A. M. D. G.

BULLETIN

of the

AMERICAN ASSOCIATION OF JESUIT SCIENTISTS

(Eastern Section)

(For Private Circulation)

THE QUANTITATIVE DETERMINATION OF POTASH IN CANE-SUGAR JUICE.

Here is a method for the determination of minute quantities of K_2O - i.e. for .1% and less. It is used in the analysis of the juice from sugar-cane to determine how much potash is taken from the soil by the different varieties of cane, so that the fields may be supplied with the proper fertilizers.
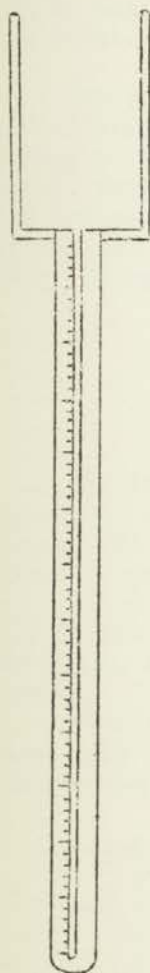
This method is unique, since it is based upon the relative volume of precipitate in two solutions, one of known potash content. Instead of using the usual gravimetric method for the determination of the amount of pricipitate, the volume of the precipitate is measured in a calibrated capillary tube, known as the "Sherrill" tube. Cf. Diagram.

PREPARATION OF SOLUTIONS.

Standard 1% K_2O solution. Weigh carefully 15.83 grams of C.P. Potassium Chloride, dissolve in distilled water in a liter volumetric flask, add 8 or 10 drops of glacial acetic acid and dilute to 1000 cc with distilled water.

Sodium Cobaltic Nitrite Solution. To 225 grams C.P. Sodium Nitrite ($NaNO_2$) add 400 cc distilled water and allow to stand over night with occasional stirring. Dissolve 125 grams C.P. Cobalt Acetate in 400 cc distilled water. When the Sodium Nitrite is all dissolved pour the Cobalt Acetate into it and mix thoroughly by pouring repeatedly from one beaker to the other. Then dilute to 1000 cc with distilled water. This solution keeps very well for several months. A precipitate may form on long standing but has no harmful effect, as it entirely dissolves when the stock solution is diluted and acidified for use.

Prepare a solution for use by adding to 100 cc of the above to 65 cc distilled water and 5 cc glacial acetic acid and mix by shaking. Remove the gases given off by placing under vacuum for one hour, or by standing over night in a loosely stoppered bottle. Sodium cobaltic nitrite does not keep well after it is acidified, so it is best to make up oneday's supply at a time.

PROCEDURE.

Sherrill Tube.

Determine the degree Brix (Hydrometer) of the juice and from this the specific gravity. To about 500 cc of juice add milk of lime to faint phenolphthalein alkalinity. Heat just to boiling and filter through a dry Buchner funnel, using suction. Pipette 150 cc of the clarified juice, which must be bright and free from suspended and colloidal matter, into a 400 cc beaker. Evaporate to less than 50 cc on water-bath or hot plate. Transfer to a 50 cc volumetric flask, add 2.8 cc of glacial acetic acid and make up to 50 cc after cooling to room temperature which should be above 72° F.

Transfer 17 cc of the Sodium Cobaltic Nitrite solution to each of the Sherrill tubes. Be sure that the stems are filled with solution and contain no air bubbles before adding the nitrite solution. To one tube add 5 cc of the standard 1% K_2O solution, and to the other 5 cc of the prepared sample. Centrifuge at once for one minute at 1000 r.p.m. Allow the machine to come to a stop, remove each tube, level the precipitate by tapping the stems gently with the finger, replace in the machine, centrifuge for 15 seconds more and read the volume of the precipitate. Then calulate

$$\% \ K_2O = \frac{50 \times \text{Reading of Juice}}{150 \times \text{Sp. Gr. Juice} \times \text{Reading of Standard } K_2O \text{ sol.}}$$

Juices which are very low in K_2O and which do not give a reading sufficiently close to that of the standard to be reliable should be run again using 10 cc of the sample in one tube and 5 cc of the standard K_2O solution with 5 cc of distilled water in the other. In this case, divide the figure obtained by the above formula by two.

The standard K_2O solution does not give constant readings, due to the temperature differences and the age of the Sodium Cobaltic Nitrite solution. Hence it is necessary to run a tube of the standard with every sample, or set of samples. It is essential that the concentrated sample be bright and contain no precipitate or suspended matter after the acetic acid is added. If this is not the case, further clarification must be obtained by acidifying the filtrate from the lime clarification, heating and again filtering before taking the 150 cc for analysis.

<div style="text-align:right">

Fr. R. Schmitt,
Loyola College,

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TEACHING FRESHMEN CHEMISTRY.

The following paper is presented in the hope that it may start a discussion or effect an interchange of ideas on methods of teaching Freshmen Chemistry in our colleges. The question we would like to have answered in this: Given any class in Freshmen Chemistry what is the best method of teaching that class?

In order to furnish a peg on which to hang any future discussion an outline of the method used last year at Georgetown will be given-not because it is by any means ideal, but in order that its weaknesses may be pointed out, and improvements suggested.

For the purpose of this paper the teaching of Chemistry may be conveniently divided into three parts: Lectures, Laboratory, Examinations. What then was the method of conducting the Lectures? An outline of the method follows.

1) A general idea of the chapter is given, showing its relation to what has gone before.
2) A bracket analysis of the lecture is written point by point on the board, so that at the end of the hour a complete outline of the lecture is on the blackboard.
   If we were dealing with an element, the analysis would follow the usual five divisions, viz, History, Occurrence, Preparation, Properties, Uses. If we were dealing with a theory we used the deadly parallel plan i.e. under one column labelled "facts" would be enumerated all the facts which led to the proposal of the theory, and in a second column labelled "Theory", the precise point in the theory which attempted to explain the parallel fact would be listed.
3) Students were required to take down these outlines and hand in their completed notes every Monday.
4) Lecture experiments were performed whenever of help.

An advantage of the above method is this: Even if a student did not do any studying he would have met every essential idea we were trying to make clear at least five different times:
1) When he heard it in lecture.
2) When he saw it written on the blackboard.
3) When he copied it down in his notes.
4) When he rewrote a copy of his notes for correction.
5) When he heard a repetition of it in class.

If, after meeting an idea five different times, a student is still unable to grasp it, there always remains the possibility of him doing a little private study.

With regard to Laboratory work, we first allowed the students to work at their own speed, demanding only careful and accurate work, but we learned that this method allowed many students to take things a trifle too easily. So we assigned a definite experiment or set of experiments for each laboratory period, and all marking was done on the basis of the assigned matter being completed. We found that this speeded up production and also enabled us to form a more accurate estimate of each students ability.

With regard to tests and examinations the methods used were as follows: Fifty minute written tests. Questions dictated. A question is dictated and four minutes given for the answer. Then the second question is dictated, four minutes given for its answer, and so for ten questions. About seven or eight minutes are left at the end of each test before the fifty minutes were up, during this time the students could make any corrections or addition they wished. For the Mid-Year and Final Examinations, a group of fifty questions was assigned and the students told that the examinations would be taken from the questions on the list. A set of questions of this type seems to have the psychological effect of inducing many indifferent students to study, - simply because the matter has been reduced from a rather vague and indefinite nightmare to fifty definite and specific questions. Furthermore, when a student fails in an examination given from such a set of questions, he knows that he has absolutely no alibi to offer for his failure except downright neglect.

This in brief is the method we used last year to teach Freshmen Chemistry at Georgetown. It has its defects, I know, and it is in the hope of remedying these defects that I am submitting it for critism, but in spite of its defects, I think it has proven to be a success, because out of a class of two hundred and seventy-five with which we started the year, about thirty-five dropped or changed their course, and about thirty more failed out at the end of the year, leaving over two hundred who successfully passed their Freshman year in Chemistry.

<div style="text-align: right">Mr. L. O'Gorman,
Georgetown University,</div>

JESUIT OBSERVATORY AT KSARA IN SYRIA.

The two Jesuit Observatories in the Far East at Zi-Ka-Wei in China and at Manila are known to men of science and navigators throughout the world as well as to Ours of different provinces. There is another in the Near East whose name is perhaps less familiar to American Jesuits though it has been mentioned in the Bulletin. It is the Observatory of Ksara in Syria conducted by Fathers of the French Province of Lyons. An account of its foundation, equipment and work and its vicissitudes during the war was published in 1924 in the "Annales De L'Observatoire" by the Director Fr. Berloty. We hope that we may be able to give in a later issue some account of the present work of the institution by the present director Fr. Combier. In the meantime some account of the observatory itself may prove interesting to readers of the Bulletin.

Various happenings in the Near East a quarter of a century ago which brought its people in closer contact with the scientific and industrial activities of Europe together with the prestige which science was beginning to exercise over them suggested to the Faculty of St. Joseph University at Beyrouth the idea of founding an observatory as a centre of scientific activity in Syria. This was certainly in keeping with the tradition of the Society in its mission work in distant lands. We all know how much the prestige of the Church and of the Society has been enhanced in the eyes of Europeans and Americans and of the natives by the scientific work of our observatories and also as a consequence how much the more direct labors of our missionaries for the salvation of souls have been helped.

The suggestion met with the approval of Superiors and after careful consideration Fr. Berloty who had won his doctorate in Science at Paris was appointed in 1906 to select a suitable site and to organize an observatory. Ksara a vineyard section was the site chosen. It lies about 40 kilometers west of Beyrouth beyond the mountains of Lebanon. It is about 920 meters above sea level. The latitude is 33° 49' 25.6" N and longitude 2 h. 23 m. 33.7" E. There is an extended view and the heavens are often wonderfully clear at night. We cannot forego quoting Fr. Berloty's description of the approach of night at Ksara during such periods of clearness. "Les austères beautés de la Science doivent permettre d'apprécier les beautés de la nature, et, dès lors, pourquoi ne pas le dire; celui qui vit à Ksara ne se fatigue pas d'assister le soir, a l'extinction progressive des feux du soleil sur l'Anti-Liban, lorsque, dans le calme reposant d'un air limpide, il voit le soleil mourant étendre sur les montagnes les nuances transparentes d'un mauve clair d'abord, puis fonce et profond: Spectacle fugitif ravissant. Peu après, l'ombre de la terre vient par sa teinte bleutée contraster vivement avec les lumières antérieures, couronne les sommets eteints, monte et s'intensifie; et, tandis que , dans le ciel pur, étincellent les étoiles plus nombreuses et brillantes, à l'autre bout de l'horizon, s'elève inclinée la clarté immense et radieuse de la lumière zodiacale. C'est dans sa splendeur, la nuit a Ksara"

Plans were projected for departments of astronomy, meteorology, seismology and terrestrial magnetism. A large number of instruments were purchased and assembled by Fr. Berloty. A seismograph was also loaned by the International Association os Seismology. Pope Pius X sent a special blessing through Mgr. de Saune Bishop of Madagascar. The actual foundation was made in October 1907. Buildings were gradually constructed. They were modest in the beginning but much progress was made in spite of limited funds and of all the difficulties caused by great distance from Europe and necessary dealings with native workmen. Among the first observations were those of a transit of Mercury, on Nov. 14, 1907. Beginning in May 1910 a monthly meteorological bulletin was published. In 1911 the French consul at Damascus became interested in the observatory and informed his government of its work. In consequence the director received many courtesies during a subsequent visit to Paris where General Ferrié was consulted regarding a radio installation for the determination of the longitude of the observatory. A receiving set was loaned by the Société Francaise Radio-électrique. As soon as it was set up the Turkish officials became interested. Suspecting some affiliation with the French Navy they insisted upon its removal. The affair went from official to official and finally reached Paris and Constantinople. It was only ended by the outbreak of the world war which brought to a close the first epoch in the history of the observatory. On Dec. 15, 1924 the staff was ordered to leave for an internment camp. However the fathers were finally sent to Beyrouth and allowed to leave Syria.

Fr. Berloty went to Egypt. He returned to Syria in December 1918 and found that the observatory, the fruit of so many years of labor, had been wrecked. Instruments, books. records, furniture etc., had been injured or carried off. Even windows and doors had disappeared. Thus the tube of the equatorial was found lying on the ground. The mount was too heavy to be removed easily but the finder, the optical parts and the driving clock were missing. After many inquiries and search a few articles were recovered, It was decided to restore the observatory and various gifts including an allotment of money by the French Academy of Sciences were received. Some of the old instruments were repaired and others were purchased. The buildings were again put in shape. For a time Fr. Berloty was alone but in Sept. 1920 Frs. Combier and Horan arrived. The former had spent a year at Ksara befor his theology which he made at Hastings in England. Immediately after his ordination there in August 1914 he was called to the colors. During the war he became a Lieutenant and a Chevalier of the Legion of Honor.

Routine observations were resumed. In 1920 Frs. Berloty and Combier took a prominent part in the geodetic survey carried on by the French Army in Syria. The work was in charge of Colonel Perrier. A base line about 12,600 meters long was measured, a series of azimuth and level observations were made and longitude measurements were made at the observatory with the aid of time signals from the Eiffel Tower in Paris.

An appreciative letter of thanks was received from General Gouraud, High French Commisoner in Syria for this cooperation. Shortly after the French Commision decided to organize an extended meteorological service in Syria. The Ksara Observatory was chosen as the central station and Fr. Berloty by an order of July 4th, 1921 signed by Gen. Gouraud was made director of the service. Auxiliary stations were established and beginning August 1921 reports were sent regularly to Ksara where a bulletin is published. In 1924 Fr. Berloty was elected a corresponding member of the French Academy of Sciences in the section of geography and navigation in recognition of his scientific work. According to the last catalogue of the Lyons Province he has changed places with Fr. Combier, no doubt on account of advancing years. The latter is now the official director. It is gratifying to know that the observatory has recovered from the disasters of the war. These were great and sufficient to daunt the courage of men of science with unlimited resources at their command. We trust that the restored observatory may enjoy many years of prosperity under its present energetic director.

<div align="right">Fr. H. Brock, S.J.
Weston College,</div>

THE EARTH'S CRUSTAL LAYERS.

At a recent meeting of the Royal Astronomical Society, Dr. Harold Jeffreys, Fellow and Lecturer at St. Johns College, Cambridge, and recognized as one of the world's leading authorities in Geophysics, detailed the generally-accepted views on the nature of the crustal layers of the earth. As the Proceedings of this Society are not within the reach of many of ours engaged in the teaching of geology and mindful of the intense interest today in this topic. it has seemed feasible to the writer to offer these items through this Review. The contients are nearly covered with a layer of sedimentary rock, and below that there is generally believed to be a layer of granite. In evidence of this latter it is contended that denudation uncovers such rock Besides most sedimentary rocks consist of shales and sandstone, products, through disintegration, of the constituents of granite.

The chief intrusive rock found is basalt. This had been known long since and so the older classification of the crustal layers was indicated as (1) a layer of sedimentary rock, (2) a granite layer, and (3) a layer of basalt. Recent researches, however, have revealed that the basaltic layer is very thin, and that below it there lays a further layer of a different composition. Studies along seismology confirm this. Assuming that a shock originates at a subterranean focus A and is recorded at a station B, compressional waves proceed directly from A to B. If, on the other hand, at a greater depth than A there exists a layer of different materials from that found at A, we have to expect a further wave to proceed downward from A to C, thereupon to be refracted at the interface between the layers, and to travel along CD, meeting the interface again D, and following a second refraction to continue on to the station B along a line DB, Seismograms show just such arrivals. Moreover they permit of the calculation of the velocity of the direct wave to approximately 5.5 kilometers per second. This harmonizes with the velocity of the compressinal wave in granite as computed from laboratory experiments. The velocity of the lower layer figures to 7.8 kilometers per second. From this layer down to the core there appears to be no change in the rate and the logical inference is that this structure is homogeneous in character, down to the center. It has been suggested that the basaltic layer is twice the thickness of the granitic layer. The absolute thicknesses of these layers is yet a matter of conjecture.

<div align="right">Fr. Francis A. Tondorf, S.J.
Georgetown Seismis Station.</div>

INFILTRATING PIG EMBRYOS WITH PARAFFIN.

This article is a short review of a method of treating pig embryos recently worked out by Mr. Malumphy, of the Biology Department at Holy Cross. If further information should be sought by any interested in the method, they will find a summary of his work in "Science" for February 17, 1928, page 197.

The embryos numbered about 2500, ranging from 4 to 22 mm. in size. There was one set of identical twins of about 12 mm., the percentage, however, of cripples, monsters, and abnormalities was rather high, some where between 35 - 38%.

Mr. Malumphy's chief aim was to subject the embryos to the least amount of heat, consistent with good infiltrating. When subjected to heat, some of the embryos shrunk from 1/16 to 1/4 their natural size, and this, at 52 degrees C., for only two hours. The maximum shrinkage takes place after the first ninety minutes.

After dehydrating, clear the embryos in oil of cedar or origanum, for about one hour. Remove and wash in xylol for ten minutes. Then place in a solution of paraffin - xylol. (Dissolve, at room temperature, 24 grams of paraffin in 100 cc of xylol). This solution should be three or four times the bulk of the embryos.

Size of embryo.	Time in solution.	
7 - 10 mm.	48	hrs.
11 - 15 mm.	54	hrs.
16 - 20 mm.	65	hrs.
21 - 24 mm.	77	hrs.
25 - 29 mm.	88	hrs.
30 - 34 mm.	95	hrs.
35 - 39 mm.	104	hrs.
40 - 45 mm.	110	hrs.
46 - 50 mm.	119	hrs.

When the embryos have finished their time in the solution, remove, dip once or twice in xylol, place in melted paraffin (not to exeed 52 degrees C.) and put in oven (also not above 52 degrees). After 15 minutes pour off paraffin, and pour on fresh - melted paraffin. Repeat at least three times, or until no trace of xylol is found.

The main principle is, by using the solution, a sufficient amount of paraffin penetrates the tissues. Afterwards in the melted paraffin and oven, this paraffin melts and by capillary action draws in fresh paraffin and likewise drives the xylol out in less than an hour.

Mr. A. J. MacCormack, S.J.
Weston College.

SOME COMMENTS ON "THE DIAMETER OF A CONIC".

On pages 20 and 21 of the last number of the Bulletin (November-December, 1927), Mr. Barry in his short note dealing with the diameter of a conic has touched upon a very interesting and far-reaching problem. He proposed the problem under the form of a dilemma and chose that horn of the dilemma which involves accepting an unrestricted straight line as the true diameter of a conic instead of the ordinarily accepted segment of the line terminated by the two points of intersection of this line with the conic. Looked at from the algebraic point of view of the analytic geometer, this seems quite satisfactory; but it seems from the purely geometric point of view (which I hold to be the primary and paramount point of view) to involve many difficulties of which I would like to mention a few, not for the purpose of offering a solution of them but rather with the intent of enticing our mathematicians into a consideration of them and hence of the important underlying problem proposed by Mr. Barry.

And if they can also be drawn on to offering the readers of the BULLETIN the results of their meditations on the subject, so much the better.

1. The first difficulty and perhaps the easiest to answer is this: If the diameter of a circle, which is a conic, is an unrestricted or unlimited straight line the 3.1416 times this line is also of unlimited or infinite extent so that the circumference of every circle is infinitely long.

2. It also follows from the adopted solution that _every line_ is a chord of any conic whatever now a chord intersects a conic in two points and as most or many of the straight lines of the plane lie outside of a given conic it would seem that many (in fact an unlimited number) of the points of a conic lie outside the conic.

3. The defination of a circle is the locus of all points equidistant (in a given plane) from a given point called the center. Now consider the relation which exist between the straight line $x = 2$ and the circle $x^2 + y^2 = 1$. The circle has its center at the origin and its radius is one unit, say one inch in lenght. The shortest distance from the origin or the center of this circle to the given line is 2 inches. But this line is a chord of the circle and has two points of intersection with the circle; hence two points at a greater distance than 2 inches from the center of the circle are on the circle and therefore,by definition, at a distance of one inch from this same center.

The difficulties outlined above do not prove that Mr. Barry's conclusion is erroneous; but they do probably show that much still remains to be explained in connection with his problem.

<div align="right">Fr. E. C. Phillips, S.J.
Georgetown University.</div>

NOTES OF INTEREST TO OURS.

Fr. Phillips of Georgetown Observatory has sent us the following notes which will be ofinterest to readers of the Bulletin.

New TIME SIGNALS. The October number of the Observatory (London) contained the following note: "It is hoped to inaugurate in the month of December (1927) a new series of time signals from Greenwich, to be sent out from Rugby. The station has the call sign GBR, and operates on a wave length of 18,740 metres, continuous wave. The signals will be broadcast twice daily from $9^h 55^m$ to $10^h 0^m$ and $17^h 55^m$ to $18^h 0^m$ G.M.T., (i.e. 5 A.M. and 1 P.M., E.S.T.) and will be of the modified rhythmic type 306 in number. The 1st., 62nd., 123rd., 184th., 245th., and 306th. signals will be of about 0.5 second duration and will commence at the exact minutes of Greenwich Mean Time. The other signals of about $0.^s08$ duration, will be exact intervals of 60/61 seconds. The new installation at Greenwich consists of a free pendulum, adjusted to mean time and corrected as required by comparison with the sidereal standard, a slave clock of the standard pattern, and a shortened pendulum making 61 beats to the minute synchronised from the standard every minute and kept swinging continuously and sending out signals as required."

Note. The Rugby wireless station is a very powerful one and under ordinarily favorable conditions can be heard here (Georgetown) with a one-tube standard regenerative circuit; the signals are usually stronger than those from the powerful station at Bordeaux, France. The regular telegraphic traffic of Rugby has been automatically recorded on the chronograph, using two stages of audio freqency amplification.

These signals are of special interest as they are the first to be sent out from Greenwich with sufficient power to be heard all over the world, and will afford a means of direct determination of longitude without the necessity of relying on any intermediate stations of any kind. Though it was announced that these signals were to begin in December they were apparently delayed as they were not heard at Georgetown. However after January 17th. they could be heard very clearly with the Georgetown two-tube receiving set.

The signals actually observed were those sent out from five minutes before one to one o'clock P.M. Eastern Standard Time. In connection with time signals Fr. Philips also summarized by request the signals sent out by the U.S.Naval Observatory according to the Observatory Circular of July 15th, 1927. The summary given here as this circular may not be in the hands of all.

Radio Station	Call	Frequency	Wave Length	Kind
Arlington	NAA	112	2678	Modulated
		690	435	"
		4015	74.7	"
		8030	37.4	"
		12045	24.9	"
Annapolis	NSS	17.6	17045	Continuous wave
San Diego	NPL	30.6	9810	" "
		102	2940	Modulated
Key West	NAR	102	2940	"

The Arlington broadcast band signal (435 meters) is low power for near points All other NAA signals and also NSS signals are on high power. The exact lag of NSS and 112 KC NAA signals is measured on every transmission. That of the 4015 KC signals is measured at 10 P.M. only and that of the 8030 KCsignals at noon only. San Diego and Key West transmit only at noon. They are controlled from Washington by long distance telegraph lines and have lags up to half a second or more and hence are not to be used for accurate scientific work. The 74.7 meter signals are probably best for night reception while the 37.4 and 24.9 meter signals are better for daylight transmission. Reports on the range and utility of the new high frequency signals are much appreciated at the Observatory.

An interesting Thermogram. September, 1927.
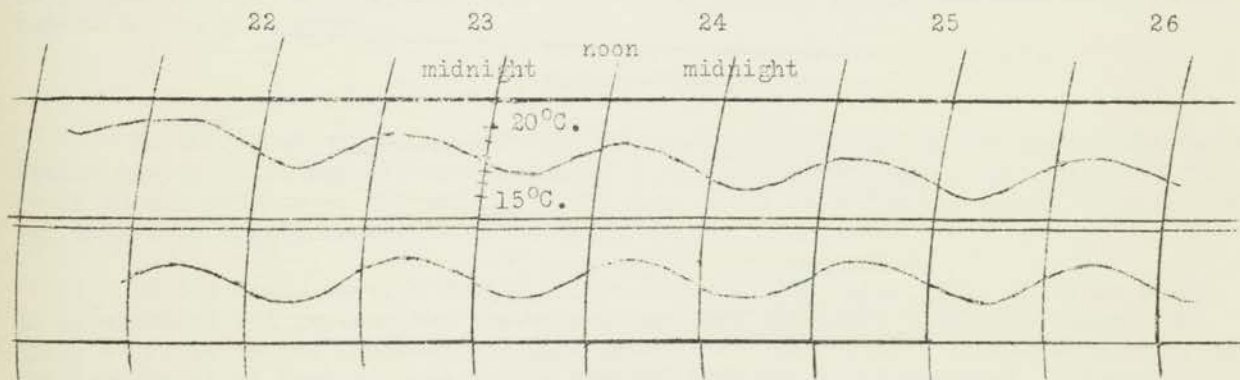
The upper curve is a direct tracing of the thermograph record made in the clock room of Georgetown College Observatory, Washington D.C. The thermograph was in the glass and wood case surrounding the Riefler Clock. The graph is interesting on account of its unusual regularity. This regularity is made striking by comparison of the graph with the lower curve which is an ordinary sine curve, its equation being $y = 1.6 \sin x$. The minimum temperature occurred at about 3 A.M. each day and the maximum at about 3 P.M. No special means of keeping the temperature of the room constant was employed.

SOME FACTS AND FANCIES ABOUT THE SUN.

Extracts from an article entitled "The Source of Stellar Energy", by John Quincy Stewart (Princeton) in the Journal of the Franklin Institute, October 1927. pp. 437 ff.

The Solar Constant = 1.94 calories min., sq. cm., or 1.35×10^6 ergs/sec.,sq.cm
" " : fluctuation 2 or 3 per cent.; max. at sunspot max.
" " : transmission through the earth's atmosphere about 70% when sun is in zenith.

Total energy reaching earth: 4,690,000 horsepower per sq. mile max. power of Niagara, 4,000,000 horsepower.

Total energy is $3,79 \times 10^{33}$ ergs per sec.

Proportion intercepted by earth 1:2200 millions
" " by whole planetary system about 1:230 millions.

"Commercial" value, at one cent per KwH. is about one billion dollars in one billionth of a sec.

Age of the sun; probably several times 1,300,000,000 years.

Emission of energy during this time; about 3.33×10^{36} KwH. or, 6.05×10^7 ergs (1.44 calories) per year per gram of sun's mass.

Sir William Herschel writing in The Philosophical Transactions of the Royal Society of London (1795, part 1, page 63) on "On the Nature and Construction of the Sun and Fixed Stars" says "Whatever fanciful poets might say, in making the sun the abode of blessed spirits, or angry moralists devise, in pointing it out as a fit place for the punishment of the wicked, it does not appear that they had any other foundation for their assertions than mere opinion and the vague surmise; but now I think myself authorized, upon astronomical principles, to propose the sun as an inhabited world, and am persuaded that the foregoing observations, with the conclusions that I have drawn from them, are fully sufficient to answer every objection that may be made against it". -- He refers to observations on sunspots which he concludes are rifts in the hot photosphere enabling him to see an inner layer of dark clouds which he judges sufficient to protect the solid inner portion of the sun from being overheated by the photosphere.

A JESUIT PIONEER.

In the first volume of the new "Manual of Meterology" by Sir Napier Shaw and Elaine Austin there appear, in Chapter VIII, a short biographical notices of 74 "pioneers in the science of the weather"; the list begin with Francis Bacon, born in 1561, and ends with Angelo Secchi, born in 1818.

In the Radio Service Bulletin" for Dec. 31, 1927 (No. 129), there is given an interesting and instructive historical synopsis entitled; "Important events in radio -- Peaks in the waves of wireless progress". The Bulletin is issued monthly by the Department of Commerce and may be secured from the Superintendent of Documents, Government Printing Office, Washington, D.C. for 5 cents per single copy, or by subscription at 25 cents per year.

JESUITS AMONG "AMERICAN MEN OF SCIENCE".

There has just appeared the fourth edition of "American Men of Science, A Biographical Directory". In the Preface the Editors state the aim of the work in the following words: "Efforts have been made to include all living Americans who have contributed to the advancement of science, the standards being nearly the same as fellowship in the American Association for the Advancement of Science or membership in the national scientific societies having research as a qualification." The work contains about 13,500 names of scientists. How many of these are Jesuits?

An effort was made to secure an answer to this question by going through the book and picking out those names to which the title S.J. was affixed; as the names are printed in bold-faced type distinct from the biographical sketches, this was a rather easy task only requiring a little patience: but the return was rather small and another search was made by looking up the names of such Jesuits as suggested themselves as properly belonging in the directory. The following list gives all those that were found; probably there are a few more which were not discovered; there are certainly missing from the list the names of some of our Jesuit scientists who should have been included; let us hope that when the next edition is being prepared proper steps will be taken by those interested to have these names included: the Editors I am sure will be glad to have such names suggested to them. The names are given as they appear in the Directory.

Prof. M. J. Ahern, S.J.; Rev. J. Algue, S.J.; Rev. Henry M. Brock, S.J.; Rev. J. P. Coony, S.J.; Rev. Geo. L. Coyle, S.J.; Rev. John G. Hagen, S.J.; Rev. V. L. Jennemann, S.J.; Rev. J. S. Joliat, S.J.; Rev. James B Macelwane, S.J.; Rev. Edward C. Phillips, S.J.; Dr. Francis William Power, S.J.; Rev. Patrick Rafferty, S.J.; Prof. J. Ricard; Rev. M. Maso Saderra, S.J.; Rev. Theo. J. Schulte, S.J.; Prof. Miguel Selga, S.J.; Prof. Alphonse M. Schwilalla; Rev. J. I. Shannon; Rev. F. A. Tondorf.

Among those recently deceased: William Francis Rigge. * The star after Fr. Hagen's name marks him out as one of the leading (first thousand) American men of science, chosen as such on account of his pre-eminence in Mathematics and Astronomy.

If any other Jesuit names are found in this Directory, I hope they will be sent to the Editor of the Bulletin. The above list shows that at least one out of every 700 American Scientists is a Jesuit. (Note Mr. T. Barry of Georgetown has sent us a similar list adding one name not given above viz. Rev. J. A. Krance Creighton University.

THE VELOCITY OF LIGHT.

In the August, 1927, number of L'Astronomie, the Bulletin of the French Astronomical Society, there is a short article by M. Gheury de Bray, calling attention to the various determinations of the velocity of light since 1849. The earlier determinations were, as is natural, less accurate than the more modern ones. But starting with those made by Michelson and Newcomb in 1885, the author reaches the very extraordinary, or at least hitherto unthought of conclusion that the velocity of light is not a constant but is diminishing at the rate of about 4 kilometers a second each year. The determinations, all of which are of a very high order of accuracy, are as follows:

Year	Observer	Method	Velocity	Decrease per year
1885	Michelson and Newcomb	Rotating Mirror	29,940 Km./sec.	2.7 Km./sec.
1902	Michelson	......	299,895	3.1
1904	Perrotin	Toothed Wheel	299,880	3.5
1924.6	Michelson	Rotating Mirror	299,802	3.5
1926	Michelson	Rotating Mirror	299,796	

When these values are plotted on coordinate paper the almost regular decrease becomes very striking to the eye.

As Michelson is determining the velocity once more this year, he should according to the conculusions of the author find from 6 to 8 units less than the previous value, depending on the date at which the observations are made. It will be extremely interesting to find out whether this will actually happen. The author hints that there may be a slow modification of the ether itself which would account for the observed facts.

The recent numbers of Popular Astronomy contains records of many variable star observations made at Georgetown by Mr. Barry.

On January 9, 1928, Father Tondorf lectured in Washington on the connection between microseisms and certain meterorology conditions to an audience consisting of about one hundred members of the Signal Corps of the United States Army. He also gave a lecture on a related subject in Baltimore on January 13.

At the end of the year Father Paul A. McNally, after a year and a half of graduate work in Astronomy at Berkeley, University of California, was appointed by Reverend Father Provincial as a permanent member of the staff of Georgetown College Observatory where he is now engaged in his new duties.

Popular Astronomy for January, 1928, announces that Mr. William Cletus Doyle, S.J., the successor of Father Rigge at the Creighton University Observatory, will continue Father Rigge's work on graphical predictions of occulatations which appeared during so many years in that Journal. This number of Popular Astronomy also contains a chart of the field of a Nova ("New Star") recently discovered by two German astronomers in the Constellation Taurus; the chart was prepared at Georgetown College Observatory.

Father Phillips himself read a science paper "On the personal Equation in Observing Occultations" at the December meeting of the American Astronomical Society held at New Haven. Fr. Roder of the Observatorio del Ebro attended the meeting.

NOTES FROM THE CHEMISTRY CLUB OF GEORGETOWN.

At the public meeting of the Chemistry Academy, Jan. 12th, Dr. William J. Hale, former professor at the University of Michigan, later Chairman of the Division of Chemistry and Chemical Technology of the National Research Council, and at present Director of the Organic Research Laboratories of the Dow Chemical Co., Midland, Mich. delivered a very interesting informal discussion on "Farm Products as the Feeders of the Industries". Today Dr. Hale is one of the leading exponents of the doctrine that "Farming Must Become a Chemical Industry". In his discussion he strongly emphasized the fact that the farmer is the world's producer of cellulose, and in this fact, as the nineteenth century age of coal tar gives way to the twentieth century age of cellulose, lies the real solution of the agricultural problem.

On February third at the first meeting of the second term of the present scholastic year, the Chemistry Academy was again privileged to listen to one of the nation's prominent chemists, Dr. F. C. Whitmore, Head of the Department of Chemistry of Northwestern University, Evanston, Ill. He is the present Chairman of the Division of Chemistry and Chemical Technology of the National Research Council, and has merited well earned recognition for his work on metallo-organic and sulpho-organic compounds. Dr. Whitmore chose for his topic, "The Habits of the Atoms". He entered the field of Physical Chemistry and treated the intricate subject of atomic numbers and atomic structure in a most interesting manner. Dr. Whitmore is an excellent lecturer and an equally excellent teacher, as was manifested by his ability to handle such a theoretical subject in so simple and pleasing a manner. His lecture was well received and highly appreciated by the members of the Academy as was evidenced by the many intelligent questions with which the speaker was besieged.

Mr. L. Gorman, S.J.
Georgetown University.

PUBLICATIONS.

Fr. John Gipprich of Georgetown University has recently published a laboratory Manual for Mechanics Heat and Sound. It represents the course given at Georgetown in these branches of Physics in the physical laboratory. We hope to give a more extended account of the book in our next issue.

The publishing house of Julius Springer of Berlin announces an extensive work on astrophysics which should be of interest to our astronomers and physicists. The title is "Handbuch der Astrophysik". It will comprise six volumes. It is being prepared by a large number of collaborators including some Americans. Apparently some of the sections will be written in English. The sixth volume has just appeared. As is the case with many modern books printed of late in Germany the price is very high. This volume costs bound 68.70 marks or about $17.00.

The Physical Review for December 1927 has an article by Fr. A. Poetker of Marquette University describing another research he carried out at Johns Hopkins University on the Infra-Red Radiation of Nitrogen. A prism and sensitive thermocouple were first used to study the infra-red region of the spectrum and then to obtain greater accuracy the region from 7500 to 10500 A was photographed on neocyanin plates by means of a grating. Certain broad radiation maxima were broken up into individual bands. Fr. Poetker states that the new data obtained point to a modification of the assignment of vibration quantum numbers as previously made by Birge. As a by-product of the work the hitherto unresolved O triplet at 9225A appeared clearly resolved on the plates. The wave lengths of the components were measured.

Fr. Joseph Merrick of Weston has an interesting article in the Jesuit Missions" for January 1928 entitled "Eye to Sky and Ear to the Ground". It is a description of the Jesuit Observatory at Manila and its work. It speaks of the pioneer achievements in meteorology by Fr. Faura and Fr. Algue his successor as director of the Observatory, and also of the work of the present staff under Fr. Selga. The history of this great scientific institution is familiar to our readers through the articles contributed to the Bulletin by Mr. Doucette then of Manila and now of Weston. (Vol. III, No. 1 & Vol. III, No. 3.) Fr. Merrick's article has several good illustrations including one of Fr. Deppermann of the astronomical department using the large Equatorial with the spectrograph attached. The frontis-piece of the number is a striking portrait of the venerable Fr. Algue director of the observatory from 1897 to 1926. The Bulletin takes this opportunity to congratulate the editors of the "Jesuit Missions" on their success in making it so readable and interesting magazine. It is bound to make our mission work in different parts of the world better known and win prayers and material help for our missionaries.

America for Feb. 4th, 1928 calls attention to an article in the January number of the Apollonian by Mr. Gookin of Weston College on Anthropology, Evolution and Dentition. The Apollonian is said to be the only Catholic dental journal in the world. It is the quarterly journal of the Guild of St. Apollonia composed of Catholic dentists of Boston amongst whom was formerly numbered Dr. Gookin. The article considers the essential differences between the dental systems of the apes and human beings. Various famous skulls of so called primitive men are examined and the statement of Boule is quoted with approval. "The dentition of Neanderthal man does not differ in any important character from that of men of today."

The Ordo for our American Provinces contains this year a supplement with tables for determining the difference between Local Mean Time, Local Apparent Time and Standard Time. It was doubtless made out by Fr. Phillips of the Georgetown Observatory. After quoting Canon 33 of the Codex Juris Canonici it states that the tables were constructed "for the use of those who may desire to take advantage of the freedom granted by the church in regard to the choice of the manner of reckoning time, especially of the time of midnight upon which the beginning of the Eucharistic fast depends".

Table 1 gives the nearest serviceable half minute the amount by which mean solar time is ahead of true solar time at any given place for each day of the year. Table II gives the amount by which a standard time clock is fast or slow with respect to the local mean time of the various houses of the American provinces. Instructions in the use of the tables are also given. These are clear and the pamphlet should prove useful to our priests of students of moral theology.

Fr. Tondorf has kindly called our attention to two publications in Seismology in the following note.

SEISMOLOGY.

Those of our sufficiently interested in problems of geophysics will do well to read an article by Ch. Maurin, director of the L'Institute de Physique du Globe de l'Universite de Paris. The article gives the physics of the transmission of e- lastic waves consequent upon earth movements in the earth's crust, their registration and their time of travel. The interesting problem of microseismic movement is also discussed.

A very interesting tome has recently been added to the literature of seismo- logy under the title of: "The Founders Of Seismology". This book was reviewed by the writer in the September 28 issue of the "Commonweal". The distributers of the volume are the Macmillan Company.

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