American Association of Jesuit Scientists

EASTERN STATES DIVISION

PROCEEDINGS

of the

THIRD ANNUAL MEETING

LOYOLA COLLEGE, BALTIMORE

AUGUST 13 and 14

1924

Program of the Third Annual Meeting

WEDNESDAY, AUGUST 13TH

10:00 A. M. GENERAL MEETING:

Call to Order.

Address of Welcome—Reverend Joseph A. McEneaney, S. J., President of Loyola College.

Greetings from Very Reverend Father Provincial.

Appointment of Committees.

Reports of Standing Committees.

Miscellaneous Business.

Presidential Address—"Some Thoughts on the Evolution Controversy."

Adjournment.

2:30 P. M. MEETINGS OF THE SECTIONS:

Physics, Mathematics, Chemistry and Biology.

THURSDAY, AUGUST 14TH

10:00 A. M. SECTIONAL MEETINGS CONTINUED:

2:30 P. M. GENERAL MEETING:

Report of the Nominating Committee.

Reports of Other Committees.

Resolutions.

Miscellaneous Business.

Adjournment.

PROCEEDINGS

The third annual meeting of the American Association of Jesuit Scientists (Eastern States Division), was held at Loyola College "Evergreen", Baltimore, August thirteenth and fourteenth.

The first general session, at which fifty-five members were present, was called to order at 10:15 A. M. by the President. The minutes of the previous meting were accepted as printed in the "Proceedings, 1923."

Father Ahern then introduced Father McEneany, president of Loyola College, who greeted and welcomed us warmly to "Evergreen." He invited us to inspect the new Chemistry Building, erected under the supervision of Rev. Henry W. McLoughlin, S. J.

We were disappointed that Very Rev. Father Provincial was unable to be present, but he sent the following greetings which were read by the President.

Provincial's Letter

August 12, 1924.

Dear Father Ahern,

Pax Christi!

For days and weeks I have been expecting to attend the meeting of the Province Science Association, but I fear that duties connected with the departure to-morrow of a number of our men or Jamaica and Europe besides some engagements of great importance on Thursday will prevent me. It is a keen disappointment not to be able to attend the congress and lend all the encouragement possible to the work and the plans of our scientists, both Fathers and Scholastics. I have been anxious to emphasize most forcibly the importance of making one's particular branch of science one's *life work*; not a temporary avocation or occupation but a sacred duty, *a special vocation* in the cause of truth,—natural truth if you will, but truth that was meant by the Almighty to be the handmaid of Divine.

The chief enemies of our holy faith in these times are not to be met with only in the domain of theology; they are found in the natural sciences which they would make a fortress, so to

speak for launching atacks on the faith, on the Church and religion.

Even were this not the case, we should always have in the Society a chosen band of men most eminent in the sciences if we would be true to our best traditions since the days of Fathers Clavius, Schall and Kircher, and those famous men of the early Society. But the fact is, if we are to retain our title and our honor of being the chief defenders and champions of the Church and holy faith, we must not only keep pace with the modern science and scientists in the progress of our times, but we must equip ourselves to refute and overthrow an army of pseudo-scientists now in the field and repel the assaults of those leaders and thinkers who would undermine all faith in revealed religion and the existence of God by their subtle deductions from false yet apparently established hypotheses, and from what they would have us accept as incontrovertible facts.

Catholic scientists must be depended upon to meet and repel these attacks; and where shall the Church look for her defenders if not in the ranks of the Society's *gens electa*, and in the *acies ordinata* of her scientists. Let me assure all who are engaged by the direction of holy obedience in this sacred cause, that they will be given all possible support. They who have the good will and the requisite scientific talents can be assured of every opportunity for self improvement and higher studies consistent with our religious and priestly character. Wishing you therefore the greatest measure of success in your annual congress, I am,

Sincerely yours in Christ,

L. J. Kelly, S. J.

By an unanimous vote the Secretary was instructed, first, to tend to Very Rev. Father Provincial our thanks and appreciation of the practical interest he has ever shown in furthering sciences in the province; secondly, to extend to Father McLoughlin our sympathies in his illness and congratulations on the success of his painstaking efforts evidenced in the new Chemistry Building.

The President then introduced Rev. Hugh Sloctemeyer, S. J., of the Missouri Province. Father Sloctemeyer has been largely responsible for the excellently organized Central States Division. He extended the greetings of that Division and encouraged a closer union in advancing the aims of the Association in both Divisions.

The next point in order was the appointment of committees by the Chairman. Fathers Coyle and Shaffrey, and Mr. McCauley were appointed as the committee on resolutions, and Fathers Didusch, Crawford, and Mr. Kolkmeyer on nominations.

Father Henry W. Brock, Editor-in-chief of the "Bulletin", gave

a report on the progress of the publication. He spoke of the mimeographing and mailing involved, and thanked the scholastics of Woodstock for their generosity and interest in carrying on the work. He urged the members to contribute articles and items of scientific interest and promised that a more generous response would enable him to increase the number of issues during the year.

This was immediately folowed by the:

Presidential Address

Some Thoughts on the Evolution Controversy

Rev. M. J. Ahern, S. J.

(Abstract)

A plea was made at the outset for some of Ours to specialize in the geogological sciences. While our criticism of the vagaries and exaggerations of evolutionists has been philosophically and theologically above reproach, it has not often been based on a first-hand knowledge of the facts which the extreme evolutionists misinterpret and distort. Our criticism would be thus even among those we are attacking, to whom we are in most cases quite unknown as specialists.

There are two fountains of error in the interpretations of evolutionists, and they both spring from erroneous concepts in philosophy, if indeed they do not, in some cases, arise from an entire ignorance of philosophy. The first source is a loose interpretation of the word "species." This word is not used by any evolutionist in the sense in which we use it in our scholastic philosophy. It is used, on the contrary, as the systematists use it in the biological sciences, to include almost any group of plants or animals that has a "systematic" difference. The scholastics would call most of these "systematic" differences merely varieties. The opinion is hazarded that many evolutionists would agree with our philosophic concepts if these could be brought to their attention in some kind of round-table discussion. When it is recognized that over a million species of plants and nearly a million species of animals are recognized by the systematists, and that thousands of new species in both groups are described every year, it will be somewhat clear that the term species needs definition at the outset of any disputation on evolution.

The second source of error is in the confusion in the minds of many evolutionists over the meaning of the terms "fact, theory, hypothesis" and regarding what is meant precisely by the words "certainty, probability, possibility." These concepts,

elementary to us, sometimes change in a protean manner in a single paragraph in the writings of many evolutionists. Witness the stupid way in which H. G. Wells uses these terms in the first volume of his "Outlines of History" where he speaks of the evolution of man. He reflects the philosophic bolshevism of prominent evolutionists.

Attention was called in conclusion to the extraordinary stretching of the evidence in evolutionary writings; also to the profound disagreement as to essential details among the evolutionists themselves. Witness the recent controversy between Gregory of the American Museum of Natural History and Smith Woodward of the British Museum over the gorilla's foot; and the sharp criticism of the "Hall of the Age of Man" at the American Museum uttered at the recent meeting of the British Association at Toronto.

A motion was carried for adjournment to meet again at 3:30 P. M., when Mr. George C. Jenkins, donor of the New Chemistry Building, was introduced by Father McEneany. Mr. Jenkins expressed his keen interest in the progress of sciences in the Province. At the conclusion of his remarks the members unanimously elected him the first honorary member of the Association as a mark of appreciation of his generous and practical interest in the advancement of our sciences.

The meeting then adjourned.

On the following day at 3:00 P. M., the final general meeting took place. The following officers of the Association were re-elected for the ensuing year, 1924-25: President, Rev. Michael J. Ahern; Secretary-Treasurer, Mr. Joseph B. Muenzen.

A motion was introduced to limit the length of papers in the various Sections. After some discussion it was voted to leave this matter to the discretion of the chairman of the respective Sections.

The Secretary-Treasurer reported expenditures to the amount of $90 incurred in the printing and mailing of the "Bulletin" and "Proceedings" for the years 1922-23, 1923-24, and announced that the members would be assessed soon to cover these obligations.

On a rising vote, a resolution was adopted that the President convey to Father McEneany the thanks of the members of the Association for his generous hospitality and the thoughtfulness in arranging several trips of scientific interest.

This was followed by a seconded motion for adjournment.

PAPERS READ IN THE VARIOUS SECTIONAL MEETINGS

PHYSICS

Chairman's Address

Some Aspects of Gravitation

Rev. H. M. Brock, S. J.

(Abstract)

Gravitation is not only the most universal of all forces but it is also unique in many of its properties. Newton showed that a gravitational attraction between the sun and each of the planets which was proportional to the product of their masses and inversely proportional to the square of the distance between them would account for Kepler's laws. This law, $F = Gmm'/r^2$, he afterwards enunciated for every portion of matter. Cavendish at the end of the 18th century was the first to demonstrate the attraction between small masses by means of a torsion balance. He also obtained a fairly accurate value of G. His work has been repeated with improved apparatus and with numerous refinements. Among the best results are those obtained by C. V. Boys and K. Braun, S. J. Their value of G is 6.658×10^{-8} dynes from which the mean density of the earth is found to be 5.527. Poynting, Van Jolly, Richarz and Krigar Menzel using the equal arm balance have obtained similar results. Father Theodore Wulf, S. J., several years ago devised a successful form of Cavendish apparatus for the lecture room and laboratory. It is rugged in form and hence can be used more easily than the usual delicate types. By means of the principle of resonance a minute attraction can be made quite sensible.

Since Newton's time various attempts have been made to ascertain what factors, if any, affected gravitation. He himself, and in 1832 Bessel, showed that gravitation is independent of the nature of the attracting masses from the fact that the period of a pendulum is the same whatever the materials of which it is made. In 1897 Austin and Thwing sought for some screening effect due to intervening matter but without success. However in 1920 Majorana announced a minute

absorption effect when a sphere of lead is surrounded by mercury. H. N. Russell questions the reality of the absorption on astronomical grounds. Mackenzie in 1895 and Poynting and Gray in 1897 showed that gravitation is independent of crystal-line structure by using crystals as the attracted masses in the Cavendish balance. Shaw in 1916 announced an increase in the value of G with rise of temperature. Repeating his work however with Davy in 1923 he concluded that change of temperature has no sensible effect, his previous result having been due to experimental errors.

In spite of the wonderful triumphs of the Newtonian Theory we have the fact that it has not satisfactorily accounted for the motion of the perihelion of Mercury. It assumes that attraction takes place instantaneously whether the bodies are at rest or in motion and it ignores the intervening medium. Furthermore no satisfactory theory has yet been proposed to account for its action.

No physical theory since the time of Newton has so profoundly affected our views of gravitation as the Theory of Relativity as proposed by Einstein. The latter lays down the principle of equivalence viz., that a gravitational field of force at any point of space is in every way equivalent to an artificial field of force resulting from acceleration. Unlike Newton he concentrates attention upon the space surrounding bodies. As a consequence he concludes that gravitation arises from curvature in four dimensional space. While the intervening space should undoubtably be taken into account it does not seem likely that we can ignore the attracting bodies themselves. Einstein's well known deductions from his theory concerning the deflection of a ray of light passing near a gravitating mass, the motion of the perihelion of Mercury and the shift of the lines of the solar spectrum have been carefully tested during the past few years. While much evidence has been found in their favor it is not yet fully admitted that the phenomena in question are due solely to relativity and not to other physical causes.

The Problem of Radiation

Rev. C. E. Deppermann, S. J.

(Abstract)

Sinice 1900, the wave theory of light is facing three difficulties: as it stands, it fails to explain satisfactorily black body radiation, sharp spectral lines, and the photoelectric effect.

Some solutions are reviewed:—Einstein's extreme quantum theory is rejected as failing to explain interference, etc. Lodge's suggestion that stoppage of light causes birth of an electron is novel, though barely possible.

Bohr's first assumptions explain only frequency of radiation; to explain polarization of light and its intensity, he relies on the correspondence principle. Its formulation marked the beginning of a swing back to classical ideas. Bohr's latest postulates (Philosophical Magazine, May, 1924) with their "virtual" oscillators and "virtual" radiation field lead us still nearer the classical ideas. Bohr apparently solves difficulties, but really leaves things shrouded in puzzling analogies.

It is suggested that the important part played by magnetism in radiation is only beginning to be known, and that a closer study of a gyroscopic medium of vortices may yield a solution of the riddle of radiation.

Limiting Cases of the Doppler Effect

(Abstract)

Mr. J. S. O'Connor, S. J.

Assuming the definition and general phenomenon of the Doppler Effect, we may divide the limiting cases into two sets, each subdivided into two others.

The first is the case of stationary source and moving observer, with the subdivision covering cases of motion towards, and away from the source.

The second case is that of stationary source and moving observer, with the subdivision again covering cases of motion to or away from the observer.

The formulas for the two subdivisions of Case I are as follows:

$$\text{(a)} \quad N' = N \frac{(V + v)}{V} \qquad \text{(b)} \quad N' = N \frac{(V - v)}{V}$$

And for the second general case:

$$\text{(a')} \quad N' = N \frac{V}{(V - v)} \qquad \text{(b')} \quad N' = N \frac{V}{(V + v)}$$

Where N = actual frequency v = velocity of source or observer
N' = apparent frequency V = velocity of waves

The limiting cases are found by making the velocity of the source or the observer equal to that of sound (or in general to that of the wave velocity).

In formula (b) from above when $V = v$ the fraction becomes zero and therefore the apparent frequency zero. Physically this means that the observer is retreating from the sound at such a rate that the latter will never reach him.

In case II formula (a′) we have the most interesting phenomenon. If V = v the denominator of the fraction becomes O, and the entire fraction becomes indeterminate or equal to infinity. Physically this must be interpreted to mean that in the case of a body vibrating with an audible frequency, and traveling with the velocity of sound, a portion of every wave front approaching an observer would exist tangent to the vibrating body; and at no matter what time or position any wave or succession of waves were emitted, they would exist at all times in exactly the same position with respect to their source as at the moment of their generation.

As a last case we take the velocity of the vibrating body to be greater than that of sound. In the same formula (a′) this gives a resultant negative frequency. This means that the waves emitted from such a source are received in the reverse succession to the order of their emission. The experimental reproduction of these two latter cases would prove interesting as a physical problem.

Generators of Electromagnetic Waves

Mr. A. C. Roth, S. J.

(Abstract)

The impracticability of audio frequency transmission necessitates the use of radio frequency. The four principal generators are the spark, vacuum tube, the arc, and alternator. Spark methods have difficulties very hard to overcome. The arc is employed as a generator by connecting to its terminals a condenser and inductance in shunt. The voltage across the arc increases as the current decreases, so that the condenser will be charged, robbing the arc. The discharge of the condenser reverses the situation, and this discharge is rendered oscillatory by virtue of the inductance. The vacuum tube makes use of the fact that a slight variation in the grid voltage will give a variation in the plate current, so that if these elements are coupled together as part of an oscillatory circuit, natural oscillations will be produced. The three types of generators are the Goldschmidt, Arco, and Alexanderson, the first utilizing the principle of electrical resonance, the second using a special transformer outside of the generator, and the last uses a specialy designed rotor which varies the reluctance of the magnetic circuit.

The Seismogram and Its Interpretation

Rev. F. A. Tondorf, S. J.

(Abstract)

At the annual meeting of the Geophysical Union held in Washington, in May last, the agenda of the International meeting of the

same Union to convene at Madrid, in October, were freely discussed. One topic was the establishment of Seismic Stations in the United States. Dr. William Bowie, of the United States Weather Bureau, insisted that the number of stations in the United States were quite adequate, the one desideratum being that these stations show some activity. As at least eighty per cent of these stations are located in Jesuit Colleges the invitation of Bowie was evidently directed to the directors of these observatories. Seismology, the baby of science, is contingent for its maturity on the records of established laboratories. Why not then set these instruments working and let the scientific world have the readings of the seismograms inscribed at these centers? But no seismogram is a contribution to the literature of geophysics unless the data which may be interpreted thereon can be expressed in absolute units. This naturally calls for standardized seismographs. An appeal was made by the writer to the Union that such a standardizing body be authorized for the States and that so our grams receive an imprimatur for their use in international researches. A one-man interpretation of the registrations of the vibrations of the earth is very unreliable if not worthless. A comparative analysis of grams of the same quake as registered at different observatories would offer material worth the while. So ambiguities in grams occasioned by the superposition on grams of markings, not of seismic origin, could be lifted. It is suggested that some method be worked out by ours interested in this work throughout the States whereby we could exchange records, exchange interpretations, thereby reorganize the existing chain of Jesuit Seismic Stations and so help towards unraveling the mysteries which lurk within the earth's crust.

MATHEMATICS

Chairman's Address

Gothic Window Tracery Curves

Rev. C. E. Phillips, S. J.

(Abstract)

After a brief historical introduction indicating the beginning and development of Gothic windows and the decorative masonry surround-

ing them, an analytical expression representing the general type of circular *flowing tracery* was given in the following form:

$$\vartheta = \frac{c}{p} (t - \tfrac{1}{2} \sin. 2\ t)$$

$$\varrho = a\ (1 + k \cos. t)$$

ϑ and ϱ are polar coördinate and "t" a real parameter; "c/p" is a proper fraction with integer and relatively prime numerator and denominator, and "k" an arbitrary constant equal to or less than unity; "a" is a constant determining the size of the curve but not affecting the shape. These equations were discussed, the effect of varying the constants was indicated and a number of examples of the resulting traceries were exhibited.

A Metrical Paradox

Rev. C. E. Phillips, S. J.

(Abstract)

The paradox referred to is the property of any equilateral spiral in virtue of which the process of *enlarging* the curve leaves the *size unaltered.*

The general equation of the spiral is:

$$\varrho = a^{\vartheta} \qquad (1)$$

To enlarge the curve in any given ratio we multiply the second member of this equation by the constant "k"; each and every radius vector ϱ' of the new curve is "k" times as long as the corresponding radius vector of the original curve and therefore the equation:

$$\varrho' = k\, a^{\vartheta} \qquad (2)$$

represents a new spiral similar to the first one but "k" times as large.

On the other hand if we leave the original curve entirely unaltered, but rotate the initial line of our polar coördinate system clockwise through an arbitrary angle, then the new equation of the original curve will be:

$$\varrho' = a^{(\vartheta + \alpha)} \qquad \text{or} \qquad \varrho' = a^{\vartheta} \times a^{\alpha} \qquad (3)$$

Now make the angle α of such magnitude that $a^{\alpha} = k$ (4), and the original curve referred to new systems is $\varrho' = k\, a^{\vartheta}$ (5). As equation (5) is identical with equation (2), it follows that the process

of enlarging the curve is equivalent to a simple rotation of the curve, but this leaves the size unaltered.

The explanation of the paradox lies in the fact that this spiral has an infinite number of spires or turns and that each spire is of exactly the *same shape* as the preceding one but is *larger* than it. Therefore we have two similar curves a larger and smaller one, and rotate the smaller one through the proper angle we simply superimpose an outer or *larger spire of the smaller* curve on an inner or *smaller spire of the larger curve*, and thus the two curves coincide throughout.

The Laws of Motion

Mr. F. W. Sohon, S. J.

(Abstract)

The time-space continuum is a picturesque concept of the universal flux of events in which by a concomitant phantasm of an immutable four-dimensioned graph the local and temporal relations are emphasized. Translation being relative, the axis of rest may be rotated in the time space continuum. Simultaneity must always be perpendicular to rest, and so the geometry of any time-space continuum where there is to be a distinction between future and past must necessarily be non-euclidean.

The effect of a constant force in either Newton's or Einstein's mechanics is to give the body a trace of constant curvature in the time-space continuum. The ratio of the force to the curvature is in either system a constant that is invariant and additive and hence a true measure of the amount of substance in the oyject. Unfortunately, Einstein by a false analogy uses the acceleration instead of the curvature with the result that he gets two different values for his mass, both variable. Attempts to identify mass and energy come from a failure to understand the difference between substance and accident.

Curvatures in the time-space continuum occur in pairs symmetrical in direction with magnitudes inversely proportional to their stationary masses. This concomitance of curvature demands a sufficient reason which can be only mutual modification, *i. e.*, inter-action or force. To characterize the traces of gravitating objects as geodesics is to describe them indeed, but the significant fact of the concomitance and mutual quantitative implication of these curvatures still demands a sufficient reason, and in the end we always have to postulate interaction, commonly known as force.

CHEMISTRY

Chairman's Address

The Influence of Water in Fermentation Industries

Rev. Geo. L. Coyle, S. J.

(Abstract)

It has long been known that with the same basic materials—malt or hops—and the same method of treatment, very different types of beer and ale are produced. It was also known that the composition of the water used in *mashing* had an important effect on the final product—the reputation of the best known brewery districts was initially due to this factor. In the case of an endeavor to produce a better type of ale, Burton yeast was tried on the usual materials, but the results were not satisfactory. It was then decided to treat the water used. The output of three artesian wells was pooled—samples analyzed—compared with analysis of Burton wells—and then sufficient salts added to the local water to bring it to the same composition as the Burton standards. The batch of twenty barrels was brewed in the ordinary way and startling results obtained. The yeasts used in this trial were kept and used on the second batch with improved results. After the third batch was brewed with the same yeast as fine a product as one could wish was obtained and continued to be obtained up to July, 1920, when prohibition went into effect.

Water containing $CaSO_4$ produce pale, delicate beers which clarify well. $CaCl_2$ seems to have the same effect. Calcium salts remove phosphoric acid which malt contains in superabundance to the needs of the yeast. NaCl produces a sweet-flavored beer. $CaCO_3$ and $MgCO_3$ give dark, harsh flavored beers which do not clarify easily, and these effects are accentuated if Na_2CO_3 is present.

The evidence seems to indicate that the principal effect of the salts in the water is due to the change they produce in the H-ion concentration. Alkaline waters have a bad effect on enzyne action, by restricting it. It has been found that when $CaSO_4$, $CaCl_2$, $MgSO_4$ and $MgCl_2$ are present 100 parts per 100,000, they all raised the Ph from 6.1 to 5.7, that NaCl and $NaSO_4$ had no effect and that $CaCO_3$ and $MgCO_3$ lowered it. It has been shown that Ph 5.5 was most favorable for enzyme action on the carbohydrates and 5.3 for protein transformation and that slight changes between this and 6.1 (the normal Ph of worts made with distilled water) have a marked effect on these actions. Malt contains primary and secondary phos-

phates. Hence, we can easily see how Ca salts increase the H-ion concentration.

$$4K_2HPO_4 + 3CaSO_4 = 2KH_2PO_4 + 3K_2SO_4 + Ca_3(PO_4)_2$$

This would explain the preference of brewers for hard waters. The other fermentation industry was a bread bakery. A large firm was able to produce a bread that was light and white and remained fresh for several days. Their competitors suffered in rural districts, where distribution charges were high, demand for the bread variable and often light, and stale bread were a problem. The problem proposed was solved as follows:

1. Enough mineral salts were added to the water to feed the yeasts and bring about favorable results.

2. Sulphur-dioxide in small amount was added to prevent stray yeasts from the air, killed off foreign bacteria in the water, brought it to neutrality, and was driven out on mixing with hot water.

3. The yeasts feeding on the added salts do not take them away from the flour the Ca salts which toughen the gluten, the bone builder, and hydrolyze starch to glucose which zymase converts to carbon dioxide and alcohol. The amount of added salts is so small that it could not be detected in an analysis of an ashed loaf of bread made with the treated water.

The result was a soft, white, spongy loaf which would keep fresh for three to four days.

This shows how difficulties can be met by the application of facts of common knowledge to the practical solution of problems.

General Chemistry Laboratory Reports

Mr. T. P. Butler, S. J.

(Abstract)

This paper discussed some of the more common forms of general chemistry laboratory reports. It was shown that large blank forms with vertical columns are preferable mainly because they keep the procedure, observation and conclusion of each step of the experiment side by side, and are therefore easier to correct. Sample forms were shown.

As to the time and place for writing the reports, it was argued that, where conditions allow, the ideal time and place is in the classroom during the last quarter of the period. The custom of allowing students to write their reports at home and hand them in to the instructor at stated intervals was deprecated as being a great pedagogical mistake.

A plea was made to correct more than the chemistry of the reports, on the score that chemistry is a part of our system of education and not an isolated subject. Furthermore it was urged that the English employed or, at least, the spelling of chemical names and the general neatness of the reports should be corrected. It has been the experience of the writer that the giving of a grading mark on each report, and not merely the customary O. K., helps to create a greater interest on the students' part in the laboratory work.

The Phase Rule

Mr. F. W. Sohon, S. J.

(Abstract)

Definition of phase, component, degree of freedom. Statement of rule. One-component systems: isotherms for water, allotropic forms of ice, liquid crystals of p-azoxyanisol. Two component systems: vapor pressure of a mixed liquid, isothermal distillation, isobaric distillation, constant boiling mixtures, eutectic diagram, ferric chloride and water, iron-carbon diagram, brass diagram. Three-component systems: condensed system discussed only, and this under constant pressure, eutectic, isothermal sections, applications to quantitative analysis. Reference: The Phase Rule—Rivett (Oxford Univ. Press).

Profit and Loss in the Laboratory

Rev. J. A. Daly, S. J.

(Abstract)

The paper endeavored to determine the amount chargeable to students under the general term "breakage" at the end of the laboratory course. It was taken for granted that in the set of apparatus loaned for the course certain items, namely, matches, wire gauze, rubber stoppers, tubing, filter paper, and the like, are not returnable, and are charged in full against the student. He is also charged for apparatus returnable and not returned, and for requisitioned apparatus. Fines, if charged against him, are totaled and added in. A proportionate charge is made for cleaning apparatus if necessary, based on the cost of a man's time. Then a *pro rata* charge is added for general deterioration. This last item would cover deterioration of iron ware, such as burners, plumbing, lecture and demonstration apparatus, scales and balances, and redressing tables for the next course.

Insulin, Glucokinin and Intarvin

Mr. G. J. Shiple, S. J.

(Abstract)

Insulin is a substance secreted by the Islets of Langerhans of the pancreas, and is used in the treatment of diabetes mellitus. Its discovery and preparation is due chiefly to Banting, Best, Collip and Macleod, though much credit is also due and independently to several others.

The various methods of extracting it from the pancreas of animals are all based on the properties of certain solvents and precipitating agents.

Though insulin has not as yet been isolated as such, still evidence points to its protein nature, since it responds to nearly all the specific tests.

When injected into animals or persons suffering from diabetes, insulin causes a decided lowering of the blood sugar (the normal level being 0.08-0.11 per cent), a storing of glycogen, and a disappearing of both sugar and acetone bodies from the urine. Toxic symptoms, relieved by glucose, result from over-dosage.

An insulin-like substance has also been obtained from extracts of liver, thymus, spleen, thyroid, submaxillary gland, and a number of other tissues, and even from the blood; likewise from clams, oysters and other molluses, as well as from a number of plant tissues, especially from onions. The substance extracted from plants is called glucokinin.

Our three chief foods are carbohydrates, proteins and fats. A diabetic has difficulty with carbohydrates, as we have seen above; also with proteins, since in general they are convertible into carbohydrates. Finally, he is unable to oxidize fats completely, but produces from them the three acetone bodies, namely acetone itself, beta hydroxy butyric acid, and aceto-acetic acid, which lead to coma and death. The natural fats, e. g. tallow and lard, etc., are built up on fatty acids which contain an even number of carbon atoms. Thus

stearic acid	$C_{17}H_{35}COOH$
palmitic acid	$C_{15}H_{31}COOH$
oleic acid	$C_{17}H_{33}COOH$

Now when these fats are catabolized, two carbon atoms are cut off at a time, leaving eventually the two acetone bodies of four carbon atoms each, from which acetone itself is derived.

Recently Dr. Kahn in New York, built up a fat called intarvin, the basis of which is margaric acid ($C_{16}H_{33}COOH$). The fat contains one atom of glycerol and three atoms of margaric acid, and hence is called an odd carbon fat. Results of feeding this fat to diabetics

have been very encouraging, automatically eliminating the formation of acetone bodies.

Neither insulin nor intarvin is in itself a *cure* for diabetes, since neither removes the *cause* of the trouble.

A Method of Solving Chemical Problems

Rev. Jos. J. Sullivan, S. J.

The following problem was proposed: 111 lbs. Fe (containing 1% C) are to be used in the preparation of H_2S. How many liters H_2S at 18°C., and 743 mm. can be prepared? The equations for the reactions are:

(1) $\underset{55.9}{Fe} + \underset{32}{S} = \underset{87.9}{FeS}$ (2) $\underset{87.9}{FeS} + 2HCl = \underset{34.1}{H_2S} + FeCl_2$

Two methods of doing the problem were compared, one the traditional method, involving proportions, logarithms, in a word, a great deal of penmanship and mathematics, taxing the professor's time and patience in its correction. The other method, used at Massachusetts Institute of Technology, does away with all this, and attacks the problem from the view-point of the Chemist, rather than of the Mathematician. It states the procedure of solution in detail, tabulating every step in order, so that the finished statement takes the form of a long fraction (the vertical lines representing multiplication signs), and is solved as such. The solution of this fraction, *i. e.*, the actual numerical calculation of the answer, it was argued, was not essential to the work. The real Chemical solution of the problem lies in the statement. However, the numerical value of the answer is usually sought, and to obtain this, it was suggested that the slide-rule be used. The statement is as follows:

lbs. crude Fe	lbs. pure Fe	grams pure Fe	gram Atoms Fe = gram Moles H_2S	liters H_2S (standard conditions)	liters H_2S (corrected to 743 mm.)	liters H_2S (corrected also to 18° c.)	
111	99	454		22.4	760	291	= (Ans. 21,650 liters)
	100		55.9		743	273	

Thus the method involves (1) a mode of attack that is *chemical*, as opposed to the traditional one, (2) a detailed statement of the problem, (3) calculations done on the slide-rule (though not necessarily).

N. B.—Keuffel and Esser will give 20% discount to college book stores buying slide-rules in quantities. A substantial "Student's Slide-Rule" can be purchased for $1.00.

Saliva

Mr. V. A. Gookin, S. J.

(Abstract)

Saliva is a secretion of the parotid, submaxillary, and sublingual glands. Small isolated tubules contribute a portion. A thin watery mixture comes from the parotids, mucin present in the submaxillary product and a heavy mucilaginous mixture from the sublingual. Amount of total mixed saliva is about 1500 cc. in 24 hours. Color affected by bile or blood pigments. Odor affected by pathogenic conditions. Sp. gr. 1.002 to 1.009. Solids from 0.6 to 2.5%. Saliva is about 99% water; this amount varies. Acid to phenolpthalein, alkaline to litmus. Acidity is "temporary" or "permanent." "Temporary" if due to CO_2. "Permanent" acidity is of uncertain origin; present in some types of tooth erosion and pyorrhea; also due partly to lactic acid. Alkalinity to litmus due to alkaline salts not neutralized by the acid factors. This acidity and alkalinity determine by their relation to one another the "Salivary Factor" a possible indication of immunity or tendency to tooth decay. Mucin content varies but significance of these changes is not known. Its increase is favorable to bacterial growth. Albumin present—also varying. Ptyalin is the principal ferment: converts starch to maltose,—soluble starch, erythrodextrine and the three achroodextrines formed as intermediates. Phosphates and carbonates of Na and Ca present. Other constituents are KSCN, nitrates, and chlorides. Ammonia present. An attempt has been made to show the significance between the variations in the proportion of NH_3 and sulphocyanates, and immunity to tooth decay. The results have been questioned. Abnormal constituents include acetone, sugar, sodium oxalate, acid lactates of calcium and magnesium. Sediment will contain epithelial cells, blood cells, fat cells, pus and bacteria.

A New Apparatus for Hydrogen-Ion Determination

Rev. M. J. Ahern, S. J.

(Abstract)

The apparatus is known as the "Double Wedge Comparator for H-Ion Determination" and is for determinations of moderate accuracy,

say to two or three hundredths of PH unit. It consists of two wedges, one of which is colored for acid reactions in the thick end gradually fading to neutral in the thin end, the other is colored for another indicator of adjacent H-ion sensibility from thick to thin end. These wedges are placed together so as to form an oblong prism showing all color reactions for a particular range. The substance whose PH value is to be determined is placed in a small chamber made of transparent pyrolin of one cubic centimeter capacity, one drop of the proper indicator is added, and the chamber placed in a wooden viewing box, so arranged that white light or light from the sky is allowed to pass through the unknown solution and the double-wedge comparator. When the tint of both unknown solution and of comparator is the same, the PH concentration is read off from the scale at the bottom of the wedge.

Wedges can be secured for any desired PH concentration.

The apparatus is made by the Williams and Wilkins Co., New Haven, Conn. The price varies from $12.50 for the apparatus with one wedge up to any price one is willing to pay, by increments of $2.50 for each additional wedge.

How the Positions of Various Groups Affect the Toxicity of Benzene Derivatives

MR. JOS. B. MUENZEN, S. J.

(Abstract)

It is a well known fact that aniline and phenol are quite toxic to the animal organism. In our investigations we found that the presence of a carboxyl group on the ring decreases considerably the toxicity of both of these compounds. Moreover we found the carboxyl group in the meta position less toxic than ortho, and the para less than the meta. This phenomenom of position was later discovered to be reversed in the mono-halogenated benzene derivatives. Here the para position was found to be the most toxic and ortho the least. Secondly, it was surprising to find that the toxicity increased with the atomic weight of the halogen, in other words, the para-iod benzoic acid was more toxic than the corresponding chlor compound. This increased toxicity of the heavier halogens is perhaps due to the inability of the organism to detoxicate them by conjugation with glycocoll, owing to the relative chemical inacticity of the higher halogens. This is the only explanation which suggests itself for this apparent paradox.

BIOLOGY

Chairman's Address

"Genetics — A Critique"

Rev. Joseph S. Didusch, S. J.

(Abstract)

The address purposed to be a critical resume of the principles and theories of hereditary transmission. The subject was introduced by a consideration of the two Mendelian laws, Segregation of Genes and the Independent Assortment of the Genes, with some of the more important applications of these laws and their modifications and extensions. This was followed by an account of the more recently discovered principles of inheritance, Linkage, the Linear Order of the Genes, Interference and the Limitation of the Linkage Groups.

In the discussion of the physical basis of heredity, the attempts to explain the transmission of the characters by means of representative particles were reviewed. Stress was laid on the differences between the modern particulate theory of inheritance and the older views, such as the opinion of Spencer with his physiological units, of Darwin with his pangenes, of Weismann with his ids and biophors and of Bonnet with his preformation tendencies.

With regard to mutation, a summary was made of the few facts relating to the imperfectly understood origin of the germinal differences that give rise to mutant characters. References were made to De Vries' Mutation Theory and his work with primrose mutants, and to the extensive experiments of Morgan with the vinegar fly, Drosophila.

The remaining paragraphs of the lecture were devoted to the question of the inheritance of acquired characters. The older views of Lamarck and Darwin were recalled, and the results which Tower obtained a few years ago by subjecting potato beetles to various environmental changes were recounted. Attention was also directed to the experiments of Dr. Paul Kammerer of Vienna with certain species of lizards and his interpretations of the facts observed. An account of his work has just been published for the first time in book form, and is creating no little interest in biological circles.

The lecture was supplemented by a collection of fifty slides selected to illustrate the main points of discussion.

Resistance and Immunity

Rev. C. E. Shaffrey, S. J.

(Abstract)

History of development of the science. Pasteur on chicken cholera and anthrax.

Development of antitoxin for diphtheria by Roux and Yersin, and for tetanus by Behring and Kitasato.

Present-day methods of preparing antitoxin for diphtheria.

Types of immunity. Natural: racial, individual, following attack of disease.

Artificial: Active, developed by body itself, vaccines.

Passive, produced by antitoxins.

Theories atempting to explain the cause of immunity.

Biological or phagocytic held by Metchnikoff of the French school.

Chemical held by Ehrlich of the German school.

Correct explanation probably a combination of both theories.

Principles of phagocytic theory. Leucocytes attracted to focus of infection engulf the living bacteria.

Principles of the chemical theory. Immunity due to presence in the blood of chemical substances which kill the bacteria. Ehrlich's side-chain theory.

Practices based on the biological theory principally the bacterial vaccines. Practices based on the chemical theory are antitoxins, attenuated viruses, injection of toxin, and injection of toxin- antitoxin.

Phenomena of immunity employed in diagnosis. Tuberculin, mallein, Widal reaction, Schick test, Wassermann reaction.

The Amoeba in Its Relation to Man

Rev. Francis A. Tondorf, S. J.

(Abstract)

The nomenclature of the amoeba is one of the most confused in all zoology. First record 1755, then called "der kleine Porteus." This name not available under the international rules. Linnaeus follows with name "Volvox chaos." Chaos oldest specific name for amoeba. Pallas, 1766, follows with Volvox Proteus. 1767 Linnaeus separated Volvox chaos genericially from Volvox placing it in new genus Chaos, chaos porteus, 1786, Mueller announced two species of amoeba, with generic name, Proteus, specific names, diffluens and tenax. First seems to have been identical with "Kleine Proteus," second distinct. 1790-1822 generic nomenclature confused with the acceptance of chaos and diffluens as more or less generically as specifically different. 1822

Bory substituted the name amiba (sic) for proteus, insisting that the type was that of Mueller's proteus. Ehrenberg emended Amibia. Other spellings met with are: Ameba, Amorba, Amoebea, Amoba, Amaeba and Amobea. Lamb first noted amoeba in man, 1859. Loesch's description of intestinal parasite found in man appeared in 1875. Four years after Grassi noted amoeba in encysted state. Most important researches those of Koch in 1833 made on cholera patients. Councilman and Lafleur noted two species in man, one harmless, the other pathogenic. Cassagrandi claimed that amoeba acted as carriers for bacteria. Kruse and Pascale disproved this (1893). Schaudin (1903) reported two species of amoeba in man, one harmless, entamoeba coli, the other pathogenic, entamoeba histolytica. Viereck gave the name of entamoeba tetrangena to the latter because it showed four nuclei in the encysted state. Schaudin described the entamoeba histolytica in 1903.

A Study in Heredity

Rev. H. C. Avery, S. J.

(Abstract)

A series of experiments initiated and carried out by Prof. M. Guyer and Dr. E. A. Smith of the University of Wisconsin seems to have resulted in facts which tend to prove that acquired defects may be transmitted. Reasoning that the serological mechanism of the animal body provided a means by which external influences might operate upon the developing germ cells, in such a way as to modify the representatives of the somatic tissue characteristics therein contained, they tried to construct a cytolytic serum which would produce such an effect. Selecting rabbit crystalline lens as the antigen an emulsion of perfectly fresh lenses in sterile normal salt solution was injected into healthy fowls. After a series of such injections the fowl's blood serum was injected into pregnant rabbits. The mating of the rabbits had been arranged so as to have the young at about the tenth day of embryonic development because between the tenth and thirteenth day th eye lens seems to be in the most important period of development. When born a number of the young showed conspicuous and persistent eye defects. These defective individuals later were bred in various ways and the surprising result was obtained of the transmission of defects induced in the original rabbits through subsequent generations. A series of eight generations showed the anomalies passed from generation to generation without any other treatment than the original injections of the first pregnant mothers.

A Practical Storage Cabinet

Mr. J. F. Busam, S. J.

(Abstract)

This paper dealt with a practical and successful means of conveniently securing what we might term the external preservation of larger animal material used in the biological laboratory.

The method involved a specially constructed cabinet which was in effect a set of drawers. Each drawer was fitted with a valve which connected through a piping system to a storage tank below. By an air compressor the preserving fluid was raised from this tank into each drawer to cover the specimen contained therein. The drawers could be drained by gravity when the specimens were needed for use.

This arrangement insured the availability and isolation of the specimen, its adequate external preservation with the illimination of molds and other putrefactive growths, and lastly its dryness when needed for use. Another advantage was the fact that such a cabinet took up very little laboratory space.

A blue print of the cabinet and its parts accompanied the paper.

Are Explanted Cells Living?

Mr. R. J. McWilliams, S. J.

(Abstract)

Explanted cells and tissues, i.e., cells and tissues separated from the parent organism and placed in suitable media, can be kept in a state of survival or in a state of culture according to the kind of medium used. In the former condition there is little appreciable increase in the mass and the cells depend for their activity on the food substances stored within themselves; in the latter there is such increase and moreover such cells with proper technique, manifest all the vital phenomena; metabolism, growth, respiration, mitotic reproduction, etc. Kept thus, as Carrel says, life in vitro becomes permanent.

Practically every kind of tissue from the human body, from that of the dog, cat, rabbit, etc., has been isolated and kept alive; some for half a year, some for as long as thirteen years. In some instances the tissue has far outlasted the average life of the species from which it was taken. From a few explanted cells, whole new individuals have been regenerated among certain Porifera and Coelenterates. Thyroid cells kept in vitro form acini glands and manufacture characteristic secretions. The metabolism of cells and their inherent growth energy can be quantitatively measured. The mitotic figures formed by the cells in the process of reproduction have been repeatedly photographed. Leucocytes maintain their amoeboid motion for long periods; explanted embryonic nerve cords regenerate new cells and fibres, iso-

lated embryonic intestines secrete and contract peristaltically for months. In the case of all types of explanted cells retention of characteristic form is the rule. And so the facts may be multiplied almost indefintely. Since therefore explanted cells and tissues, properly cultivated, in their activities square with all the criteria whereby the living is distinguished from the non-living, they are themselves truly alive.

The fact of the matter is, as Ebeling says, that every modern worker in this line regards them so unquestionably. Carrel for example considers three weeks of life in vitro, sufficient for most physiological studies. His work as well as that of Harrison, Burrows, Fischer and Ebeling, has of course very practical ends. Thus Burrows has recently made quite an advance in the study of the causes of cancer; Carrel has found out at least one of the body's methods of tissue regeneration. "Almost the whole of our knowledge of muscle-nerve physiology and much of that of the action of the heart is based on experiments with surviving organs." (Harrison). Apart then, from academic interest the cultivation of explanted cells has very valuable psychological and pathological results to yield, the basis for which proved time without number, is the fact that explanted cells and tissues are truly living.

The Internally Secreting Glands

Mr. G. J. Shiple, S. J.

(Abstract)

No organ of the body is a complete unit by itself, and many of them have as their main function the assisting of other organs by secreting directly into the blood streams substances which are thus carried to the other parts of the body. These organs are called internally secreting glands, and the active principles of their secretions are known as hormones. The following are the more important:

1. The hypophasis. In human beings it is about as large as a pea, and lies at the base of the brain. Its secretion has important influences on growth and development. Pituitrine is extracted from the posterior lobe.

2. The thyroid. It is the best known of the ductless glands, and lies in the neck, close to the larynx. Its secretion profoundly affects general metabolism, due to an iodine-containing substance, thyroxin, which was isolated and analyzed in 1916 by Kendall. KI restores diminished secretion to normal. Excessive secretion causes exophthalmic goiter or Grave's disease, and is relieved by operation.

3. The para-thyroids. These are small glands either imbedded in the thyroids or lying close to them. Complete removal generally means tetany and death within 10 days. Little is known about the secretion.

4. The adrenals. They are two small glands lying like caps on top of the kidneys. In man their extirpation cannot be long survived. They secrete adrenaline, which has also been synthesized and is closely related chemically to tyrosine. Adrenaline increases blood pressure by contracting the peripheral blood vessels. Diminished secretion causes Addison's disease.

5. The pancreas. It is located in the abdomen, just below the stomach, and secretes from the Islets of Langerhans the substance insulin, which plays a very important role in sugar metabolism, and the stoppage of which leads to diabetes mellitus.

6. The ovaries and testes. They have a marked influence on the growth, development and metabolism of the body, and profoundly modify the general psychological properties. A large number of so-called pubertal characteristics depend on the internal secretion of these organs. Much that has been said about the rejuvenating influence of vasectomy and hypertrophy of the interstitial gland is still an open question.

Recent Achievements of the Hybridizers

Mr. David N. McCauley, S. J.

(Abstract)

The above title offered too vast a field to be covered in the brief period to which this paper was limited. Therefore it was found more convenient to change the subject to "A Few Recent Achievements in Plant Hybridization."

While some consideration was given to the work of the U. S. Bureau of Plant Industry and of Professor Daniel of the University of Rennes, this paper dealt chiefly with a few of Mr. Luther Burbank's outstanding successes. Since Mr. Burbank has always deemed his work on trees to be his principal economic success, a few phases of this work were explained, particular attention being given to various walnut hybrids. Some of the results of this hybridization were a more rapidly growing tree, an enormous increase in the production of nuts, and the introduction of characters which permit this more perfect hybird to grow not only in the California proving grounds, but also throughout the United States.

Consideration was also given to Burbank's marvelous work with the potato, the plum and such new fruits as the pomato and the plumcot. Since much of Burbank's work entails the enhancement of the world's beauty, some of the new cower hybrids were also seen. Among these were some new varieties of the poppy, amaryllis and lily.

A Catholic Biologist—Pierre Andre Latreille

Mr. E. C. Dubois, S. J.

(Abstract)

As the names of Swammerdam, Linnaeus and Fabricius indicate certain epochs in the earlier stages of Entomology, so may that of Latreille be used to distinguish the most flourishing period in recent times. Pierre Andre Latreille was born at Brives, November 29, 1762. Abandoned by his parents in childhood, Pierre found friends in Paris. He was ordained priest in 1786 and returned to Brives to devote all his spare moments to the study of entomology. During the French Revolution Latreille was arrested and sentenced to deportation. While in prison he sent a specimen of a rare beetle, Necrobia rufficollis, to Bory de St. Vincent, through whose influence he was liberated. Later he was appointed professor of entomology in the Museum of Natural History in Paris. This position he retained till his death, February 6, 1833.

In 1796 Latreille published his first book, "Precis des Characteres generique des Insectes disposes dans un Ordre Naturel." This was followed by a greater work, "Genera et Crustaceorum et Insectorum secundum ordinem naturalem in familias disposita." Here the Linnanean "Insecta' 'are divided into two groups or classes of equivalent value, "Crustacea" and "Insecta." The former of these he characterizes as possessing a heart and breathing by tracea. Latreille introduced some changes in the arrangement of these groups when he contributed the sections, "Crustaces, Arachnides and Insectes" to Cuvier's work, "Regne Animal."

The Psychological Aspect of Birds

Mr. H. L. Freatman, S. J.

(Abstract)

This paper briefly showed from observation that confirmed our ideas on animal intelligence, viz., that birds lack this faculty. All birds of the same species build the same kind of nest, hence they cannot perfect essentially their mode of action or increase their store of knowledge. The chirping sparrow always is an easy prey to its enemies. The catbird never builds high in the elm like the oriole. Birds never invented a mechanical instrument, never lit a fire, never intelligently handed down to their descendants useful information.

The oriole and phoebe display great skill and genius in nest-building, but even this is shown from their early years. Some cedar-birds and phoebes, say our adversaries, built differently from their own species; we, too, saw chipping-sparrows' nests lined with moss in-

stead of the ordinary horsehair. Others, they say, use strings and rags one supplies them, and so on, but all these variations are but accidental and hence do not weaken our argument. All is due to a Divine Intelligence guiding them through instinct.

A chickadee raps at a window-pane, because it does not know that there is glass between itself and a piece of suet. The catbird utters a catcall only because it has memory and imagination about its having youngsters which the bluejay stole, and not intelligence. Again a Divine Intelligence guides birds as to when a storm threatens. Then instinct shows them the difference between what is harmful and good. The canary never escapes from its frail cage because it knows not the relation between effect and cause. The chickadee for the same reason never seeks our warm fireside in winter. Some imprisoned birds build nests for young they never will have. Birds conspiring against an enemy only act through instinct. Rational speech, an essential of intelligence, is never found in birds. Birds know not right and wrong. Their sameness of action in their species is no sign of free-will. Such are a few items that prove non-intelligence in birds.

The Spinning Organs of Spiders

Mr. Anthony J. MacCormack, S. J.

(Abstract)

The main idea of the paper was to give a few interesting details about the most complicated spinning organs known. The external anatomy of the three pairs of spinnerets, common to all spiders, was first considered. On closer examination of these, their membranous tips, known as the spinning-fields, will be seen. Over these surfaces, hundreds of small tubes, known as the spinning tubes, are distributed. These connect by means of ducts with the various silk glands.

So far, seven kinds of silk glands have been discovered. These all differ greatly in form, in number, in color, in nature of products, etc. Only three forms of these glands are common to all spiders. The others are each characteristic of certain species; roughly, however, five kinds will be found in most spiders.

The names of the various glands will give an idea of their anatomy; such as, the pear-shaped glands, the bellied, the berry-shaped, etc. The various uses to which the silk of spiders is put demand a most varied assortment of silk. One may gain a fair idea of the assortment from the fact that the silk is woven into strands, bands, sheets, loops, etc., as the necessity arises. The silk is used to make attachment-disks, by which the spider hangs, or crosses open spaces; or to make swathing-bands, which when wound round the prey ren-

ders it helpless. To make both the dry, inelastic silk and the viscid, elastic silk of the webs; and for many other requirements of the spider's life. The most beautiful and fine silk is found in the egg-sacs. One has to see it to appreciate its marvelous beauty.

Vivisection and Antivivisection

Mr. Henry C. MacLeod, S. J.

(Abstract)

Father Schaffrey's paper gives in some detail the experiments in the science of Immunology. These eperiments along with all others performed on animals for progress in the medical sciences are called vivisections.

An amalgam of the definitions received from fifteen of the highest medical authority is that vivisection is the experimental use of living animals for progress in the medical sciences.

Vivisection is ethically justifiable because: (1) It is not evil in itself, since it is not inherently cruel, nor is it an immoral use of the powers we possess, nor does it infringe on the supposed rights of brutes. (2) It produces more good than evil by comparing the results. (3) The good obtained cannot be brought about by any other means, since the alternative is impracticable and preposterous.

Some objections: "No mention made of anesthetics." Of course not, since the descriptions of which this is the criticism are taken from technical periodicals for technical men and not for the prejudiced ignorant. Because garbling has become a science and misquotation an art and sentiment has been so prostituted and degraded, the Pavlov Dog has broken many hearts and many pocketbooks.

From the litany of facts to the credit of vivisection are the success of all modern surgery, the finding of curatives and preventatives for disease and the positive value to the animal industry.

The reason for the antivivisectionalists' stand is because they have not a true appreciation for the value of scientific knowledge, hence they fail because in their ignorance they prefer to be zoophilists rather than philanthropists.

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Martin, Rev. Richard, 1923. St. Joseph's Coll., Philadelphia, Pa.
McCullough, Henry B., 1923. Woodstock College, Woodstock, Md.
McLoughlin, Rev. Henry W., 1922. Loyola Coll., Baltimore, Md.
Muenzen, Joseph B., 1923. St. Louis University, St. Louis, Mo.
Power, Francis G., 1924. Fordham University, N. Y. City.
Schmitt, Rev. Richard B., 1923. Ateneo de Manila, Manila, P. I.
Shiple, George J., 1923. Woodstock College, Woodstock, Md.
Sohon, Frederick W., 1923. Valkenburg, Holland.
Strohaver, Rev. George F., Fordham University, N. Y. City.
Sullivan, Rev. Joseph J., 1923. Woodstock Coll., Woodstock, Md.
Tivnan, Rev. Edward P., 1923. House of Phil., Weston, Mass.

BIOLOGY SECTION

Officers (1924-1925)

President, Rev. Clarence E. Shaffrey, Boston College, Boston, Mass.

Secretary and Sub-Editor of Bulletin, Henry C. MacLeod, Fordham Univ., N. Y. City.

Members

Avery, Rev. Henry C., 1923. Poughkeepsie, N. Y.
Busam, Joseph F., 1922. Woodstock College, Woodstock, Md.
Caballero, Rev. Gustav, 1923. Ateneo de Manila, Manila, P. I.
Didusch, Rev. Joseph S., 1922. St. Joseph's Coll., Philadelphia, Pa.
Dubois, Evan C., 1924. Boston College, Boston, Mass.
Freatman, Harold L., 1924. St. Joseph's College, Philadelphia, Pa.
Frisch, Rev. John A., 1924. Canisius College, Buffalo, N. Y.
MacCormack, A. J., 1924. Holy Cross Coll., Worcester, Mass.
MacLeod, Henry C., 1924. Fordham Univ., N. Y. City.
McCauley, David V., 1923. Woodstock College, Woodstock, Md.
McWilliams, Raymond J., 1922. Woodstock Coll., Woodstock, Md.
Pollock, John A., 1923. Woodstock College, Woodstock, Md.
Pouthier, Edward S., 1923. Woodstock College, Woodstock, Md.
Reith, Joseph, 1922. Woodstock College, Woodstock, Md.
Shaffrey, Rev. Clarence E., 1923. Boston College, Boston, Mass.
Tondorf, Rev. Francis A., 1923. Georgetown, Washington, D. C.