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PHOTOGRAPHIC NOTES No. VI.

MAKING OF LANTERN SLIDES.

If the negative is larger than contact-printing size, set it in a frame parallel to the camera front (gelatine side toward the lens) and facing a uniform white surface, sky or artificial lighting. Proper setting of the camera will give the necessary reduction to slide size. Different exposures may be given to different parts of the negative by means of appropriate masks. The time of exposure and the softness of the resulting slide may be controlled by the use of "stops" in the lens Unless one has a special kit for $3\frac{1}{4}$ x 4 plates(or English size $3\frac{1}{4}$ inches square) some quide should be placed in the plate holder (standard opening $3\frac{1}{4}$ x $4\frac{1}{4}$) to ensure centering of the lantern plate. The camera reduction of large negatives, especially scenic, gives beautifully soft slides with delicate detail.

Contact printing from small negatives is quicker, and for line work better than camera reduction. Let us now suppose that many slides are to be made from a number of negatives by contact printing. If the negatives have been properly spotted, blocked out and intensified (if necessary), they should be sorted in groups, weak, medium and strong; all members of one group requiring practically the same exposure. If the subject is not correctly centered and squared on the slide, it will not be fit for projection.

This adjustment of slide-plate to subject can be done more easily in daylight than in the gloom of the red lantern. Therefore select the right-size, true-cut mat for each plate; place the mat on the gelatine side of the negative and square it up carefully with the subject. Then laying the negative, glass side down, on a flat surface, without disturbing the setting of the mat, make, on the gelatine film, two scratches or ink-marks touching each of two adjacent edges of the mat. Remove the mat and placing on the negative, a "cover glass" so that its adjacent edges coincide with the coordinating marks, cut two scratches full length of the cover glass sides. Thus you have a simple way of "registering" the sensitive plate in the dark room; make its adjacent edges coincide with the scratched lines on the negative and there will be no worry about spacing or angles.

In the dark room we need a 4 x 5 tray, three or four ounces of developer (same as for negatives), a 4 x 5 printing frame, snugly fitted with a flat flawless plate of glass and, most important of all, the exposure light. Most of the failures in slide making (flatness and fog) may be traced to a strong uncontrollable exposure light. An old-fashioned small flat-wicked Kerosene lamp meets all the ordinary requirements. Its variations in light efficiency, being connected with the size of the flame, are more easily estimated and remembered than the changes in intensity of the glow of the Mazda lamp. Place the negatives, face up, in the printing frame, lay on it the sensitive plate face down and square it with the adjusting lines; holding frame and plates on the table,

set in the hinged back and clamp it down without moving the negative and overlying plate. During these manouvers be very careful not to rub the sensitive side of the lantern plate, on the negative, as all friction marks are likely to develop in proportion to their harshness.

Light the lamp and make the exposure. The Hammer Yellow Label lantern plate is uniformly good and will give satisfactory results with any negative. With this plate and an oil lamp having a one-inch-wide flat wick set to give a half-inch flame, hold the printing frame about two feet from the light and expose (good negatives) for twenty seconds, for weak negatives, lower the light, double the distance and double the exposure.

An oil lamp flame is more flexible than an electric bulb and its low intencity reduces the chances of exposure error. The sodium hydroxide- hydroquinone developer recommended for negatives works very well with lantern plates, producing the necessary contrast with clear light. While developing the exposed plate, keep the tray in shadow till the operation is nearly finished, then it may be moved into the full red light; the film is less sensitive when wet than when dry. A hand magnifier, 3 inches in diameter, will aid the eye to detect the approach of injurious fog. As soon as the developing is finished place the plate in running water and leave it there until you have the next plate completely ready for exposure; this interval will allow time for the removal of the absorbed developer. Then transfer the plate to a clean fairly strong Hypo solution (3 of Hypo to 8 of Water); change when thoroughly fixed to the washing tray and leave there for 15 or 20 minutes. With these precautions there will be no need of a clearing solution; the use of a hardener in the fixer sometimes interferes with the coloring of the slide. If one wishes a soft slide from a strong harsh negative, expose (almost overexpose) close to a strong light and double the amount of water in the developer. When the plates are washed set them to dry on a rack in a dustless room. If the finished slides are weak or lacking in contrast, remove them; don't try intensification, the results will be poor and the life of the slide will be much shortened.

The appearance of the slide on the screen may be spoiled by its framing and consequently suitable mats should be employed. If the subject is approximately round in outline do not use a circular mat; in general the round-cornered parallel-sided openings are to be preferred.Avoid the freak shapes, stars, leaves etc: elliptrical openings should be used only in exceptional cases. Above all do not attempt to make mats; rough lines and incorrect angles are too prominent when magnified and they catch the eye to the injury of the slide proper. If a mat of right size cannot be found, one of the stock sizes may be nicely fitted to the subject with a little ingenuity; but do not try to reduce the opening by pasting binding strips over it. The paper of which the mat is made should be examined or tested carefully. One kind, a smooth (not glossy) thin dead black paper is extremely hyposcopic. If mats of this type are used, when the slide is bound up and put in the lantern for projection, the heat from even a 500 watt lamp will drive the retained water from the mat as vapor to condense, in the opening, on cover glass and film, forming a dark cloud of changing shape on the screen and disappearing only when the slide becomes too hot to hold liquid water. When the slides cools down the water vapor finds a resting place in the mat until the next projection and so on da capo. The only remedy is not to use this kind of mat, you cannot change its thirsty disposition. It is good practice in every case after the mat has been fastened to the slide to heat slide and cover glass before binding.

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THE PRESENT STATUS OF NUTRITIONAL CHEMISTRY.

In 1906 it was first suggested by F.G.Hopkins, of Cambridge, England, that our food must not only include meat or meat substitutes, but that there must also be present certain other substances too small in amount for chemical analysis, but essential for health and growth, and he called those substances "food accessories". They were later called by Casimir Funk "Vitamines"; and thus the vitamine hypothesis was given its start. While its developments have been remarkable in the past 20 year. there are two of its aspects which have made these years unique in the history of nutritional chemistry.

First, the development of the "feeding tests", using experimental animals such as the white rat, the pigeon, the guinea pig, etc., has given nutritional science a very efficient tool. In 1898 Eijkman produced in fowls a disease identical with the oriental plague called beri-beri, thus giving us a simple means of testing therapeutic agents for this disease; while the identity of the rickets produce experimentally in white rats with that occurring in human beings has led to the development of curative agents for this disease also. Scurvy has been produced and cured in the guinea pig, so that we have a good idea of the treatments of this once prevalent bugbear of long sea voyages.

Second, the development of the vitamine hypothesis has led to an unprecedented degree of cooperation between different branches of science in the pursuit of nutritional problems. The men interested in these problems in the beginning of the present century were very few, and most of them were physiologists. The theory of the dietary origin of disease was still new. Findlay in England in 1908 had reported experiments which seemed to show that rickets were chiefly caused by "confinement with consequent lack of exercise". At that time it had long been known that cod-liver oil was practically a specific for this disease. Following the demonstration in 1915 by McCollum of Johns Hopkins that a fat-soluble vitamine (Vitamine A) existed in butter and eggs, studies of other fats had shown that cod-liver oil was our very richest source of this vitamine. These facts stimulated doubt as to the truth of Findlay's views on the etiology of rickets, and suggested that it was really due to a deficiency of Vitamine A in the diet. Further experiments by Mellanby under the auspices of the British Medical Research Council seemed to confirm this explanation, and his results, published in 1919, gave it a sort of sanction by this important body.

However, there were two groups of scientists in this country also interested in this problem; one at Johns Hopkins, and the other at Columbia. At the former University, McCollum and Simmonds had found that rats fed on certain cereal diets developed the beaded ribs characteristic of rickets, and that unless calcium salts were added to the diets, normal skeletons would not develop; and that symptoms were identified with human rickets by cooperation with the Pediatrics Staff of the Johns Hopkins Hospital. At Columbia, Sherman had found by statistics on American dietaries that calcium was the element most likely to be deficient in most of them. He then started to find the relation, if any, between vitamines and the utilization of calsium for bone manufacture in the organism. Two of his experimental diets contained no vitamines, but contained a certain amount of calcium together with varying amounts of phosphorus, which together with calcium forms the mineral substance of bone, namely calcium phosphate. The rate used in the experiment developed rickets on the low phosphorus diet, but not on the one rich in phosphorus.

Again, the identity of this experimental disease in the rats with human rickets was assured by cooperation with the medical man at the Columbia College of Physicians and Surgeons, where the group composed of Jobling, Pappenheimer, Hess, Zucker, Sherman, and their colleagues was ready, along with the Johns Hopkins group, to test out the results of the Englishman Mellanby as soon as they were published. The outcome of this cooperation was that rickets were produced by several causes: normal calcium and low phosphorus in the diet, also low calcium and normal phosphorus; and even on these diets, the disease can be warded off by feeding cod-liver oil or egg yolk in which substances the protecting substance is not identical with the

already recognized Vitamine A, but another and new Vitamine which McCollum called Vitamine D. The place of this substance in a deficient diet can also be taken by the high-frequency radiations present in the rays of the ultra-violet lamp or in direct sunlight. These radiations are filtered out by window glass, but not by quartz; they range from about 2000 to 3000 Angstrom units. Last year Hess and Steenbock found out that it is not even necessary to expose the patient suffering with rickets to these radiations; even foods ordinarily affording no protection against rickets become "antirecketic" by merely submitting them to the rays of the ultra-violet lamp. These experiments make clear the necessity of giving young children plenty of opportunity for basking in the direct rays of the sun, if their bones are to develop properly. Rickets in children result in serious malformation of the skeleton in later years, especially in girls in whom narrowing of the pelvis makes subsequent child-bearing difficult if not impossible. These discoveries along the lines of rickets show the value of the vitamine hypothesis, and also the great strides that can be made in therapeutics when cooperation between different groups of related scientists can be maintained, as is proposed in the projected Chemo-medical Institute at Georgetown.

We should not however fully appreciate the work of the more recent investigators in Nutritional Chemistry if we did not remember the contributions of the pioneers in the science, the men who first laid the foundations of this subject as a fairly exact science by the study of the energetics of nutrition - in other words, the investigators like Rubner and Pettenkofer and Voit in Germany, and Lusk, Atwater, and F.G.Benedict in this country, who introduced the idea of the calorie into the nutrition question. Graham Lusk, who was 65 years old on Feb. 15 of this year, is still teaching at Cornell Medical School in New York City; and the calorimeters in which he placed animal and even human subjects for the evalation of the calorific requirements of their diets are still in use there and at the Sprague Institute for Medical Research, close by Cornell and other great medical institutions at the Bellevue centre around 1st Ave and 26th St. Lusk's work however was not confined to the mere mechanical evaluation of such and such diets. He made a profound study of the intermediary metabolism of foodstuffs, and established the relation between the amino-acids and the sugars.

The foods which we eat can be regarded as made up for the most part of fats carbohydrates, proteins, and mineral salts. By the processes of digestion, the organism pulls these foods to pieces and delivers them to the blood in the shape of comparatively simple substances. Thus the fats are hydrolyzed to glycerol and fatty acids, which are later partially resynthesized to fats and delivered as such to the blood stream. The proteins are split to their constituent amino-acids, 18 in all. The sugars and starchy foods are ultimately converted into the simple sugar glucose, which is poured into the blood stream as such. From these simple substances the body is able to keep up its energy supply and to rebuild lost ao damaged tissues. We now come to a series of investigations based ultimately on this pioneer work of Lusk and his colleagues, which exemplify in a remarkable degree the progress which medical science has made through biochemical studies, and which go to show what may be expected from such studies in the future.

The normal organism possesses the power of oxidizing all the fat and sugar taken in on any reasonable diet, to carbon dioxide and water. If we are dealing with the pathalogical condition known as diabetes mellitus however, the organism is unable to do this; and the products of incomplete oxidation of the fat, along with the unburned glucose itself, accumulate in the blood. The former are acidic substances, and the blood, although capable of a marvelous amount of adaptation with respect to the neutralization of the acid thrown into it, changes its reaction after a time and its normal slight alkalinity changes to neutrality or even to a faint degree of acidity, with the result that a profound coma and ultimately death ensues. The general condition is known as ketosis, or an acidosis due to the presence of ketone-like bodies in the blood. Not long ago the world was startled by the news that Banting of the University of Toronto had isolated a substance called insulin, which is a cure for this condition.

His chief contribution lay in the fact that he had isolated it in such pure form that it was available for medical use. As has been said, the diabetic cannot utilize more than a very small amount of sugar, nor can he oxidize completely the fatty constituents of the diet. It was learned some years ago that in the organ which the butchers call the "belly sweetbread", and which the physiologists call the pancreas, there is a principle which in some way changes the glucose of the blood so that it will be taken up by the tissues and take part in the combustion of fat - for Rubner said "fats burn in the flame of the carbohydrate". This principle we call insulin. Banting extracted this principle from the pancreas of animals and after extensive purification processes injected it into the blood of diabetics, enabling them to oxidize glucose and fat to completion. The extract is now available in ampules put up by the several large pharmaceutical houses; the details of the preparation were described by a member of the Eli Lilly staff in a recent number of the Journal of Chemical Education. There is an extensive literature on the subject, as may be supposed, and at present the research men are naturally engaged in intensive effort to isolate from the commercial preparation the really pure chemical substance to which the activity of the extract is due, as has already been done in the case of adrenaline. So far no definite results have been reported; and it may be said in passing that this is all that as yet be said of the work of MacCallum, James, Laughton, and their associates at Toronto on the depressor principle in liver extract. It is known that in this extract there exists some substance capable of reducing the blood pressure to a remarkable degree. But even after three years of work on it, no definite formula can be assigned to the real substance itself. Insulin is a very powerful drug, a active as strychnine, and its use in cases of necessity should have the supervision of a <u>competent</u> physician.

Another example, which we have time only to mention, showing how a chemical study of the diet has produced most beneficial results in medical work, is that of Steenbock's studies on anaemia. Experimenting on rabbits, he showed that an anaemic condition produced in the animals by a long-continued milk diet could not be cured by any administration of iron in inorganic form unless some organic substance occurring in vegetables, especially in cabbage leaves, was also fed with the iron. Haemoglobin, the red coloring matter of the blood which carries the oxygen to and from the tissues, not only contains iron, but also an organic complex to which the iron is attached. Cabbage and other vegetables contain this complex although they may contain little iron. The whole experiment tends to show that we must have the iron and the complex both in the diet if we are to avoid a deficiency of haemoglobin in the blood, or in other words, an anaemia.

The short review we have given of nutritional studies makes evident the inadequacy of this short time for any comprehensive view of nutritional developments during even the last 10 years. It shows however three points: the progress attained through the use of experimental animals; the fact that an enormous amount of investigations on this general subject are going on; and finally the value of cooperative effort between the different branches of the science.

Neither is it possible to offer any butthe briefest suggestions as to food selection and use; but this much can be said. The science of nutrition does not classify foods into good and bad categories, but recognizes that Nature has supplied very few complete foods and an enormous variety of incomplete foods. The diet must be complete, but does not mean that we must abjure white flour and eat only whole wheat, or that because we need green vegetables that meat is not a valuable foodstuff. It simply means that if one has chosen rolls, meat and oranges for himself, he must supplement these with other purchases that will supply the nutrient factors which these lack in the amount required by the body. Obviously the power to do this lies in the development of our knowledge as to what meat, oranges, and rolls contribute, and what they lack, and the same information about the other articles offered in the markets. Also we see in this situation why, if we include in our diet a few articles that are themselves fairly complete in the factors, such as milk, green vegetables, whole cereals, we can follow our appetites mor safely in the purchase of the rest of the meals.

It must be remembered that instinct is a very poor guide to food selection and is not a substitute for intelligence.

One corollary of all this would seem to be the advisability in our houses, especially the large houses, of some scientific regulation and selection of diet. Almost any biochemist or doctor can prescribe the skeleton of such diet; that is, the number of calories required, the distribution of these calories among the fats, carbohydrates, and proteins in the diet, and the general nature of the foods containing the so-called food accessories. However, the translation of these basic requirements into a series of eatable meals over a long period of time is a very difficult task and one that should be entrusted to some experienced dietician. Only in this way can we make intelligent use of the accumulated scientific knowledge of dietetics which is now the common property of everyone, and which is of course put to practical use by all those in charge of feeding large communities, especially those whose members are of some value or some supposed value to the state.

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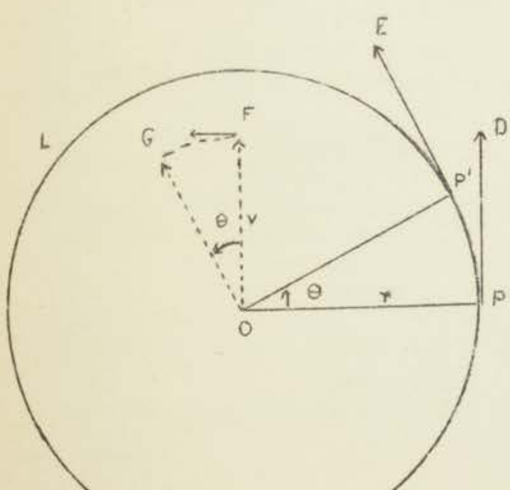
ACCELERATION IN UNIFORM CIRCULAR MOTION

The following derivation of the value of the acceleration in uniform circular motion makes use of vectors and avoids the calculus. Let two arrows V_a and V_b representing, in magnitude and direction, two vector quantities (e.g. two velocities) be placed with the tip of V_a adjoining the origin of V_b. Then the vector sum of V_a and V_b will be represented (in magnitude and direction) by the arrow V_c drawn from the origin of V_a to the tip of V_b. That is, $V_a + V_b = V_c$. Since V_b is added vectorially to V_a to obtain V_c, then $V_c - V_a = V_b$.

If, then, two arrows V_c and V_a (representing two velocities) are placed with their origins together, the difference between velocity c and velocity a ($V_c - V_a$) will be represented, in magnitude and direction, by V_b, the arrow drawn from the tip of the subtrahend to the tip of the Minuend.



Suppose a particle, moving uniformly along the circle PP'L, has at P a velocity represented (in magnitude and direction) by the arrow PD = OF. Since the speed (<u>magnitude</u> of velocity) of the particle is constant, the arrow representing the velocity will always be of the same length. But, since the direction of the velocity of the particle, at every point of its path, is along the tangent to the circle at that point, the <u>direction</u> of the velocity (and consequently the velocity itself) is continuously changing. The problem is to find the ratio of this change of velocity to the time required for the change, i.e. to find the <u>acceleration</u>.

While the particle moves <u>continuously</u> along the arc from P to P', the dotted arrow representing the velocity turns <u>continuously</u> through the angle θ. Since the origin of the rotating arrow always remains at the point O while the tip describes the arc FG, two successive positions of the arrow would be represented by two vectors with their origins together at O.

Therefore the distance between successive positions of the tip is equal to the difference in velocity. (Cf. supra). Then, the total difference in velocity as as the arrow moves through the angle θ will be the total path moved through by the tip of the arrow, that is, the arc FG. But,

$$\frac{\text{total change of velocity}}{\text{time}} = \text{acceleration}, \quad \frac{\text{arc FG}}{t} = a, \quad \text{arc FG} = at.$$

Moreover, the arc PP' (the distance moved through by the particle is equal to vt, where v is the constant speed of the particle along the circle.

Then, θ (in radians) $= \frac{\text{arc}}{\text{radius}} = \frac{\text{arc FG}}{v} = \frac{at}{v}$. Also, θ (in radians) $= \frac{\text{arc PP'}}{r} = \frac{vt}{r}$.

Therefore, $\frac{at}{v} = \frac{vt}{r}$,

therefore, $a = \frac{v^2}{r}$. But $v = \frac{s}{t}$ $\frac{2\pi r}{T}$, where T is the period or time it takes for the particle to travel around the circle.

Therefore, $a = \frac{4\pi^2 r}{T^2}$

Moreover, at every instant, the direction of the change of velocity is tangent to the arc FG and therefore perpendicular to the direction of the velocity. Now as the particle moves around the circle, the direction of the velocity of the particle at every point of its path is perpendicular to the radius at that point. But at the same point the direction of the velocity is perpendicular to the direction of the change of velocity. Hence the direction of the change of velocity (and acceleration) at every point must be along the radius, and (as is evident from the figure) towards the center of the circle. That is, the acceleration ic centripetal.

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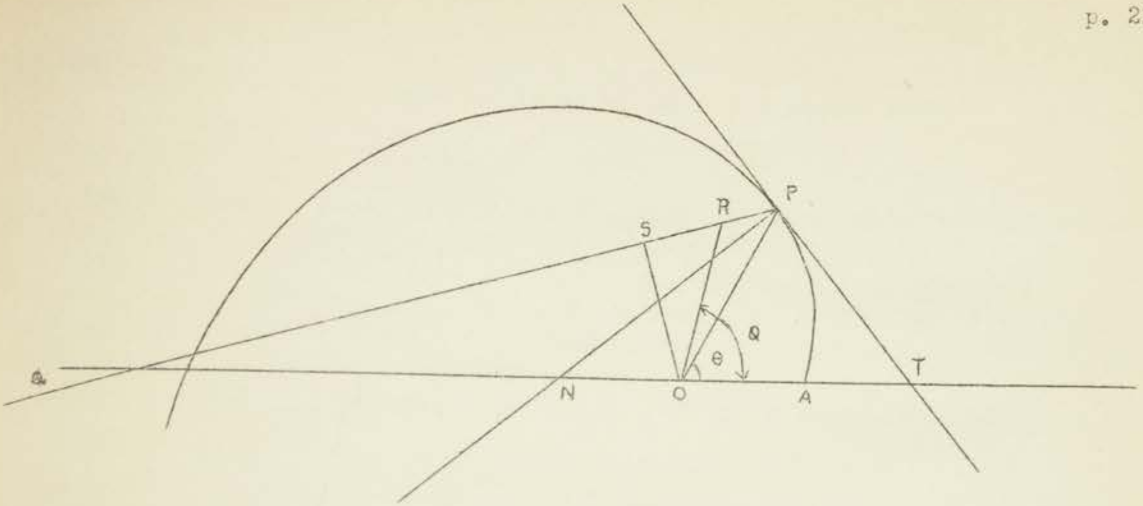
SOME NOTES ON THE LOGARITHMIC SPIRAL.

In the last number of the Bulletin the general characteristics of these spirals and the manner of constructing them were described. In this paper we will treat briefly of the caustic curve produced by reflecting rays of light from the surface of a cylindrical mirror when a point source of light is placed at the center or pole of the mirror and the cross section of the cylindrical mirror is a logarithmic spiral. The caustic curve, as is shown in treatises on geometrical optics, is the envelope of the reflected rays; if this envelope reduces to a point, as in the case of the parabolic mirror used in astronomical telescopes, we have a true focus; otherwise the reflected rays spread out over an area with a brilliant boundary forming the caustic, if we restrict ourselves to two dimensions; if we extend our considerations to three dimensions we would have a solid with a brilliant boundary forming the caustic surface. In this paper we restrict our consideration to the rays of light in a single plane which is supposed to be perpendicular to the elements of the cylindrical surface of the mirror.



In our figure the curve is a logarithmic spiral. O is the pole of the spiral and also the point source of light; OA is the initial line of reference in the polar system of coordinates which we will use for our discussion. P is any point of the curve, and hence OP is an incident ray and PQ the corresponding reflected ray, PN being the normal to the mirror at the point P. PQ is constructed according to the ordinary law of reflection by making the angle NPQ = OPN. We must first derive the equation of the reflected ray in terms of the constants of the spiral.

Let OS be drawn perpendicular to PQ and let R be any point on the reflected ray. We then have

1). $OR = OS \sec ROS = OS \sec (AOS - AOR)$

But $AOS = AOP + POS$, and the angle at S being a right angle,

$$POS = 90^\circ - OPS = 90^\circ - 2\ OPN.$$

From the fundamental property of the logarithmic spiral the angle OPT is constant, as was shown in the previous paper, and hence also the angle of incidence, OPN, is constant and equal to $90^\circ - OPT$, which finally gives us

$$AOS = AOP + 2OPT - 90^\circ.$$

Let us call OR, which is the radius vector to any point of the reflected ray, r; call AOP θ, AOR ∅ and OPT V. We then have as the equation of the reflected ray:

2). $r = OS \sec (\theta + 2V - 90^\circ - \phi)$.

OS is constant for any one ray but varies with the point of incidence and hence we also express it in terms of the constants of the spiral. Now

$OS = OP \sin 2\ OPN = OP \sin 2(90^\circ - V) = OP \sin 2V$. Whence

3). $r = OP \sin 2V \sec(\theta + 2V - 90^\circ - \phi)$.

But since OP is the radius vector of the point P of the spiral we have from the equation of the spiral, $OP = a^\theta$, and therefore

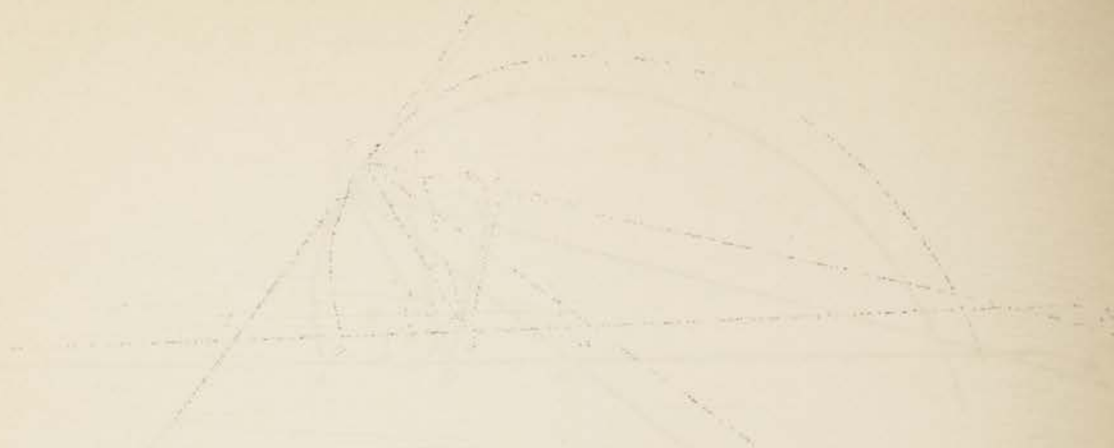
4). $r = a^\theta \sin 2V \sec(\theta + 2V - 90^\circ - \phi)$.

Each point of the spiral, determined by arbitrarily chosen values of θ, gives us a similar equation, and hence 4) represents a singly infinite family of straight lines, θ being the single parameter of the family. Our optical problem of finding the caustic of the mirror thus reduces itself to finding the envelope of this family of straight lines. The ordinary method of doing this, as explained in the text-books on Calculus, is to take the partial derivative of the above equation with respect to the parameter and then by means of this derived equation to eliminate the parameter from the original equation 4). Differentiating 4) with respect to θ we get

5). $0 = a^\theta \log_e a \sin 2V \sec(\theta + 2V - 90^\circ - \phi)$
$\quad + a^\theta \sin 2V \sec(\theta + 2V - 90^\circ - \phi) \tan(\theta + 2V - 90^\circ - \phi)$.

This factors at sight into

6). $0 = a^\theta \sin 2V \sec(\theta + 2V - 90^\circ - \phi) \times (\log_e a + \tan(\theta + 2V - 90^\circ - \phi)$.



Now for any real spiral 2V is a real angle (different from 0° and 180°) and hence sin 2V cannot be zero; the secant of an angle can never become zero, neither can a^{θ} become zero for any finite value of θ; hence the second factor is the one tha must be zero and we get

7). $\log_e a = -\tan(\theta + 2V - 90^\circ - \phi)$.

In our previous paper we saw that $\log_e a = \cot V$, or $\tan(90^\circ - V)$ which implies $\log_e a = -\tan(V - 90^\circ)$; putting this value in 7) we have

8). $\tan(V - 90^\circ) = \tan(\theta + 2V - 90^\circ - \phi)$; wherefore

$V - 90^\circ = \theta + 2V - 90^\circ - \phi$ (or this plus some multiple of 180°) i.e. on the envelope $\theta = \phi - V$ (or $\phi - V + n\,180^\circ$). When we put this value in equation 4) we have as the equation of the envelope

9). $r = a^{\theta - V} \sin 2V \sec(V - 90^\circ$ which $= a^{\phi - V} 2\sin V\cos V/\sin V = 2a^{\phi - V}\cos V$.

Since V is a constant we can write this last equation in the form

10). $r = k.a^{\phi}$ which shows that the caustic of this mirror is exactly similar in shape to the mirror itself, another instance of the special property of repetition characteristic of these curves.

The other solutions of equation 8), namely $\theta = \phi - V + n180^\circ$, refer to the intersections of a given radial line with the succesive spires or turns of the curve which are infinite in number. For actual reflection we could use only one spire, since the rays will be reflected from the first surface they meet and will not pass through the mirror to the outside spires. If we restrict our mirrors as in the figure given above, the fundamental solution used in equation 9) is a sufficient representation of the caustic, θ being restricted to values not over 180°.

Errata Corrigenda.

There are two typographical errors in our previous paper which should be corrected. On page 7. in the little table near the middle of the page the plus sign should be replaced by the multiplication sign, the successive values of θ being 0°, 10°, 20°, etc. and not 10°, 110, 12°, etc. as in the text.

On page 8, last paragraph, we should read p/18 instead of 18, (p = 3.1416. Thus 10° = p/18 radian: tan V = (p/18) ÷ $\log_e a$. The numerical values given for tan V and V are correct.

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BIOLOGIC PREPARATION FOR THE STUDY OF MEDICINE AND DENISTRY.

The attention of our professors of Biology in the pre-medical and pre-dental courses is called to a most interesting article, contributed to the Journal of the Medical Association, entitled: "Biologic Preparation For Study Of Medicine And Dentistry". The paper, written by Frederick C. Waite, professor of Histology and Embryology, at Western Reserve University, Cleveland, Ohio, appears in the number under date of August 21, 1926. A feature of the contribution is that it bespeaks the professor's findings, following twenty-five years of observation of medical and dental students in his classes coming from college courses in biology.

As it is quite likely that this Journal is not within reach of many of ours engaged in this teaching of biology to the above-named students, it has seemed feasible to the writer to summarize the paper in part, suggesting that one of the members of the American Association of Jesuit Scientists, Eastern States Division, be designated to dicuss this matter at greater length at the coming conclave of the Association.

The one great need of students entering the professional schools is a comprehension of the fundamental facts of cell structure and functions, and their differentiation.

The undergraduate course in biology should give the students entoring medicine or dentistary a knowledge of the fundemental facts of veterbrate structure and function of the several organ systems of veterbrates. By this, the author emphatically declares, is not meant the structure of man or even mamalian structure, but those common veterbrate characteristics such as the coelom, axial and appendicular skeleton, circulation, excretion and tropisms. In view of the fact that there is a persistent tendency in professional schools to make everything anthropomorphic, if the student is to reach any comprehensive and comparative idea of man in his structural and functional relations to other vertebrates, the undergraduate school must furnish him with the necessary firm basis of vertebrate anatomy. As physiologic anatomy is rapidly replacing purely morphologic consideration, it is easy to see that the undergraduate courses in biology can do much in encouraging the student to think of structure and function as inseparable. Comparative anatomy, therefore, indicating the correlation of structure and function, including change of function and progressive specialization should be included in the curiculum. Nor should biologic philospohy be forgotten. He should be familiarized with arguments and conclusions regarding evolution, heridity, mendelism, the fundemental laws of biogenesis, sexual dimorphism, parasitism, metamerism, differentiation etc. It was particularly gratifying to the writer to find the doctor insisting that "it is unwise to give courses that anticipate the courses that lie in the province of the professional school. Such subjects as pathogenic bacteriology, mamalian physiology, microscopic anatomy of mamalian organs and human anatomy had better be left to the professional school and the time given to subject matter that cannot be treated in the professional school. About two years ago in an article I contributed to the Teachers Review, I discouraged our professors against similar practices. I have approched but one or other item in this very sound exposition. I, amongst others, shall welcome a more exhaustive discussion at some future date, by one more capable than myself.

Fr. F.A.Tondorf, S.J.
Georgetown University.

A CONVENIENT LEVEL TRIER.

A level trier for determing the constant and radius of curvature of a spirit level is found in many physical laboratories. There are several types on the market. Usually they are provided with either fixed or movable Vs so that only unmounted tubes can be conveniently tested. This limits their usefulness. It is usually safer to give a student a mounted level. Besides it is often desirable to test the levels of a surveyor's Transit or Wye or Dumpy Level without removing them from the instruments. I have recently purchased a level trier from the Buff and Buff Manufacturing Company of Jamaica Plain (Boston) Mass. They are well known makers of surveying instruments. The instrument has some good features. It has the usual iron base. The iron flat horizontal movable bar has a micrometer screw at one end. The tip of the screw rests on a hardened steel disk embedded in the base. The other end of the bar is supported by means of two short stout knife edges which rest in a groove in the base. This allows a certain amount of lateral movement. The screw head is divided into two hundred parts and the distance between the knife edge and screw tip about 17 inches-is so chosen that the instrument reads directly in seconds of arc. Each division of the screw head is equivalent to two seconds. A ring with an inside thread cut in it is attached to the bar over the knife edges into which a surveyor's transit or level can be screwed in order to test its levels. The finish is the crystalline black now rather commonly applied to scientific instruments. As made, Vs were cast with the bar for unmounted levels. I suggested to Mr. Buff that the instrument would be more useful in the laboratory if provision were made for testing mounted levels and that I would prefer to have the Vs sawed off and their bases smoothed off so that they could be set on the bar only when needed.

He therefore removed them and mounted each on a three sided base so that they can be set firmly anywhere on the bar. This was done without extra charge. The catalogue price of the instrument is $47.50 and an educational discount is given. It should be noted that the ring will take a Buff or Berger Transit or Level. Inquiry would have to be made regarding other types. Mention is made here of this level trier as some who may be interested may not have occasion to see the Buff and Buff catalogue. Besides the cut in the catalogue does not correctly represent the present type.

Fr. H. Brock.
Weston, Mass.

MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The American Association for the Advancement of Science and its affiliated Scientific Societies held their usual annual meeting in Philadelphia from December 27th to January 1st. Representatives of our Colleges from the East and Missouri were in attendance. The public sessions were held at the Drexel Institute and the various sectional meetings took place at the University of Pennsylvania. At the opening session, presided over by the president Prof. L.H.Bailey of Cornell, addreses of welcome were made by Prof. C.E.McClung, the chairman of the local committee, and by Dr. J.H. Penniman provost of the University of Pennsylvania. The retiring president's address was delivered by Prof. M.I.Pupin of Columbia University on "Fifty Years of Progress in Electrical Communication". Pupin is the author of the popular aurobiography "From Immigrant to Inventor". He came to this country as a poor boy from Servia and has attained a distinguished position among American professors and men of Science. He is the inventor of the so-called Pupin loading coils which have made telephony through long cables a possibility. At the second public session Secretary Hoover gave an address on "The Nation and Science". Another public address was that of H.D.Curtis, the director of the Alleghany Observatory on the "Unity of the Universe". He dwelt on the size of the Universe in which the principle of continuity prevails. He questioned the proof for a finite universe based on the distribution of the stars and thought as a matter of speculation that the universe might be infinite. He seemed to use the term infinite rather in a mathematical than in a philosophical sence. He made a rather lengthy digression affirming his belief in the immortality of the soul.

A subject of interest to astronomers, physicists and meteorologists was that treated by C.F.Marvin chief of the U.S.Weather Bureau in his presidental address before the American Meteorological Society, viz. "Measurements of Solar Radiation and their Interpretation". Dr. Abbott the Secretary of the Smithsonian Institution has been measuring the intensity of solar radiation for a number of years in different parts of the world and claims to have good evidence that it does not remain constant. It is expected that such variations will be founf to have an effect on our weather and that they may assist in making forecasts for a week or more in the future. Marvin in his address pointed out that as instruments and methods of observation have improved these variations have diminished in value being hardly 1/3% from day to day. He pointed out the difficulties in eliminating errors due to atmospheric conditions and to the type of pyrheliom-eter used. He also showed that there is some evidence of an annual variation which would be due to terrestrial and not solar conditions. Two important sources of instrumental error are due to the fact that some of the incident radiation is reflected and that some sky radiation as well as direct solar radiation falls on the instrument. He described a new type of pyrheliometer now being developed at the Weather Bureau which receives the radiation in a conical rather than in a cylindrical vestibule of small aperature. The incident radiation is either immediately absorbed or after one or more reflections in the cone itself.

At the joint session of the geological section of the Association and the Eastern Section of the Seismological Society of American Fathers

J.Macelwane Repetti of St. Louis University presented two joint papers, one entitled "The Calaveras Valley, California Earthquake of April 3, 1924" the other "The Crystal Springs, California Earthquake of February 10, 1925. At the Meeting of the American Astronomical Society a paper of Fr. W.F.Rigge of Creighton University on the "Occultation of Saturn January 28, 1927 was read by title.

PUBLICATIONS.

Preuss's "Fortnightly Review" for November 15th, 1926 has a brief review of "The Palms of British India and Ceylon" by Fr. Ethelbert Blatter, a volume of 600 pages with 106 full-page plates published by the Oxford University Press. The publishers claim that this is the first comprehensive survey of the whole range of palms found in British India and Ceylon including foreign species which are grown there for ornamental purposes. Fr. Blatter of Swiss birth is a member of one of the German Provinces and has spent many years in India in missionary work and in Science teaching at Bombay and has made a special study of the native palms. When India was assigned to the Md. N.Y. Province as a mission Fr. Blatter, if we mistake not, appeared in our catalogue as Vice-Rector of The College of St. Francis Xavier's in Bombay. Not being a German citizen he was not obliged to leave the country with so many of his Brethren during the war. Popular Astronomy for December has an article by Fr. W. Rigge of Creighton University on the Lunar Appulse of December 18th.

The Mathematical Monthly for Aug.-Sept. 1926 has an article by Fr. E.C. Phillips of Georgetown University on "Some Applications of Mathematics to Architecture".

The Journal of the American Chemical Society for December 1926 has a review of the "Practicum der Qualitative Analyse fuer Chemiker, Pharmazeuten und Medizinor" of Dr. A.Ochs by Fr. G.Coyle of Georgetown University.

We are indebted to Fr. Phillips for the following references to Scientific articles by Ours:

Napier's Rods in China" by Fr. Louis Vanhee of Brussels in the Mathematical Monthly for June-July 1926. pp. 326 ff.

"Double Star Measures" by Fr. L.Gauchet of Shanghia in the Astronomical Journal for Sept. 1926, No. 6.

"Seismology, Aretrospect", by Fr. F.Tondorf of Georgetown University in the Journal of the Washington Academy of Sciences, 1926 p. 237. ff.

"Light Curves of YZ, VY, XZ and CT Carinae by Mr. F.W.Sohon, of Valkerburg, in the Bulletin of the Astronomical Institutes of the Netherlands for Oct. 11th. 1926

The Southern Supplement of "The Wiley Bulletin for November 1926, among its pictures of Southern Collefes and Universities gives a view of the large Bobet Science of Loyola University in New Orleans. Congratulations to our University of the South on its progress.

We also wish to record Fr. Deppermann's article in the Astro Physical Journal for January 1926 in Some Studies of the Stark Effect.

The Bulletin wishes all its readers a very HAPPY NEW YEAR.