railways, quarries, subterranean works, building, breweries. All industries are arranged in 64 corporations, and it is estimated that more than 4 500,000 of work-people are insured. Wounds and fractures are the most usual form of injury, and the duration of treatment tends to increase every year, by virtue of a law which makes an allowance when incapacity for work exceeds three weeks (this was based on the observation that fractures were generally healed in three weeks). Since this law was introduced the treatment of fractures has taken longer. There are always more accidents in winter than in summer, and on Mondays and Saturdays than on other days. Also, there are twice as many accidents from 9 A.M. to noon, and from 3 to 6 P.M., than from 6 to 9 A.M., and from noon to 3 P.M. Better light in summer, and fatigue towards the end of each half-day of six hours, are supposed to explain some of these variations.

— In the February number of *Nature Notes*, Mr. Robert Morley vouches for the accuracy of a story which seems to indicate the possibility of very tender feeling in monkeys. A friend of Mr. Morley's, a native of India, was sitting in his garden, when a loud chattering announced the arrival of a large party of monkeys, who forthwith proceeded to make a meal off his fruits. Fearing the loss of his entire crop, he fetched his fowling-piece, and, to frighten them away, fired it off, as he thought, over the heads of the chattering crew. They all fled away, but he noticed, left behind upon a bough, what looked like one fallen asleep with its head resting upon its arms. As it did not move, he sent a servant up the tree, who found that it was quite dead, having been shot through the heart. He had it fetched down and buried beneath the tree; and on the morrow he saw, sitting upon the little mound, the mate of the dead monkey. It remained there for several days bewailing its loss.

— The people of Vienna have been greatly alarmed by the outbreak of a new epidemic, which is believed by some to be connected with the influenza. It affects the intestines, its symptoms being fever and acute colic, with the ejection of blood. Its appearance seems to indicate the absorption of some poisonous matter. At first it was attributed to the drinking-water, but this view has been generally abandoned. A representative of a Vienna newspaper has taken the opinion of some of the Vienna physicians on the subject. Professor Nothnagel hesitated to pronounce any judgment on the illness, the facts not having been sufficiently studied. Professor Drasche thought it might be "nothing else than a distinct form of influenza," and was confident that it was not due to the drinking-water. Professor Oser was also sure that the drinking-water had nothing to do with the disease, and "did not consider that there was any indisputable evidence of its connection with influenza." Dr. Bettelheim seemed to think that there was something in common between influenza and the new malady called "catarrh of the intestines." He based his opinion on the fact that from the day when the latter made its appearance in an epidemic form cases of ordinary influenza had begun to decrease. He looked upon them both as being of an infectious nature. A chemical analyst, Dr. Jolles, said it would require three weeks to make a bacteriological inquiry into the character of the illness. A chemical analysis of the drinking-water, says *Nature*, showed it to be of normal purity.

— *Nature* prints some notes by Mr. J. J. Walker, R N., on ants' nest beetles at Gibraltar and Tangier, with especial reference to the Hisperidæ. The search for ants' nest Hister is a somewhat troublesome employment, as only about two or three per cent of the ants' nests contain the beetle. Mr Walker, however, thinks "it is a pretty sight, and one which compensates for a great deal of strain to the eyes, as well as to the back, to see a *Sternocœlis* or *Eretmotus* lying motionless among the hurrying crowd of ants and then, suddenly developing an amount of leg quite surprising in so small a creature, marching off daintily on the tips of its toes (or rather tarsi) with a ludicrous resemblance, in gait and appearance, to a tiny crab." The comparatively weak mandibles of the ants are ineffective against the hard armor and tightly-packed limbs of the beetles, which devour the helpless brood with impunity. Mr. Walker has more than once taken *S. acutangulus* with a half-eaten larva in his jaws, and they are usually to be found clinging to the masses of larvæ where these lie thickest. On the other hand, he once (but once only) saw an ant take up a *S. arachnoides* in its mandibles and carry it off into a lower gallery of the nest; but this may have been done under the influence of alarm, the frightened ant seizing on the first object that came in its way.

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ESTIMATES OF DISTANCE.

HERBERT NICHOLS, in his experiments on "The Psychology of time" (*American Journal of Psychology*, April, 1891), has shown that estimates of time intervals are influenced by immediately preceding estimates, so that, in general, intervals are judged to be longer after practice on estimating an actually longer interval than when no such practice precedes, and shorter after practice on a shorter interval. The experiments about to be described were undertaken to see whether the same rule applies to estimates of distance. They show no such effect, perhaps because the intervening practice was not sufficiently sustained to affect the judgment. But the results are interesting for several reasons, and they are therefore given below.

The mode of experimenting was as follows: On each of three sheets of unruled paper (about six by nine inches) was placed a pair of pencil dots; on the first these were 4.02 inches apart; on the second .92 of an inch; on the third exactly the same distance as on the first. Without being told the object of the experiments, the person to be experimented on was shown the first pair of dots, allowed to look at them as long as he pleased, and then, the paper being taken away, told to make from memory, on a slip $9 \times \frac{1}{2}$ inches, two dots at the same distance apart, as nearly as he could. This was repeated on a fresh sheet, without his looking at the model again, and so on till he had made ten trials. The same thing was then repeated with the second and third sheets.

The following table shows the results, the first column giving the difference between the actual distance of the dots and the average of the ten estimates in each series; the second column the percentage of this difference to the actual distance; the third the mean deviation of the estimates from the average (taken always as positive); and the fourth the percentage of this mean to the actual distance. All distances are in decimals of an inch.

Persons.	Error of Average.			Per Cent.			Mean Deviation from Average.			Per Cent.		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
S. S....	+.65	−.17	+.92	16	16	23	.13	.04	.12	3	4.5	3
J. S....	−.10	+.21	+.70	2 5	23	17	.14	.13	.14	3	14	3
A. L. B.	−1.35	−.30	−1.31	33 5	33	32.5	.14	.07	.25	4	5	6
E. S....	+.26	+.31	−.19	6	33	5	.31	.09	.23	8	10	6
L. B...	+ 75	+.18	+.68	19	19.5	17	.24	.04	.26	6	5	6
M. S....	−.31	+.20	+.45	8	21	11	.17	.09	.28	4	9	7
L. F....	+.05	+.07	−.01	1	7.5	0.2	.09	.04	.06	2	4	1.5

The degree to which the absolute value of the errors depends on previous training is plainly shown; for instance, L. F., in whose case they are remarkably small, is the daughter of a well-known artist and herself accomplished in the use of the pencil, while A. L. B. is a boy five years of age. The consistency of the estimates seems, however, to depend much less on training, as shown in the third column, the ratio of A. L. B's. mean deviations to those of L. F. being about 1.5, 1.7, and 6.8 for the three series respectively, while the ratios of their errors (from the first column) are 27, 4, and 131. In the cases of S. S., A. L. B., and L. B. the errors are nearly proportional to the actual length of the intervals, which would seem the natural rule; but in the other cases there seems a tendency toward making errors of the same absolute value in estimating both short and long intervals. A. L. B., whose absolute errors are far the largest, keeps them most nearly proportional. The mean deviations are much more generally proportional to the intervals, the most noticeable exception being that of J. S.—also the chief exception to proportionality in the former case.

ARTHUR E. BOSTWICK.

THE LATEST ADVANCES IN SPECTRUM PHOTOGRAPHY.

A LETTER just received by the present writer from Mr. Victor Schumann of Leipzig, whose work in the domain of spectrography is less widely known and appreciated than it deserves to be, reveals such surprising advances within the past year in photographing radiations in the ultra-violet spectrum, that I am impelled to present the following summary of Mr. Schumann's results.

More than two years ago he demonstrated the remarkable absorptive effect of air upon very short vibrations, so great, indeed, that even the air within the tubes of the spectrograph was a serious obstacle to the investigation. However, he was able, with the apparatus then at hand, to demonstrate the existence of lines up to and beyond wave-length 1,852 by photography, using the light of the aluminum spark.

With the fine skill and ingenuity which has ever characterized his work, Mr. Schumann has since constructed a spectrograph exhausted of air, with lenses and prism of white fluor-spar. The source of light for these researches was the hydrogen Geissler tube. With the "exhausted spectroscope," as it is termed, and plates of proper sensitiveness, Mr. Schumann finds the photographic action of the spectrum beyond wave-length 1,852 very strong indeed. It is composed of fourteen groups of lines, including altogether about six hundred lines. The boundary of this hitherto en-

tirely unknown portion of the spectrum extends about four times as far from the most refrangible line hitherto photographed (the aluminum line 1,852), as that line is beyond the blue hydrogen line of wave-length 4,861. The interest in these researches is, therefore, very great; and it seems as though the limit of the radiations might only be reached when we can detect them in the universal ether itself, unaffected by a trace of an absorptive medium, and with photographic plates of special character.

The ordinary plates do not serve for work of this kind. The plates used by Mr. Schumann are specially made by himself, and are peculiar in possessing great sensitiveness to the ultra-violet rays, but relatively very little to the light of the visible spectrum. Because of this insensitiveness to the visible spectrum, the plate acts toward the ultra-violet precisely like one exposed to filtered light, from which all the rays have been absorbed, which, as diffused light in the spectrograph, would tend to cause fogginess of the picture. Such is the effect when an attempt is made to photograph the ultra-violet spectrum with an ordinary plate; for, before the ultra-violet rays have affected the plate, or produced a distinct image, the plate is fogged all over by the diffused light. The method of making the new plates is not yet published, because the investigations are not yet completed nor ready for publication.

Photography in a vacuum presents some difficulties and requires far greater care than under ordinary conditions, even under the most favorable conditions the photographic effect of these extremely refrangible radiations is relatively so very weak that on many plates prepared according to the new method it was difficult to establish even the existence of the vibrations of the shortest wave-lengths.

We may look forward with the greatest interest to the early publication of full details and results of this most skilfully conducted investigation, which has so greatly extended the known limits of the invisible spectrum.

ROMYN HITCHCOCK.

1455 Mass. Ave., Washington, D.C., Feb. 20.

METALS AT HIGH TEMPERATURES.

ON Feb. 5, Professor Roberts-Austen, C.B., gave a very interesting lecture on metals at high temperatures at the Royal Institution. As was to be expected, nothing very novel was brought forward, but the lecturer certainly succeeded in demonstrating to a large audience results which have hitherto been only obtained in the laboratory. Every one who has ever heard Professor Roberts-Austen lecture, knows his fondness for experimenting with gold, which no doubt is mainly due to his position at the mint, though, apart from this, many would find a certain fascination in handling and experimenting with such a metal. Moreover, gold is a metal remarkable for other properties besides its monetary value. On previous occasions Professor Roberts-Austen has drawn attention to the fact that its properties are changed in a most remarkable manner by alloying it with small percentages of other metals, and on the present occasion he exhibited a new series of alloys of this metal with aluminium which are of equal interest to those previously known. One of these alloys in particular, containing 20 per cent of aluminium, is noteworthy, as it forms an exception to the usual rule that the melting point of an alloy is lower than that of either of its constituents. This alloy, on the other hand, has a fusing point above that of gold, the most infusible of its constituents. Curiously enough, the alloy with 10 per cent of aluminium follows the ordinary rule. These alloys, it should be added, have the most brilliant colors. The 20 per cent alloy is a brilliant ruby in tint, whilst those containing greater percentages of aluminium are purple in hue.

With the aid of the oxy-hydrogen blowpipe and M. Le Chatelier's pyrometer, the lecturer was able to show a large audience the peculiarities of the cooling curves of several metals, and also to measure the fusing points of some of the most refractory of them. Indeed, he succeeded in fusing iridium, using for the purpose the electric arc, the thermo-couple employed as pyrometer consisting of a rod of iridium, and a rod of an alloy of the same metal with 10 per cent of platinum. The temperature thus reached is stated to be the highest yet measured, viz., 2,000° C., and thus it is now possible to measure temperatures ranging from $-200°$ C. to $+2{,}000°$ C., the former temperature having been attained by Professor Dewar in his lecture to the Royal Institution some short time back.

Even before the invention of this instrument, Professor Roberts-Austen stated that very considerable progress had been made in pyrometry, so that Mr. Callender, with his improved Siemens apparatus, in which the change in the resistance of a platinum coil, as it grows hotter, is used as a measure of the temperature to which it is exposed, has succeeded in measuring temperatures of 1,500° C., with an error of not more than one-tenth of a degree.

In measuring lower temperatures than the fusing point of iridium, the thermo-couple used consisted of a couple of wires, one of platinum and the other of an alloy of this metal with 10 per cent of rhodium, simply twisted together. This couple was inserted in the mass of a clay dish, on which gold and palladium, etc., were melted by the aid of an oxy-hydrogen flame. The ends of the wires were coupled with a suitable reflecting galvanometer, which by means of a powerful lantern threw a bright spot of light on a long scale fixed to the wall of the lecture-room. By means of this apparatus Professor Roberts-Austen was able to exhibit the recalescence of iron and show that at this point the metal suddenly becomes magnetic. For this purpose a block of iron heated to redness was placed on a stand fitted with a thermo-couple and an ordinary magnetic needle, which carried a mirror reflecting a second spot of light on the screen. At a high temperature iron is non-magnetic, but as it cooled down the spot of light from the pyrometer travelled down its scale, till at the point of recalescence it became stationary, and at the same moment the second spot of light connected with the magnetic needle suddenly swung over, showing that the metal had then become magnetic. Of more immediate interest, from a practical point of view, was a second experiment exhibited. In this a bar of iron, heated to bright redness, was fixed at one end and loaded at the other. Instead of bending over under the influence of the weight, which of course was not large, it remained rigid until it had cooled down to its point of recalescence, when it suddenly began to deflect.

Professor Roberts-Austen maintains that these peculiarities point to a re-arrangement of the molecules of the metal, and that they occur even with chemically pure iron, being intrinsic in the metal and not merely the effect of foreign constituents, though of course these are of considerable importance in modifying the results observed. That such changes occur in practice there can be little doubt, though the effects seem often to be peculiarly local. Steel plates showing very considerable ductility on test have snapped simply from internal stresses without showing the slightest signs of elongation or

contraction of area at the point of fracture, making it difficult to believe that during fracture the molecular arrangement of the particles affected by the fracture has been the same as when specimens of the same plate have shown perhaps 18 per cent elongation and 30 per cent contraction of area in the testing machine. These facts would almost lead to the conclusion that a sort of wave of molecular change may arise in a steel plate, during which abnormal fracture may occur, and after which the material of the plate may be found in its ordinary condition. By working at a blue heat, it is known that such a molecular change is produced, and the fracture of a mild steel bar thus treated shows that the metal has become brittle, but such a change is permanent. It is, moreover, certain that liability to this class of fracture is increased by the presence of certain impurities in the metal, the amount of which is often astonishingly small, and much light will probably be thrown on these points, says *Engineering*, by investigations now in progress.

It is not necessary that these investigations should, in the first place, be conducted on steel itself, as it frequently happens in scientific work that a problem is more easily solved by first dealing with simpler analogous cases than by a direct attack on it in all its complexity. For a flank attack of this character, gold, apart from its value, offers many advantages, as it is easily obtained in the pure state, and is at the same time profoundly affected by alloying it with very small quantities of other metals, which changes it is difficult to explain on any other hypothesis than that of an altered molecular grouping.

JOURNEYS IN THE PAMIRS AND ADJACENT COUNTRIES.[1]

THIS was the subject of the paper read at the meeting of the Royal Geographical Society, on Feb. 8, by Capt. F. E. Younghusband. The author described two journeys, one in 1889 across the Kárákorum and into the Pamir, the other in 1890 to Yarkand and Kashgar, and south to the Pamirs again.

"The country," he said, "which I now wish to describe to you is that mountainous region lying to the north of Kashmir, which, from the height, the vastness, and the grandeur of the mountains, seems to form the culminating point of western Asia. When that great compression in nature took place this seems to have been the point at which the great solid crust of the earth was crunched and crushed together to the greatest extent, and what must have formerly been level peaceful plains such as we see to the present day on either hand, in India and in Turkistan, were pressed and upheaved into these mighty mountains, the highest peaks of which are only a few hundred feet lower than Mount Everest, the loftiest point on this earth. It was amongst the peaks and passes, the glaciers and torrents of this awe-inspiring region, and anon over the plain-like valleys and by the still, quiet lakes of the Pamirs that my fate led me in the journeys which I have now come before you to describe."

Starting from Leh, in Ladak, Captain Younghusband's first objective point was Shahidula. This place is situated on the trade route to Yarkand, and is 240 miles distant from Leh. This he left on Sept. 3, to explore the country up to the Tagh-dum-bash Pamir.

The route now led up the valley of a river, on which were several patches of fine grazing, and till last year this had been well inhabited, but was now deserted on account of Kanjuti raids. The valley is known by the name of Khál Chuskún. Chuskún in Turki means resting-place, and Khál is the name of a holy man from Bokhara, who is said to have rested here many years ago. The mountains bounding the north of this valley are very bold and rugged, with fine upstanding peaks and glaciers; but the range to the south, which Hayward calls the Aktágh Range, was somewhat tame in character, with round mild summits and no glaciers. The Sokhbulák is an easy pass, and from its summit to the east could be seen the snowy range of the western Kuenlun Mountains, while to the west appeared a rocky mass of mountains culminating in three fine snowy peaks, which Hayward mistook as belonging to the main Mustagh Range, but which in fact in no way approach to the height and magnificence of those mountains, and really belong to the Aghil Range, which is separated from the Mustagh Mountains by the valley of the Oprang River.

On Sept. 11, the party crossed the remarkable depression in the range which is known as the Aghil Pass.

"From here is obtained one of the grandest views it is possible to conceive; to the south-west you look up the valley of the Oprang River, which is bounded on either side by ranges of magnificent snowy mountains, rising abruptly from either bank, and far away in the distance could be seen the end of an immense glacier flowing down from the main range of the Mustagh Mountains This scene was even more wild and bold than I had remembered it on my former journey, the mountains rising up tier upon tier in a succession of sharp needle like peaks, bewildering the eye by their number, and then in the background lie the great ice mountains — white, cold, and relentless, defying the hardiest traveller to enter their frozen clutches. I determined, however, to venture amongst them to examine the glaciers from which the Oprang River took its rise, and leaving my escort at the foot of the Aghil Pass, set out on an exploration in that direction. The first march was easy enough, leading over the broad pebbly bed of the Oprang River. Up one of the gorges to the south we caught a magnificent view of the great peak K 2, 28,278 feet high, and we halted for the night at a spot from which a view of both K 2 and of the Gushirbrum peaks, four of which are over 26,000 feet, was visible. On the following day our difficulties really began. The first was the great glacier which we had seen from the Aghil Pass; it protruded right across the valley of the Oprang River, nearly touching the cliffs on the right bank; but fortunately the river had kept a way for itself by continually washing away the end of the glacier, which terminated in a great wall of ice 150 to 200 feet high. This glacier runs down from the Gushirbrum in the distance towering up to a height of over 26,000 feet. The passage round the end of the glacier was not unattended with danger, for the stream was swift and strong, and on my own pony I had to reconnoitre very carefully for points where it was shallow enough to cross, while there was also some fear of fragments from the great ice-wall falling down on the top of us when we were passing along close under it. After getting round this obstacle we entered a gravel plain, some three quarters of a mile broad, and were then encountered by another glacier running across the valley of the Oprang River. This appeared to me to be one of the principal sources of the river, and I determined to ascend it. Another glacier could be seen to the south, and yet a third coming in a south-east direction, and rising apparently not very far from the Kárákorum Pass. We were, therefore, now in an ice-bound region, with glaciers in front of us, glaciers behind us, and

[1] Nature, Feb. 11.

glaciers all around us. Heavy snow-clouds too were unfortunately collecting to increase our difficulties, and I felt that we should have a hard task before us. On first looking at one of these glaciers it would appear impossible to take ponies up them, but the sides are always covered with moraine, and my experience in the exploration of the Mustagh Pass in 1887 showed that, by carefully reconnoitring ahead, it was generally possible to take the ponies for a considerable distance at least up such glaciers; and as the one we had now reached seemed no worse than others, and there appeared a gap in the range which looked as if it might be a pass, I took my ponies on, and after three days' scrambling on the ice, reached the foot of the supposed pass, and started at 3.30 on the following morning to find if it was at all practicable."

Captain Younghusband was, however, obliged to return after reaching a height of 17,000 feet, and he decided to return to his camp on the Oprang River. He thus describes the glaciers from which this river takes its rise: —

"The length of this glacier is 18 miles, and its average breadth half a mile; it is fed by three smaller glaciers on the west and one on the east. At its upper part, immediately under the pass, it is a smooth undulating snow-field about a mile and a half in width. Lower down this *névé* is split up into crevasses, which increase in size the further down we get. Then the surface gradually breaks up into a mass of ice-domes, which lower down become sharp needle-like pinnacles of pure white ice. On each side lateral gravel moraines appear, and other glaciers join, each with its centre of white ice-peaks and its lateral moraines, and preserving each its own distinct course down the valley, until some three miles from its termination in the Oprang River, when the ice-peaks are all melted down and the glacier presents the appearance of a billowy mass of moraine, and would look like a vast collection of gravel heaps, were it not that you see, here and there, a cave or a cliff of ice, showing that the gravel forms really only a very thin coating on the surface, and that beneath is all pure solid ice. This ice is of opaque white, and not so green and transparent as other glaciers I have seen, and the snow at the head of the glacier was different from any I have seen before; for beneath the surface, or when it was formed into lumps, it was of the most lovely pale transparent blue. I must mention, too, that every flake of snow that fell in the storm was a perfect hexagonal star, most beautiful and delicate in form. The mountains on either side of the valley, especially on the eastern side, are extremely rugged and precipitous, forming little or no resting-place for the snow, which drains off immediately into the glacier below. The western range, the main Mustagh Range, was enveloped in clouds nearly the whole time, and I only occasionally caught a glimpse of some peak of stupendous height, one of them, the Gushirbrum, over 26,000 feet, and others 24,000 feet. The snowfall on these mountains must be very considerable, and it seems that this knot of lofty mountains attracts the great mass of the snow-clouds, and gets the share which ought to fall on the Kárákorum, while these latter, being lower, attract the clouds to a less degree, and are in consequence almost bare of snow."

After some further exploration of the glaciers, rivers, and passes in this wild region, Captain Younghusband returned to India by way of Kashmir. In the summer of 1890, he once more made his way northwards through Kashmir, with a companion, Mr. Macartney. They reached Yarkand on Aug. 31.

"After a rest of two or three weeks at Yarkand," Captain Younghusband went on to say, "Macartney and I left our companions and started for a trip round the Pamirs. Approaching this interesting region from the plains of Kashgaria, one sees clearly how it has acquired the name of Bam i-dunya, or Roof of the World. The Pamir Mountains rise apparently quite suddenly out of the plain from a height of 4,000 feet above sea-level at their base to over 25,000 feet at their loftiest summits — a massive wall of rocks, snow, and ice. Mounting this wall the traveller comes on to the Bam-i-dunya, which would perhaps be better translated as the 'upper story' of the world. Houses in Turkistan are flat-roofed, and you ascend the outer wall and sit out on the roof, which thus makes an upper story, and it appears to me that it was in this sense that the Pamir region was called the Roof of the World. The name, indeed, seems singularly appropriate, for once through the gorges which lead up from the plains, one enters a region of broad open valleys separated by comparatively low ranges of mountains. These valleys are known as Pamirs — Pamir being the term applied by the natives of those parts to a particular kind of valley. In the Hindu Kush and Himalayan region the valleys, as a rule, are deep, narrow, and shut in. But on the Roof of the World they seem to have been choked up with the *débris* falling from the mountains on either side, which appeared to me to be older than those further south, to have been longer exposed to the wearing process, and to be more worn down — in many parts, indeed, being rounded off into mere mounds, reminding one very much of Tennyson's lines: —

> "'The hills are shadows, and they flow
> From form to form, and nothing stands;
> They melt like mist; the solid lands,
> Like clouds they shape themselves and go.'

The valleys have thus been filled up faster than the rainfall has been able to wash them out, and so their bottoms are sometimes as much as four or five miles broad, almost level, and of considerable height above the sea. The Tagh-dumbash Pamir runs as low as 10,300 feet, but, on the other hand, at its upper extremity the height is over 15,000 feet; and the other Pamirs vary from twelve or thirteen to fourteen thousand feet above sea-level. That is, the bottoms of these Pamir valleys are level with the higher summits of the Alps.

"As might be expected, the climate is very severe. I have only been there in the autumn, and can therefore speak from personal experience of that season only; but I visited them in three successive years, and have seen ice in the basin of my tent in August. I have seen the thermometer at zero (Fahrenheit) at the end of September, and 18° below (that is, 50° of frost) at the end of October. The snow on the valley bottoms does not clear away before May is well advanced. June and July and the beginning of August are said to be pleasant, though with chilly nights; and then, what we in England might very justly call winter, but which, not to hurt the feelings of the hardy Kirghiz who inhabit these inhospitable regions all the year round, we will, for courtesy's sake, call autumn, commences."

Captain Younghusband and Mr. Macartney advanced up those long gravel desert slopes which lead out of the plains of Turkistan, and then through the lower outer ranges of hills covered with a thick deposit of mud and clay, which Captain Younghusband believes to be nothing else than the dust of the desert, which is ever present in the well known haze of Turkistan, deposited on the mountain-sides; then over the Kara-dawan, Kizil-dawan, and Torat Passes; through the narrow defile known as the Tangitar, where one has to

force the ponies up a deep, violent stream rushing over huge bowlders between precipitous, rocky cliffs, in which they noticed large, square holes pierced, suggesting to them that in former days this, the high road between Eastern and Western Asia, was probably improved by having a bridge over this difficult and dangerous part; then over the Chichiklik and Koh-mamak Passes and the Tagarma Plain, till they reached the neighborhood of Tash-kurgan, the northernmost point of Captain Younghusband's explorations in the previous year. Passing through the Little Pamir, they struck the Alichur Pamir near Chadir-tash at its eastern extremity, and from there they looked down a broad level valley, averaging four or five miles in width, to some high, snowy peaks overhanging Lake Yeshil-kul at its western extremity. The range bounding this Pamir on the north is free of snow in summer, but that separating it from the Great Pamir is of considerable height, the summits are always covered with snow, and the passes across it difficult. Traces of ancient glaciers are very frequent, and the western end near Lake Yeshil-kul is choked up with their moraines, forming a sea of gravel mounds, in the hollows of which numerous lesser lakes may be seen. On the borders of Yeshil-kul, at a place called Somatash, Captain Younghusband found the fragments of a stone bearing an ancient inscription in Turki, Chinese, and Manchu. This interesting relic, as far as Captain Younghusband has been able to get the rubbings he took of it translated, refers to the expulsion of the two Khojas from Kashgar by the Chinese in 1759, and relates how they were pursued to the Badakhshan frontier.

From the Ak-su Valley the two travellers ascended the sterile valley of the Ak-baital, which at this season of the year (October) has no water in it, and visited Lake Rang-kul. "On the edge of this lake is a prominent outstanding rock, in which there is a cave with what appears to be a perpetual light burning in it. This rock is called by the natives Chiragh-tash, i.e., the Lamp Rock, and they account for the light by saying that it comes from the eye of a dragon which lives in the cave. This interesting rock naturally excited my curiosity. From below I could see the light quite distinctly, and it seemed to come from some phosphorescent substance. I asked the Kirghiz if any one had ever entered the cave, and they replied that no one would dare to risk the anger of the dragon. My Afghan orderly, however, had as little belief in dragons as I had, and we set off to scale the cliff together, and by dint of taking off our boots and scrambling up the rocks, very much like cats, we managed to reach the mouth of the cave, and on gaining an entrance found that the light came neither from the eye of a dragon nor from any phosphorescent substance, but from the usual source of light — the sun. The cave, in fact, extended to the other side of the rock, thus forming a hole right through it. From below, however, you cannot see this, but only the roof of the cavern, which, being covered with a lime deposit, reflects a peculiar description of light. Whether the superstitious Kirghiz will believe this or not I cannot say, but I think the probability is that they will prefer to trust to the old traditions of their forefathers rather than the wild story of a hare-brained stranger. The water of the Rang-kul is salt, and the color is a beautiful clear blue. The mountains in the vicinity are low, rounded, and uninteresting, though from eastern end a fine view of the great snowy Tagarma Peak may be obtained."

The winter was spent in Kashgar. On July 22, 1891, Captain Younghusband left to return to India by way of the Pamirs and Gilgit.

"On reaching the Little Kara-kul Lake, a piece of interesting geography, which I believe had been first noticed by Mr. Ney Elias, on his journey through these parts some years ago, presented itself. Captain Trotter of the Forsyth mission saw from the plains of Kashgar a stupendous peak, the height of which he found to be 25,300 feet, and the position of which he determined accurately. From Tash-kurgan or its neighborhood he also saw a high mountain mass in the direction of the peak he had fixed from near Kashgar; bad weather prevented his determining the position of this second peak, but he thought there was no doubt that the two were identical. Such, however, is not the case. There are two peaks, about twenty miles apart, one on either side of the Little Kara-kul Lake. That seen from Tash-kurgan is the true Tagarma Peak, and cannot be seen from Kashgar; while that seen from Kashgar cannot be seen from Tash-kurgan. There appeared to me to be very little difference in height between the two. Both are remarkable not only for their extraordinary height, but also for their great massiveness. They are not mere peaks, but great masses of mountain, looking from the lake as if they bulged out from the neighboring plain; and one sees far more distinctly than is usually the case, the layers upon layers of rock which have been upturned like the leaves of a book forced upwards. It struck me, too, especially from the appearance of the rocks in the neighborhood of the northernmost peak, that these must have been upheaved far more recently than the worn-out-looking mountains in the centre of the region of the Pamirs. The appearance of these two great mountain masses rising in stately grandeur on either side of a beautiful lake of clear blue water is, as may be well imagined, a truly magnificent spectacle, and, high as they are, their rise is so gradual and even that one feels sorely tempted to ascend their maiden summits and view the scene from the loftiest parapets of the 'Roof of the World.'"

On Oct. 4 Captain Younghusband and a companion left the Tagh-dum-bash Pamir to explore "an interesting little corner of Central Asia, the point where the two watersheds — the one between the Indus on the south and the Oxus and Eastern Turkistan Rivers on the north, and the other between the Oxus on the west and the Eastern Turkistan Rivers on the east — join. If any point can be called the Heart of Central Asia I should think this must be it. Here on the Oxus side of the watershed are vast snow-fields and glaciers, and among these, with three of its sides formed of cliffs of ice — the terminal walls of glaciers — we found a small lake, about three-quarters of a mile in width, out of which flowed the stream which joins the Panja branch of the Oxus at Bozai-Gumbaz."

After this Captain Younghusband made his way down to Kashmir.

FURTHER CONFIRMATION OF THE DISCOVERY OF THE INFLUENZA BACILLUS.

IN January, 1890, Professor Babes of Bucharest investigated nine cases of influenza. The difficulty of studying them was increased from the fact that complications with other diseases were involved. Unfortunately, also, no experiments were made upon animals. Yet, from the results then found,[1] it will be seen that the bacteria are the same as those discovered by Pfeiffer, which Babes himself acknowledges.[2]

[1] Centralblatt für Bacteriologie, Bd. VII., No. 8, 15, 17-19.
[2] Deutsche Med. Wochenschrift, Feb. 11, 1892.

The bacteria showed the following peculiarities: —

1. In fresh cases the bacteria are found in large masses in the mucus, that is, in the inner of the leucocytes; they form a thick layer on the surface of the inflamed mucous membrane, and press into the superficial lymph-spaces and often also into the inner organs.

2. They form very fine, generally pointed, diplobacteria, or short rods, with a diameter of 0.2μ, often making chains. One recognizes in the inner of the same chromatic granules; these appear to be surrounded by a light zone, and they are without motion. With aniline colors they stain feebly, in single cases better, and are faint, or do not stain at all (except the chromatic granules), with Gram's method. In older cases and cultures, as in the inner of the leucocytes, the bacterium is found in a state of granular disintegration, frequently lessened in size or swollen so that the thickness of the individual bacteria can vary between 0.1 and 0.3 μ. The thickness also varies according to the coloring matter employed.

3. The bacteria can be cultivated in many cases, especially in glycerine. There are formed here, especially deep in the nutrient medium, very small rod-like colonies.

4. The bacterium is pathological for rabbits, since in some cases its introduction into healthy nasal cavities causes a sort of sepsis, pneumonia, and death of the animal.

From Babes's investigations it appears that white mice are not always immune against greater quantities of the culture or the products of the disease, and that they can die.

As there is now no special difficulty in recognizing and cultivating the very small bacteria in cover-glass preparations, it is to be hoped that they may be made valuable in diagnosis, and that a way for preventing and subduing the disease may be experimentally investigated.

Georgetown Medical School. A. MACDONALD.

LETTERS TO THE EDITOR.

Making an Herbarium or Preserving Plants.

THIS is the time of year when botanists are making plans for the summer campaign. I am not going through the subject by going into details, as *Science* has recently noticed several small manuals which treat fully of the subject. I wish to emphasize a few points which have received too little attention. I am somewhat familiar with the collecting done by the older botanists of this country, and with some in other countries.

We have a great advantage in many ways over the older collectors. We are learning all the time from each other. We are going deeper and deeper into the study of plants.

Almost everyone who preserves specimens, on the start hoards up a lot of worthless trash — of snips, tops, and mere fragments. Don't do it, but study the subject well from every side. I speak now more particularly with reference to grasses; but the following statement, I feel sure, will apply with almost equal force to most families of plants. This is the statement which I believe to be true, with very few exceptions: —

All truly good herbarium specimens have been made within the past twenty years, and a very large proportion of those prepared during the last twenty years are far from good. It is no injustice to others to say that, so far as I know, C. G. Pringle of Vermont, by his fastidiousness in this matter, started a reform which seems to be rapidly spreading. We should have an abundance of material, lower leaves, flowers, fruit, and root-stalks, if there are any, and little packages of nuts, flowers, and seeds on the sheet for study. Some years ago I spoke of the importance of preserving seedlings of many of our plants. This is a good time to refer to this part of the subject, since Mrs. Kellerman has illustrated the seedling blackberry. Turn to page ninety-four and study it. Go to raising seedlings, or pick them up wherever they can be found. Look out, too, for buds of trees and shrubs, and collect them before the inner scales have fallen — as they are opening. Do not be satisfied with mediocrity, but strive to have everything neat and complete. W. J. BEAL.

Agricultural College, Ingham Co., Mich., Feb. 22.

The Barn Owl a Winter Resident in Ohio.

THAT the barn owl, *Strix pratincola*, is, at least, a rare winter resident of central Ohio can no longer be questioned. A few days since two individuals were found in the hollow trunk of a sycamore tree at Utica, Licking County. One of them was killed by the fall of the tree; this I have not seen. The other was taken alive, and I had the satisfaction of seeing it last week in the possession of Mr. Newkirk of Newark, O. There is no doubt as to its identity, nor can I think there is any regarding the stated time and place of capture.

There are but few recorded instances of its occurrence in the State, and none of the dates at hand are in winter. Dr. J. M. Wheaton, in "Reports on the Birds of Ohio," says, "Rare visitor. Mr. Oliver Davie of this city [Columbus] has a specimen . . . killed in this vicinity Nov. 2, 1878. The dates of captures [Circleville, summer, 1873; Columbus, November, 1878; near Cincinnati, April, 1880] indicate that it is, at least, a summer resident of the State." It would seem that it is a permanent resident; in all probability rearing its young in central Ohio.

D. S. KELLICOTT.

Ohio State University, Columbus, Feb. 17.

A Magnetic Cane.

CAPT. D. P. SANFORD of this city owns a walking-stick that possesses magnetic properties, but how it came by them he is unable to explain. Several years ago he purchased a strong, heavy cane, having for its central portion a rod of excellent quality of steel, extending throughout its entire length. At the lower end it is about the thickness of the ordinary lead pencil; at the top nearly three-quarters of an inch in diameter. Its outer part is composed of leather, which, having been cut into rings, was forced, one ring upon another, till solid from end to end. This was rounded, smoothed and polished, and varnished. The cane was finished, first, by enclosing the lower end with a steel ferrule through which the central steel rod projected half an inch; second, by covering the upper end of the cane with a circular copper plate over an inch in diameter, and about one-sixteenth of an inch in thickness.

The cane was never near a magnet to its owner's knowledge; but recently he has noticed its magnetic property, which, in his belief, is growing stronger. Now, what causes this?

The water-tight non-conducting covering insulates the rod perfectly, except at the lower end, where, as a matter of course, it constantly comes in contact with the earth. The upper part, covered with the copper plate, is held in the warm and moist hand for hours at a time. Now, will the conditions of insulation, two metals, moisture of earth and hand, and difference in temperature between the two ends, account for the exhibition of magnetic properties? Will some one offer an explanation?

A. H. BEALS.

Milledgeville, Ga., Feb. 20.

[If the writer of the above will take any steel rod and give it a number of raps while held in a more or less vertical position he will find that it will become magnetic.—ED.]

AMONG THE PUBLISHERS.

THE question of "Speed in Locomotives," which for a time has superseded in popular interest the luxuries of railroad travel, will be discussed in the March *Scribner* by a notable group of railway authorities. M. N. Forney, editor of *The Railroad and Engineering Journal*, will consider the question of "The Limitations of Fast Running;" Theodore N. Ely, General Superintendent Motive Power, Pennsylvania Railroad, will treat of "Train Speed as a Question of Transportation;" H. Walter Webb, Third Vice-President of the New York Central, will describe "A Practical Experiment" — the running of the Empire State express. The views of three sueh authorities, presented in a popular way in one number, give for the first time an adequate knowledge to

the public of the difficulties and risks involved in running through trains at a high rate of speed.

— P. Blakiston, Son, & Co., Philadelphia, have nearly ready a "Monograph on Physical Education," by Frederick Treves, F.R.C.S., printed from the advance sheets of "A Treatise on Hygiene," by various authors. It is a systematic exposition of a very important subject that is at present attracting the attention of school boards, college trustees, physicians, and sanitarians generally.

— To Skakespeare students the plan and scope of Dr. Furness's variorum edition is universally known, as are the infinite pains, judgment, and critical faculty expended in the exposition of each play. Every volume as it appears brings into one focus all the wealth of a great Shakespeare library, so arranged as to be immediately accessible. "The Tempest" is the ninth volume of this incomparable edition, and will soon be published by J. B. Lippincott Company. The plays previously issued are "As You Like It," "Romeo and Juliet," "Hamlet" (2 vols.), "Macbeth," "King Lear," "Othello," and "Merchant of Venice."

— Under the heading "One Hundred Miles an Hour," Mr. Charles N. Deacon of the Reading Railroad discusses, in the March *Lippincott*, the facts and possibilities of railway speed, and rejects the popular notion that a faster rate necessarily means increased danger.

— J. B. Lippincott Company have just published a new edition of "Soule's Synonymes," revised and enlarged by George S. Howison, Mills professor of philosophy in the University of California.

— Houghton, Mifflin, & Co. will publish immediately the lectures in "The Evolution of Christianity," recently delivered at the Lowell Institute, in Boston, by Rev. Dr. Lyman Abbott, which have been carefully revised by Dr. Abbott for this publication in book form; "Equatorial America," in which M. M. Ballou describes his travels to St. Thomas, Martinique, Barbadoes, and the principal capitals of South America. This house will also shortly issue a new work by A. P. Sinnett, whose "Occult World" and "Esoteric Buddhism" secured so wide a reading. The new book will be named "The Rationale of Mesmerism."

— M. L. Holbrook Company, 23 Clinton Place, New York City, announce for immediate publication a work on the hygienic treatment of consumption, which has been in preparation many years, and which would have been published earlier if it had not been detained to await the verdict on Professor Koch's merits. The book is written mainly for the patient.

— In a volume of more than two hundred pages J. B. Lippincott Company will soon publish "Type-Writing and Business Correspondence," by O. R. Palmer. It is a compendium of the entire subject, and places in the hands of the novice just such information as is most needed. To insure its practical efficiency

CALENDAR OF SOCIETIES.

Women's Anthropological Society of America, Washington.

Feb. 20.—Folk-Lork.

Biological Society, Washington.

Feb. 20.—W. H. Dall, Factors in the Distribution of Animal Life as Illustrated by Marine Forms. It is expected that at each meeting a paper of general biological interest will be introduced for discussion, the above being the first of the series. F. A. Lucas, On Charcharodon mortoni; J. N. Rose, The Flora of the Galapagos Islands; John M. Holzinger, On the Identity of Asclepias stenophylla, Gray, and Acerates auriculata, Engelm.

Appalachian Mountain Club, Boston.

Fed. 25.—Frederick H. Chapin, Ascent of Uncompahgre Peak, Cliff-Dwellings of Navajo Cañon, Colorado (illustrated by about one hundred new stereopticon views.)

Business Department.

Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, may have the 'Want' inserted under this head FREE OF COST, *if he satisfies the publisher of the suitable character of his application. Any person seeking information on any scientific question, the address of any scientific man, or who can in any way use this column for a purpose consonant with the nature of the paper, is cordially invited to do so.*

A PROFESSORSHIP in Chemistry is wanted by one who has had five years' experience in that capacity. Would prefer to give instruction by lectures and experiments rather than by text-book methods. Would like a position in a college or university where there is a good student's laboratory. Special points of strength claimed are: (1) Thorough control of a class and good order during lectures and recitations. (2) Accuracy in experimenting with chemicals and skill in the manipulation of chemical apparatus. The permission of several distinguished educators has been given to refer to them if required. Would not care to accept a position paying less than $1,500. Address B. E., care of *Science*, 874 Broadway, New York.

ADDRESS WANTED.—Will some one please send the address of the Secretary of the American Philological Society. Also that of Herbert Spencer. "ADDISON," Room 84, 164 Madison St., Chicago, Ill.

ADDRESSES of Old Book Dealers wanted.—Wishing to obtain a number of old books out of print, I very much desire the addresses or catalogues of rare second-hand book dealers. If there is a directory or list of such dealers I should like to obtain possession of one. W. A. BLAKELY, Chicago, Ill.

WANTED.—Books on the Magic Lantern. Will exchange, "How the Farm Pays," by Cozier and Henderson; "Culture of Farm Crops," by Stewart; "American Agriculturist," 1890 and 1891. I. SLEE ATKINSON, 43 Wallace St., Orange, N. J.

WANTED.—(1) A white man versed in wood and iron working, able to work from specifications and plans, suited for an instructor of boys; his business to have charge of shops of school, outline and direct the work for foremen and students; salary to be $1,000 per annum (nine months). (2) A man (black preferred) to teach the colored, iron working and forging, subordinate to the preceding; salary, $720. (3) A man (white) competent to take classes in engineering (assistant's position), but with the ability to perform any of the work required in any of the ordinary engineering courses of our universities; salary from $1,000 to $1,500. A. H. BEALS, Milledgeville, Ga.

BOOKS: How to Exchange them for others. Send a postal to the SCIENCE exchange column (insertion free), stating briefly what you want to exchange. SCIENCE, 874 Broadway, New York.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

To exchange; Experiment Station bulletins and reports for bulletins and reports not in my file. I will send list of what I have for exchange. P. H. ROLFS, Lake City, Florida.

Finished specimens of all colors of Vermont marble for fine fossils or crystals. Will be given only for valuable specimens because of the cost of polishing. GEO. W. PERRY, State Geologist, Rutland, Vt.

For exchange.—Three copies of "American State Papers Bearing on Sunday Legislation," 1891, $2.50, new and unused, for "The Sabbath," by Harmon Kingsbury, 1840; "The Sabbath," by A. A. Phelps, 1842; "History of the Institution of the Sabbath Day, Its Uses and Abuses," by W. L. Fisher, 1859; "Humorous Phases of the Law,' by Irving Browne; or other works amounting to value of books exchanged, on the question of governmental legislation in reference to religion, personal liberty, etc. If preferred, I will sell "American State Papers," and buy other books on the subject. WILLIAM ADDISON BLAKELY, Chicago, Ill.

Wanted, in exchange for the following works, any standard works on Surgery and on Diseases of Children: Wilson's "American Ornithology," 3 vols.; Coues' "Birds of the Northwest" and "Birds of the Colorado Valley," 2 vols.; Minot's "Land and Game Birds of New England;" Samuels' "Our Northern and Eastern Birds;" all the Reports on the Birds of the Pacific R. R. Survey, bound in 2 vols., morocco; and a complete set of the Reports of the Arkansas Geological Survey. Please give editions and dates in corresponding. R. ELLSWORTH CALL, High School, Des Moines, Iowa.

Wanted to buy or exchange a copy of Holbrook's North American Herpetology, by John Edwards. 5 vols. Philadelphia, 1842. G. BAUR, Clark University, Worcester, Mass.

For sale or exchange, LeConte, "Geology;" Quain, "Anatomy," 2 vols; Foster, "Physiology," Eng. edition; Shepard, Appleton, Elliott, and Stern, "Chemistry;" Jordan, "Manual of Vertebrates;" "International Scientists' Directory;" Vol. I. *Journal of Morphology;* Balfour, "Embryology," 2 vols.; Leidy, "Rhizopods;" *Science*, 18 vols., unbound. C. T. McCLINTOCK, Lexington, Ky.

To exchange Wright's "Ice Age in North America" and Le Conte's "Elements of Geology" (Copyright 1882) for "Darwinism," by A. R. Wallace, "Origin of Species," by Darwin, "Descent of Man," by Darwin, "Man's Place in Nature," Huxley, "Mental Evolution in Animals," by Romanes, "Pre-Adamites," by Winchell. No books wanted except latest editions, and books in good condition. C. S. Brown, Jr., Vanderbilt University, Nashville, Tenn.

For Sale or Exchange for books a complete private chemical laboratory outfit. Includes large Becker balance (200g. to 1-10mg.), platinum dishes and crucibles, agate motors, glass-blowing apparatus, etc. For sale in part or whole. Also complete file of *Silliman's Journal*, 1862-1885 (62-71 bound); Smithsonian Reports, 1854-1883; U. S. Coast Survey, 1854-1869. Full particulars to enquirers. F. GARDINER, JR., Pomfret, Conn.

the book has been divided into sections giving sample business letters representing widely-different trades, also rules for punctuation and for using the various kinds of type-writing machines.

— Of Dr. Franz Boas's recent publications on the ethnography and linguistics of the American North-west, the following are before us: 1. "Notes on the Chemakum Language," in *American Anthropologist* for January, 1892, pp. 37–44. The people speaking this language were visited by Boas in the summer of 1890 on Puget Sound, and then only three persons were surviving. Before Boas nothing thorough had ever been made public upon this curious and very consonantic language, which forms, together with a dialect on the Pacific Coast, unexplored as yet, a linguistic family by itself. 2. "Third Report on the Indians of British Columbia," contained on pp. 2–43 of Seventh Report on the North-tribes of Canada, Cardiff meeting, 1891, of the British Association for the Advancement of Science; mostly ethnographical and somatological. 3. "Vocabularies of the Tlingit, Haida, and Tshimshian Languages," American Philosophical Society of Philadelphia, Oct. 2, 1891; in its Proceedings, pp. 173–208. These copious word collections are so arranged that the English signification stands first. At the end of the article there are texts and a song in Tshimshian with interlinear translation.

— All teachers and those interested in higher education will be attracted by the paper in the *Atlantic Monthly* for March, by Professor George H. Palmer of Harvard University, entitled "Doubts about University Extension." The writer has given this subject a most careful study, and relates the history of the movement in England and in the United States. He speaks of the difficulties of making it a success here, owing to the different social conditions of the two countries, and suggests plans by means of which the system may be made a possible success in America. The paper will well repay a careful reading.