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A. M. D. G.

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THE BULLETIN.

With this issue the Bulletin begins its fourth volume. While it has perhaps not grown as much as could be desired in size and in the number of its members, at least cherishes the hope that it has been of some help as a bond of union for the members of our Association engaged in teaching science and mathematics in our Colleges and High Schools. It again bespeaks the cooperation of its readers during the coming year. As in the past it requests articles and notes on topics of scientific and pedagogical interest and references to new apparatus, experiments, books, etc. and also to the scientific doings and publications of Ours anywhere in the world.

An event of great importance which may affect the Association and the Bulletin in some way in the future took place during the summer. This was the separation of New England from the Maryland-New York Province and its constitution as a separate province. The change was not unexpected. After having been a vice-province for five years, New England now becomes independent and has now to map out its own course in the field of catholic education and missionary enterprise. Fr. J.M.Kilroy remains at the head and Fr. J.H.Rockwell becomes procurator with residence at Weston. It should be noted however that up to the present the division has made no difference in the status of the Association. It still comprises the Jesuit scientists of the Eastern States and the Bulletin continues to be its organ. At the Georgetown Meeting which took place after the decree went into effect, everything went on as in preceding meetings without any sign of a division. As for the Bulletin the only change made was with regard to the printing. Fr. G.J.Shiple of Woodstock College, who from the beginning very generously taken charge of the printing with the assistance of the Woodstock theologians and who himself has made almost all the stencils, was ordained last June. As he will have less time at his disposal during the coming year he accordingly requested that some other arrangement be made for the printing. It was therefore decided to accept the kind offer of Fr. D.P.Mahoney Prof. of Physics at Holy Cross College Worcester to have the stencils made and the printing done at Holy Cross by his assistants under his direction. Fr. H.Brock of Weston continues as editor. We may add that the editor and printers of the Bulletin were much gratified by the vote of thanks extended to them at the Georgetown Meeting and recorded in the report. Proceedings of the meeting are published in this issue.

THE GEORGETOWN MEETING OF THE ASSOCIATION.

On August 12th. and 13th. the Eastern Section of the American Association of Jesuit Scientists held its fifth annual meeting at Georgetown University, Washington, D.C. About seventy members, including quite a few from Woodstock College, were present at the meeting. The general sessions were held during the morning of the first day and the afternoon of the second; the sectional meetings during the afternoon of the first day and the morning of the second.

In the absence of Fr. Lyons, President of the University, an address of welcome was given by Fr.Dixon. Following Fr.Dixon's cordial welcome, Fr. Strohaver opened the meeting with the Presidential address. In his address, Fr. Strohaver outlined the attitude of modern chemists with respect to the valences of the chemical elements, and indicated their reasons for denying that the valences are unchangeable.

Fr. L.J.Kelly Provincial of the N.Y.-Md. Province was present at the meeting, and, in a short address to the members of the Association, praised their work. He also laid special stress on the increasing need of men eminent in the sciences. Fr. Dopp S.J. was a guest at Georgetown during the meeting and attended some of the sessions. Acting upon a motion made by Fr. Ahern, a resolution of encouragement and sympathy was extended to Fr. Dopp, secretary of the Societe' Scientifique de Bruxelles, with the hope that La Revue de Questions Scientifiques of which he is editor will soon be out of difficulty. The Revue has suffered greatly as a result of the World War.

One of the resolutions, read by Fr. Phillips and adopted by the Association, is worthy of special attention. It reads as follows:

"Be it also resolved that a rising vote of thanks be extended to those whose self-sacrificing labors have made possible the continued publication of the Bulletin, in particular to its Editor, Fr. Brock, and to Fr. Shiple and his co-workers at Woodstock."

It was decided that the colleges should hereafter take care of the mimeographing of the Bulletin. Fr. D.P.Mahoney of Holy Cross College offered to undertake the labor of mimeographing the Bulletin during the coming year.

The following officers were elected for the coming year:

General Officers:	President, Rev. G.F.Strohaver
	Secretary, Mr. T.H.Quigley
Section Officers:	
Biology:	President, Rev. C.E.Shaffrey
	Secretary, Mr. G.J.Kirckgessner
Chemistry:	President, Rev. R.B.Schmitt
	Secretary, Mr. E.J.Wolff
Mathematics:	President, Rev. E.C.Phillips
	Secretary, Mr. T.D.Barry
Physics:	President, Rev. J.L.Gipprich
	Secretary, Mr. E.J.Nuttall

The Executive Council decided that hereafter the Physics and Mathematics sections shall meet as separate entities.

During the two days of the meeting, The Central Scientific Company provided an exhibit and demonstration, in the Physics Laboratory, of some of their apparatus.

T.H.Quigley S.J.
Holy Cross College.

SCIENCE SUMMER SCHOOL.

The Scionce Summer School for the scholastics of the Maryland-New York and New England Provinces was hold again this year during August after the Villa At Holy Cross College Worcester Mass. Fr.G.Strohaver Professor of Chemistry at the College was in charge and directed the work in chemistry. Fr.D.Mahoney professor of Physics at Holy Cross and Fr.H.Brock of Weston gave instuction in Physics and Mr.A.MacCormac! professor of Biology at the College had charge of Biology. Fr.M.Ahern formerly of St. Joseph's College Philadelphia gave four lectures on evolution open to all and Fr. Preuss of the Missouri Province, a Graduate of Cambridge University England, who lectured to the classics teachers, also gave an illustrated lecture for all on his Alma Mater. The Bulletin rejoices that Fr.J.Dinand president of the College who in accordance with his physician's orders was obliged to rest and recuperate during the summer has been able to resume his duties on Mt. St. James and it wishes him renewed health and strength to carry on his good work.

MEETING OF THE JESUIT SEISMOLOGICAL ASSOCIATION.

Mr.J.S.O'Connor formerly director of the Fordham Seismological Station and now a theologian at St. Louis University has kindly sent us a copy of the minutes of the meeting of our recently organized Seismological Association which was held in Chicago on August 24th. As this association is an important inter-province activity and bids fair to occupy an important place in the scientific world we think it worth while to give the detailed account of the proceedings of the meeting. Otherwise the may not come to the attention of many who are interested in our work in Seismology.

The meeting of the Jesuit Seismological Association held on August 24, 1926 was called to order by the Secretary, Reverend J.B.Macelwane, S.J. in the absence of the President, Reverend F.D.Sullivan, S.J.

The delegates present were: Reverend H.F.Brockman, S.J., Rector of St. Xavier's College, Cincinnati, Reverend G.J.Brunner, S.J. of Loyola University, Chicago, Reverend Joseph Joliat, S.J., and Reverend James B. Macelwane, S.J., of St. Louis University, and Mr. Vincent Herr, S.J. of St. Xavier's College, Cincinnati; all representatives of the Missouri Province, Reverend E.J.Kolkmeyer, S.J. of Canisius College, Buffalo, Messrs. J.S. O'Conor, S.J., amd J.W.Tynan, S.J. of Fordham University, New York, and Mr. V.F.Dillon, S.J. of Shadowbrook, Massachusetts; representatives of the Maryland- New York Province, Reverend O.L.Abell, S.J. of Loyola College, New Orleans; and Reverend C. Maring, S.J., of Spring Hill College, Mobile, Alabama; representing the New Orleans Province. Mr.C.D.McAleese, S.J. of the Missouri Province also attended, representing Reverend A.G.Forstall, S.J. of Regis College, Denver. Reverend James B. Henry, S.J., representative of the California Province was unable to attend on account of sickness.

Copies of "Agenda" for the conference had been mimeographed and mailed to the delegates by the secretary, in order to facilitate the business of the meeting, but it was decided that the intended order of procedure be slightly changed so that the election of officers for the coming year might be the first business of the meeting. The result of the election was as follows: Reverend James B. Macelwane, S.J.President Mr. John S. O'Conor, S.J., Secretary - Treasurer.

The minutes of the last meeting, namely of August 24, 1925 were then read by the secretary. The minutes were accepted as read.

Father Macelwane supplemented the minutes by recalling the fact that in accordance with the resolution passed at the end of last year's meeting, providing that an account of that meeting be sent to the Provincials of the American Assistancy, and to Very Reverend Father General, the secretary had forwarded copies of the minutes to the above mentioned. In return letters of approval were received from the several Provincials, as well as from Father General, and Father Mattern, American Assistant. The letters of Father General and Father Mattern were then read.

A motion was made by Father Abell, anent the contents of Father General's letter, that recommendations be made to the Provincials of the various Provinces regarding the preparation of men still in their studies, so that when necessity or expediency require it, there will be a number of younger men equipped with the knowledge, skill, and experience necessary to conduct a seismologic station.

There followed a discussion emphasizing this necessity, as well as the value of the influence of present Rectors and Directors of existing stations, in making such recommendations. This motion was seconded and passed.

The next business of the meeting was the report of the Secretary for the year 1925 - 1926, which was read as follows:

REPORT OF THE SECRETARY OF THE JESUIT SEISMOLOGICAL ASSOCIATION FOR THE YEAR 1925-1926

Soon after the first organization meeting of the Association a report and a copy of the minutes were sent to the four Provincials of the American Assistancy for their approval and comment and were distributed to the stations. All the Provincials approved the acts of the conference. A copy was also sent to Very Reverend Father General and he wrote a letter of approval and advice. Father Mattern also wrote the Director. These letters were copied and distributed to the stations. But immediately after the first or organization meeting and before sending out the acts of that body the secretary went at once to Georgetown to confer with Father Tondorf who had been prevented by ill health from attending the meeting. He also took occasion to see the various officials of the Coast and Geodetic Survey especially Commander Heck and to confer with Dr. Day and others of the Geophysical Laboratory in regard to the work of the Association. On all sides he found the most ready cooperation.

The first four months of the school year were occupied with the details of organization. Plans were submitted to the various stations for criticism and suggestions were asked on all sides. The main lines of the work had been laid down at the meeting in Chicago but the details had been placed in the hands of the secretary.

A letter was sent to all the principal stations of the world announcing the formation of the Association and asking for eleven sets of their publications to be distributed to the active stations. The response was excellent. Some of the stations wrote that they would send their publications direct, others that they preferred to have them distributed by our Central Station. In all, reports were sent by twenty stations in Europe, seven in Asia, seven in North America, one in South America and three in Oceania and the East Indies.

A plan of cooperation with Science Service was worked out whereby Georgtown was to telephone and Fordham was to telegraph data on important earthquakes direct to Science Service in Washington at their expence and they would relay the data to the Central Station free of charge. Our stations in Spring Hill, New Orleans, Denver, Spokane and Santa Clara were asked to send two telegrams, one to Washington and one to the Central Station in Saint Louis, the only obligation being that the Central Station should, at the expence of Science Service, wire the position of the epicenter as soon as it is found. Besides Science Service telegraphs to our Central Station the data from all the government stations and from Ottawa, Canada; Apia, Samos; and manila free of chagge.

The Central Station began to function fully with the beginning of the year 1926. A Preliminary Bulletin giving the data received by telegraph from Science Service is mimeographed after each earthquake and sent to about 170 stations and individuals in various parts of the world. The result of this is that the Association is credited in the various summaries such as that of the Swiss Government, Published in Zurich and that of the International Geodetic and Geophysical Union, published in Strasbourg.

The Central Station has undertaken the publication of data for our stations in Denver, New Orleans, Santa Clara and Spokane. However, as will be seen from the financial report of the treasurer this cannot be continued unless the stations whose

data are published add to the dues the price of the stationery and postage, because the $100.00 from each station will not cover the total expenses otherwise. During past year the Central Station has rendered assistance by letter to most of the stations, has visited several at their call, has prepared and distributed a Modified International Notation and especially has worked out a new set of tables of travel times for the analysis of seismograms and the determination of epicentral distance. Two parts of these tables comprising 36 and 34 pages respectively have already been distributed. Two other parts are almost ready to be mimeographed.

The secretary has with him a set of instructions for the determination of the constants of Wiechert seismographs which will be distributed as part of the agenda of this meeting.

There are in operation at present eight stations, Gonzaga in Spokane, Santa Clara, Canisius in Buffalo, Fordham in New York, Georgetown, Loyola in New Orleans, Regis in Denver, and Saint Louis. Holy Cross is expected to go into operation in the near future. This is also true of Loyola here in Chicago. St. Xavier's in Cincinnati is establishing a new first-class station with five seismographs.

All Together the secretary feels that the Association may well be satisfied with its first year's work and may look forward to a normal growth in the years to come.

The report of the Treasurer was then read and discussed. Mimeographed copies of this report were also distributed to the delegates, and a similar copy is appended to these minutes.

It was stated by Father Macelwane that while the report covers only one half year, due to certain initial expenses, which will not necessarily be recurrent, the total expenditures were a close approximation to the estimate of last year, as well as an indication of the amount necessary to operate the Central Station for each ensuing year. Further the deficit of nearly $700.00 indicated that unless the annual dues of $100.00 a year were paid by all stations belonging to the Jesuit Seismological Association, the operation of the Central Station could not be continued on the present basis of general service. In addition the present practice of interpretation and publication of data from grams of certain individual stations could not be included in the general service covered by the annual dues, in as much as the total amount of the dues, if paid, would merely cover approximately the necessary routine disbursements. In a lator discussion concerning the special expenses incurred by stations calling on the Central Station for publication of reports, determination of constants of instruments, or remedying defects of the same Father Kolkmeyer moved, seconded by Father Abell: that whatever such expence is incurred for any station, be assessed against that station, and that statements to that effect be issued at the time determined for the payment of the annual dues. Motion was passed.

A discussion as to the best method for obtaining cooperation of all stations in this matter of payment of dues ensued.

It was finally decided that statements be sent to each station on the first f October of each year, calling attention to the fact that these dues would be payable on or before October 15th, of the same year. This decision was put in the form of a motion by Mr. O'Conor, seconded and passed. This concluded the routine business of the meeting.

The meeting proper was conducted in the form of a general discussion. At the suggestion of Father Joliat, Father Macelwane opened the discussion with an explanation of three methods of obtaining exact time marks, and the importance of making corrections to the nearest second.

The three methods were; first, automatic inscription of wireless signals with the aid of a relay and chronograph, second, the eye and ear method, third a combination of both, wherein the observer listens and closes the time circuit by means of a key. These methods were also discussed from the floor.

The conventional methods of dating and inscribing time on actual records were also discussed.

The orientation of instruments, and the determination of constants were next taken up. Exact orientation was defined and its significance stressed. The distinction was brought out that orientation not only means the general direction of the instrument along,or at right angles to the meridian, but that it pertains to the specific relations of the direction of each thrust arm to the corresponding points of the compass, so that from the particular direction of the pen motion with regard to its zero line, the actual direction of the ground motion may be deduced.

Copies of directions for the determination of constants of the Wiechert seismograph were given to all the delegates. These directions constituted part of the work of the Director of the Central Station, and will enable a standardization of these instruments with which the majority of our stations are at present equipped.

The four principal constants, namely: damping ratio, friction, period and magnification were treated in some detail by the Director of the Central Station, and the directions supplemented with the necessary explanations.

The morning session of the meeting adjourned at 11:45.

The meeting reconvened for the afternoon session, at 1:00 P.M. Under the heading of "new clippings" Father Macelwane suggested that as the intention of the Association as determined in last year's meeting, was to have the Central Station, act as a clearing house for such information, in addition to each station keeping an individual file of cliipings that report local disturbance accounts of general interest and those concerning distant quakes might be sent to the Central Station and would be appreciated by the Director.

Regarding the Bulletin of the Seismological Society of America, Father Macelwane spoke of the willingness of the editors to publish any items of seismic interest which may be given to them. It was significantly remarked that since we are operating the majority of stations in this country we should contribute a large amount of the contents of the Bulletin.

With respect to our cooperation with Science Service, Directors of our Stations were advised to note the agreement made with this Bureau, and greater care in the composition of code telegrams was urged, in order on the one hand to avoid unnecessary expence to the Service, and on the other to render the data unequivocal.

Father Maring related the desire of European Jesuit stations to cooperate with the United States Jesuit stations. A motion by Father Kolkmeyer, seconded by Father Abell, directed that the Central Station get in touch with the above mentioned stations,and determine possibilities, and means for closer cooperation.

This motion was passed.

The final point of general discussion was the policy of the entire organization as well as that of the Central Station. Father Abell moved, Mr. Herr seconded: that the policy of the organization as followed during the past year be continued for the coming year. The motion was passed.

Father Brockman, Rector of St. Xavier's College, Cincinnati, closed the meeting with some pertinent remarkes about publicity. Referring to Father General's letter he cautioned the delegates to give only solid facts, if any profit is expected to accrue from their publication. Publicity is durable in proportion to its substantiality.

The meeting adjourned at 2:20 P.M.

Some NOTES ON THE LOGARITHMIC SPIRAL.

The spirals are interesting and to many people even fascinating curves. Of all these curves the most fascinating is probably the logorithmic spiral. It may be defined geometrically as a plane curve of such a form that the angle between the tangent to the curve at any point and the radius vector to that point is the same for all points of the curve.

The algebraic definition may be expressed by the following very simple equation in polar coordinates:

$$r = a^{\theta},$$

where a is any positive constant different from unity. Taking the logarithm of both sides of this equation we find

$$\log_a r = \theta.$$

That is to say, the logarithm (to a properly chosen base) of the radius vector is equal to the vectorial angle; or more generally, whatever the base of the logarithms may be, the logarithm of the radius vector is proportional to the vectorial angle.

The curve is very easily drawn provided we have a table of logarithns and a sheet of polar coordinate paper. We must first choose a definite value of a and a convenient unit for the vectorial angle θ: as our polar coordinate paper is usually divided into multiples and submultiples of ten degrees, this angle, 10°, is a convenient unit. Suppose our other variable, the radii vectors are divided in submultiples of an inch, and we wish the radius vector to increase fron one inch to four inch in the first spire or complete turn of the curve; then since the first spire is that part of the curve for which the limiting values of θ are 0° and 360° or 36 times 10°, we must choose for a the value determined by the equation $a^{36} = 4$. Our logarithms are constructed on the base 10 and we find a by solving the logarithm equation $\log a^{36} = \log 4 = 0.60206$; hence

$$\log a \ (= 1/36 \log a^{36}) = 0.01672, \text{ or } a = 1.0393.$$

This gives us as the equation of our particular spiral

$$r = 1.039^{\theta}, \text{ or } \log r = 0.01672\theta,$$

the unit of r being one inch and the unit of θ being 10°. We now form a table of corresponding values of θ and r as follows:

θ	log r	r
10° +0	0.00000	1.000
1	0.01672	1.039
2	0.03344	1.080
3	0.05015	1.122
4	0.06688	1.166
etc.	etc.	etc.

In this table the second column consists of the successive multiples of 0.01672 and the third column is obtained from the second by finding the corresponding antilogarithms or numbers in the logarithm table.

We now lay off on the successive radial lines spaced at intervals of 10° the successive values for r found in column 3 above and join all these points by a smooth curve and we have our spiral.

Another method of drawing or constructing the curve without the use of tables at all is suggested by the form of the original equation $r = a^{\theta}$; for let r_{n+1} and r_n be the values of the radii vectors determined by two successive values of our unit vectorial angle then the ratio of these two radii is

$$r_{n+1} : r_n = a^{n+1} : a^n = a;$$ that is the ratio of any two successive radii is constant. If we choose a convenient value for a, say 1.1, then each radius vector can be obtained from the preceeding one by adding to it one tenth of its own length. Thus our successive value of r and θ, still using the inch and 10° as our units for r and θ, will be:

θ =	0°	10°	20°	30°	40°	50°	etc.....
r =	1.000	1.100	1.210	1.331	1.464	1.610	etc.....

If we posses a pair of proportional dividers the whole construction can be made mechanically; all we have to do is to set the dividers so that the longer arms bears to the shoryer ones the required ratio, here it will be 1.1 = 1; them we open the shorter arms so that one point rests on the center or pole of our coordinate paper and the other point on the unit point of the initial line; with the dividers kept at this opening we set one point of the longer arms on the pole and the other arm will mark out for us the proper distance on the 10° radial line; now adjust the shorter arms to this new distance and the longer arms will give us the required point on the 20° radial line, and so on. If we choose a different ratio for the arms we will get a different spiral, since a change of ratio of the divider arms is equivalent to a change in the value of the arbitrary constant a of the original equation.

After having constructed a few of these spirals with different values of the constant a, or what amounts to the same thing, with different values for our unit vectorial angle, it will be well to construct by estimation the tangents to the curve at various points and to measure the angle between these tangents and the corresponding radii vectors: if the work has been carefully done all the angles for any one curve will be found equal, but the constant angle of one spiral will be different from the constant angle of a different spiral.

To obtain the exact value of this angle we must have recourse to the differential calculus or some similar mathematical help. As in ordinary Cartesian coordinates the derivative dy/dx gives the tangent of the angle made by the tangent line to the curve and the axis of x, so in polar coordinates the differential expression $rd\theta/dr$ equals the tangent of the angle made by a tangent line to the curve and the radius vector to the point of tangency (provided the vectorial angle θ is expressed in radians). Differentiating the equation

$$r = a^{\theta}, \text{ we find } dr = a^{\theta} \log_e a \, d\theta, \text{ and hence}$$

$$rd\theta/dr = a^{\theta}d\theta/a^{\theta}\log_e a \, d\theta = 1/\log_e a = \tan V.$$

Since a is constant, $\log_e a$ will also be a constant and hence the tangential angle is constant and we have a simple and direct proof of the fundamental geometrical property of the logarithmic spiral.

If θ is expressed not in radians but in some smaller unit, say 10°, which equals 18 radian, then the value of tan V is given by the expression $18/\log_e a$. In our case, first considered, a was equal to 1.039, and for this spiral $\tan V = 18/0.0385 = 4.532 = \tan 77.6^{\circ}$ which is therefore the constant angle of this particular spiral.

In a future instalment we will treat of the caustic curve produced by the reflection of light from a spiral mirror.

Fr. E.C.Phillips
Georgetown Univercity.

The Neutral Point

To most of us water is the most neutral substance we can conceive. It is neither acid nor basic predominatly, an when, according to the Theory of Ionization, a molecule of liquid H O dissociates, it gives rise to one hydrogen ion and one hydroxyl ion, the resulting electrical effect being zero, as is the resultant acid or basic effect.

From mass action consideration we can calculate the resultant hydrogen ion concentration and hydroxyl ion concentration when liquid water thus dissociates. The equation for this dissociation, we know, is

$$H_2O = H^+ + OH^-$$

where of necessity the hydrogen inn concentration equals the hydroxyl ion concentration. The mass action expression of equilibrium is

$$(H^+)\ (OH^-) = K_w$$

that is the product of the hydrogen ion concentration times the hydroxyl ion concentration equals a constant. At 25 the constant equals $1 + 10^{-14}$. That is

$$(H^+)\ (OH^-) = 1 + 10^{-14}$$

If the hydrogen ion concentration equals X and this also equals the hydroxyl ion concentration, then $X^2 = 1 + 10^{-14}$ and $X = 1 + 10^{-7}$. Thus at 25° C., in pure water, hydrogen ion has a concentration of 10^{-7} mols and hydroxyl ion has the same concentration. This corresponds, as we know, the P_H7 for the hydrogen ion and $P_{OH}7$ for the hydroxyl ion according to the modern nomenclature. And so we should expect that a neutral solution at 25° C, showing no preponderance of hydrogen ion over hydroxyl ion, or vice versa, would have according to our calculations, the above values, the same values found in neutral water, that is P_H7 and $P_{OH}7$.

But is this the case? Is P_H7 the neutral point actually found? Many experiments go to show that it is not actually so and that there are found in actual practice a large number of so-called neutral points. But one set of experiments I should like to review briefly, most of which bear testimony to the fact P 7 is not Nature's neutral point.

These experiments deal with catalysis of various reactions by hydrogen ion or hydroxyl ion, in which reactions the rate of the reaction depends on the concentration of the catalyst whether it be hydrogen or hydroxyl ion. Examples of hydrogen ion catalysis are the hydrolysis of sucrose;

$$C_{12}H_{22}O_{11} + H_2O + H^+ = C_6H_{12}O_6 + C_6H_{12}O_6 + H^+$$

and the saponification of esters like ethyl acetate:

$$C_2H_5OOCCH_3 + H_2O + H^+ = C_2H_5OH + CH_3COOH + H^+$$

Both the above reactions are catalyzed by hydroxyl ion as well as many others too numerous to mention now. The fact that these reactions all depend on the concentration of the catalysts whether hydrogen or hydroxyl ion would lead us to ask when these catalysts actually stop working, that is when they reach their neutral point, and we might be tempted to suggest that the point of minimun catalytic activity would be just that point in the P concentration scale where the hydrogen ion concentration is equal to the hydroxyl ion concentration, that is where the acid properties of the hydrogen ions are exactly neutralized by the basic properties of the hydroxyl ions; in other words, at P_H7. We can determine just where this catalytic neutral point is for any given reaction by a few more or less simple calculations which will be given in a footnote to this paper.

Accepting these calculations which we shall not go through now, we note that at the minimun point

$$H^+ = \sqrt{B + K_w}$$

where B is the catalytic ration of the hydroxyl ion and hydrogen ion, and K_w is the ionization constant of water. We see then that at the minimun point the hydrogen ion concentration equals the square root of the catalytic ratio times the ionization constant of water. Here we see that if the catalytic ratio of the activity of the hydroxyl to the hydrogen ion is unity, the hydrogen ion concentration at 25° is

$$(H^+) = \sqrt{K_w} = \sqrt{1 + 10^{-14}} = 1 + 10^{-7},$$

a concentration corresponding to P_H7, the calculated neutral point. But the catalytic ratio is seldom unity;

for example at 25° C. the value of B for ethyl acetate, according to some workers is 1690 and therefore for minimum catalytic activity at the neutral point, so-called

$$(H^+) = \sqrt{B \times K_w}$$
$$= \sqrt{1690 \times 1 \times 10^{-14}}$$
$$= 4 \times 10^{-6}$$

which corresponds roughly to a P_H value of 5.4 and not to $P_H 7$, the electrical neutral point. (1) (2)

For the hydrolysis of methyl acetate, the minimum point would have a P_H value of 5.42 (3) and the minimum point for the mutarotation of glucose is P_H 4.64 (5), and so for many other reactions, especially bacteriological (4) and colloidal, the catalytic neutral point, that is the point of minimum activity is not the calculated $P_H 7$, but some value over toward the acid end of the P_H chart. Between $P_H 4$ and $P_H 6$ seems to be a zone of particular importance in industrial and bacteriological research.

We might ask in conclusion why the neutral point for hydrogen and hydroxyl ion catalysis does not turn out be the theoretical neutral point, and the answer is that either our calculations are oncorrect or the hydroxyl ion is a more active catalyst than the hydrogen ion. As for the calculations they are ordinary physico-chemical calculations and accepted by everybody.

Regarding the view that the activity of the hydroxyl ion is greater than the activity of the hydrogen ion we might say that many chemists today are firm adherents of such a theory. It would seem, therefore, that the hydroxyl ion activity is so great even at the calculated neutral point that it overbalances the activity of the hydrogen ion and that it requires even at a concentration of $P_H 7$ an excess of hydrogen ions, even a concentration as high at times as $P_H 4$ to lower it to its catalytic minimum or point of catalytic neutrality.

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Note

The total catalytic activity for any solution of hydrogen and hydroxyl ions is equal to the sum of the two activities, or setting it formally:

The total catalytic activity (Y) equals the activity of the hydrogen ion (A) times the hydrogen ion concentration (H^+) plus the activity of the hydroxyl ion (B) times the hydroxyl ion concentration (OH^-); that is

$$Y = A\ (H^+) + B\ (OH^-)$$

Assume the activity of the hydrogen ion as unity, whence A 1, and that the activity of the hydroxyl ion (B) is the ration of the catalytic activity of the hydroxyl ion to that of the hydrogen ion and the expression reads

$$Y = (H^+) + B\ (OH^-)$$

From $(H)\ (OH) = K_w$

$$(OH^-) = K_w/(H^+)$$

Therefore $Y = (H^+) + B \times K_w/(H^+)$

Let $(H^+) = X$

Then $Y = X + BK_w/X$

Differentiate:

$$dy = dx - \frac{BK_w}{X^2}\,dx$$

Divide through by dx:

$$\frac{dy}{dx} = 1 - \frac{BK_w}{X^2}$$

At the minimum point $dy/dx = 0$

Therefore

$$0 = 1 - \frac{BK_w}{X^2}$$

Or $1 = \frac{BK_w}{X^2}$ Or $X^2 = BK_w$, Therefore $X = \sqrt{BK_w}$

Fr. J.J. Sullivan
John Hopkins University
Baltimore.

VITAMIN E -- THE REPRODUCTINE VITAMIN

Doubtless, each one of us is already familiar with the meaning of the term "vitamins" -- at least, under the general description of "accessory food substances", that is, substances other than the proteins, fats, carbohydrates and mineral compounds, which are requisite for a well balanced diet. Likewise, we are also aware that these substances are given different names -- because of the work they do in the animal organism. Thus we have the growth promoting vitamin (A), the antineuritic vitamin (B), the anitscorbutic vitamin (C), and the antirachitic vitamin (D).

The relationship of vitamins to reproduction has attracted a large number of investigators, with valuable results, and it is now recognized that vitamins are as important for reproduction as for growth; and, in the case of rodents at least, a vitamin has been discovered which is essential for the generative function. This vitamin is variously named vitamin X or vitamin E. The latter name seems to be preferable. Asyet vitamin E has hardly emerged from controversy. It was only in 1922 that Evans and Bishop first proposed the evidence for this vitamin. They found that it was present in lettuce leaves (fresh or dry), egg yolk, meat (ox cheek and liver), wheat embryo, oats, alfalfa and milk fat. It is not stored in the body for long periods, is resistant to ordinary cooking temperatures, is insoluble in water, but can be extracted with ethyl alcohol, ether, and with benzene ether and acetone. Later investigation has shown vitamin E to be present in yellow corn, hemp seed, cottonseed and olive oils, but not in cocoanut, linseed or sesame and alcoholic extracts of wheat embryo and green kale.

This is about all that can be said with much certainty regarding vitamin E.

Much more work upon the subject is still necessary. In fact, not much more can be said of any of the vitamins, though about two years ago two Japanese workers announced that they believed they had isolated vitamin A. But be this as it may, the evidence for the existence of vitamin E is very strong indeed. In connection with this subject one must be careful not to lay all the blame for sterility on the absence of vitamin E. There are many other factors which must be taken into account. Thus, both a definite quality as well as quantity of protein is absolutely essential, for this is the only source of nitrogen for the organism. Fats are of less importance, provided enough is fed to supply the fat-soluble vitamins, and granted that the ration is otherwise adaequate. Carbohydr ates, in themselves, are not required at all, provided sufficient energy is had from fats and proteins, but such a diet is too costly and dangerous for long usage. The mineral content is exceedingly important and, just like protein, must be had in suitable quantity as well as quality, and must include Ca, K, Na, Mg, Fe, P, S, Cl and I. Finally reproduction may be prevented by excess of at least some of these materials.

It may not be out of place here to say a word about the application of these facts to human reproduction, that is, what are the chances for that class of degenerates who would deliberately choose a deficient diet in order to prevent conception, or at least, to inhibit that which would naturally follow from conception? This is of course, more of a matter for moralists than for bio-chemists. However, I believe it can be answered very simply and definitely. The chances of this being done successfully are practically nil. It would be next to physically impossible, first, for any person to find such a diet (since vitamin E is so widespread), and secondly, to stick to it, once it was found, long enough to attain the desired results. Finally, it must be born in mind that the work so far has been done on rodents, so that it remains to be seen whether it applies equally to humans or not.

George J. Shiple S.J.
Woodstock.

JESUIT COOPERATION IN THE WORLD LONGITUDE DETERMINATION.

Through the kindness of Fr. Phillips Director of the Georgetown Observatory, we have received a copy of the memorandum prepared by the U.S.Naval Observatory on the World Longitude Determination to be carried out this fall by a number of observatories. This enterprise was planned some years ago and was approved by the International Astronomical Union and the International Geodetic and Geophysical Union. The memorandum states that it is proposed to determine the differences of longitude with great accuracy and to make redeterminations at intervals sufficiently separated in time in oder to test the permanency of their relative positions and certain possibilities as to movement of the earth's crust". The principal stations of the so called "fundamental polygon" will be the Naval Operating Base at San Diego California, the Algiers Observatory in Africa and the Shanghai Observatory in China. These stations have nearly the same latitude and are about eight hours apart in longitude.

The Shanghai Observatory mentioned is evidently that of Zi-Ka-Wei in charge of the Fathers of the Paris Province. In this connection Fr. Phillips states that Fr. Gautier of our scholasticate at Jersey whom he met two years ago told him that the French Government had entrusted to our Zi-Ka-Wei Observatory the astronomical work in the projected international longitude observations. Pere Lejay who has worked for several tears at the famous National Observatory in Paris had been designated by Superiors to direct this work. It is expected that many other observatories will also take part in the work including Washington, Greenwich, Paris and Australia. As is well known longitude is determined by finding the difference between one's local time and the time of the standard station transmitted by telegraph or radio.

Time signals will be sent out by radio from the principal stations at three periods of the day from October 1st. until December 1st,1926. They will be of the so called rythmic type there being 61 signals a minute for five minutes. Both short and long waves will be employed. The Annapolis and Arlington (or Bellevue) signals will be the principal ones by which observers can connect directly with Washington.

Place	Wave length	h	m		h	m
Annapolis	17,145 meters	20	: 10	to	20	: 15
		3	: 10	"	3	: 15
		10	: 10	"	10	: 15
Arlington or Bellevue (near Washington)	74.7 and 24.9 meters	20	: 10	to	20	: 25
		3	: 20	"	3	: 25
		10	: 20	"	10	: 25

The time indicated is Greenwich Time.

The Jesuit Station at Zi-Ka-Wei will transmit from Saigon at 17,000 and 25 meters from 11.30 to 1135 and from 19.00 to 19.05 Greenwich Time. The Naval Observatory has prepared instructions for constructing apparatus for receiving and recording the radio time signals. Copies can doubtless be obtained by writing to the Observatory.

OUR EASTERN SCHOLASTICATES.

At Woodstock the new wings and chapel and other important improvements have been completed and after a lapse of two years philosophy is being taught again. There are about fifteen philosophers in residence. Fr. V.Keelan is teaching first year and Fr. J.Brosnan has returned from Weston for Chemistry and mathematics. Second and third year will apparently be added in due season. At Weston construction has been going on steadily but some months must elapse before the whole building is completed. Science classes are still being conducted in temporary quarters. There have been a few changes in the faculty. Fr. J.Hurley has succeeded Fr. Reilly as minister, the latter having been appointed Superior of St. Mary's Church in Boston.

Fr. D.Callahan prefect of studies and professor of psychology who had the sympathy of all during his illness last summer has been transferred to Woodstock and Fr. A.Sheehan has taken his place. Fr. M.Ahern has taken Fr. J.Brosnan's classes in chemistry, geology and first year mathematics and Fr. F.Dore comes out from Boston College for Biology. Fr.Casey is treasurer as well as Spiritual Father.

VISIT OF FR.H.DOPP.

Fr.Henry Dopp, Professor of mathematics at the Belgian Scholasticate at Louvain and Secretary of the Societe' Scientifique de Bruxelles, visited this country last November in the interests of the "Revue des Questions Scientifiques", the Bulletin of the Society of which he is the editor. This Society, composed mostly of catholic men of science in Belgium, France and some other countries, was founded in 1875 and has always affirmed for its motto the great truth enunciated by the Vatican Council that there can be no real conflict between faith and reason. It has had an honorable career and while bringing together many of the men of science of Europe, its meetings and especially its Revue have always furthered the interests of true scholarship. It has been honored by Leo XIII and Pius XI. If we mistake not one of our Belgian Fathers has always occupied the post of secretary with the duty of editing the Revue and attending to the many details concerning the meetings. Owing to financial conditions following the war it has become increasingly difficult to publish the Revue and Fr.Dopp therefore came to the United States to seek some cooperation.

He attended the meetings of the eastern and central divisions of the American Association of Jesuit Scientists at Washington and Chicago respectively and also visited some of our colleges. We were glad to welcome him at Weston.

PUBLICATIONS:

The "ETUDES" for August 5th contains an article by Fr.Dopp on the fiftieth anniversary of the founding of the Société Scientifique de Bruxelles with an interesting account of its work. The official celebration of the Jubilee took place last April.

Fr.H.Gill of the Irish Province has an article in the July number of the Dublin Review on "A Jesuit Pioneer of Relativity". It is a sketch of Fr. Roger Boscovitch and a discussion of some of the theories expounded in his "Theory of Natural Philosophy". A new Latin English edition of this work has recently been published. Lengthy extracts are given. As Fr.Gill points out some of the views expressed have a remarkable similarity with much that we read at the present day in treaties on the theory of relativity.

Fr.M.Selga of the Manila Observatory contributes a note to the October number of Popular Astronomy on an Elliptical Lunar Halo observed at Manila on July 23, 1926.

The London Tablet for August 7th 1926 referring to the transfer of the Theologate of the Lyons and Paris Provinces from Hastings England to Lyons France speaks appreciatively of work done in geology by some of the young fathers during their residence there. It quotes from the local paper "The Hastings Observer" which states that Fathers Teilhard de Chardin and Pelletier made discoveries of great geological importance and many of the geological objects in the possession of the Brassey Institute were collected by scholasticates of Ore Place. It will be remembered that Fr. Teilhard de Chardin who is now professor of geology at the L'Institut Catholique of Paris was associated with Mr. Dawson in the discovery of the bone fragments connected with the famous Piltdown skull in Sussex.

The Philadelphia Catholic Standard and Times for September 18th publishes a radio address of Fr. W.Rigge of Creighton University on "How Big is the Universe". The address was broadcasted from Station WOAW Omaha.

We were glad to receive a copy of the inspiring Report of the Fourth Annual Convention of the Mid-West Division of the Jesuit Educational Association. It is very interesting reading.

Frs.Repetti and Jos.Sullivan have resumed their post-graduate work at St.Louis and Johns Hopkins Universities respectively. Fr.P.McNally has taken up post-graduate work at the University of California. Fr.A.Poetker of the Missouri Province took his doctorate in Physics at Johns Hopkins University last June. Congratulations.

Fr.Deppermann after a year of special work in astronomy has gone to Manila to join the staff of the Observatory.