THE SIGMA ZETAN

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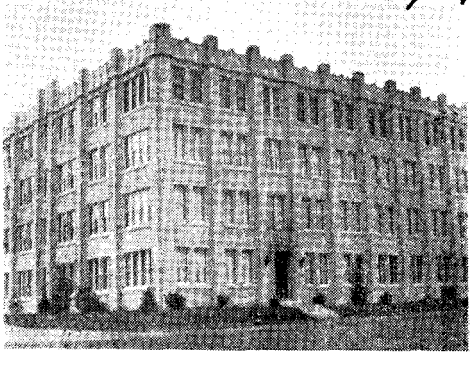
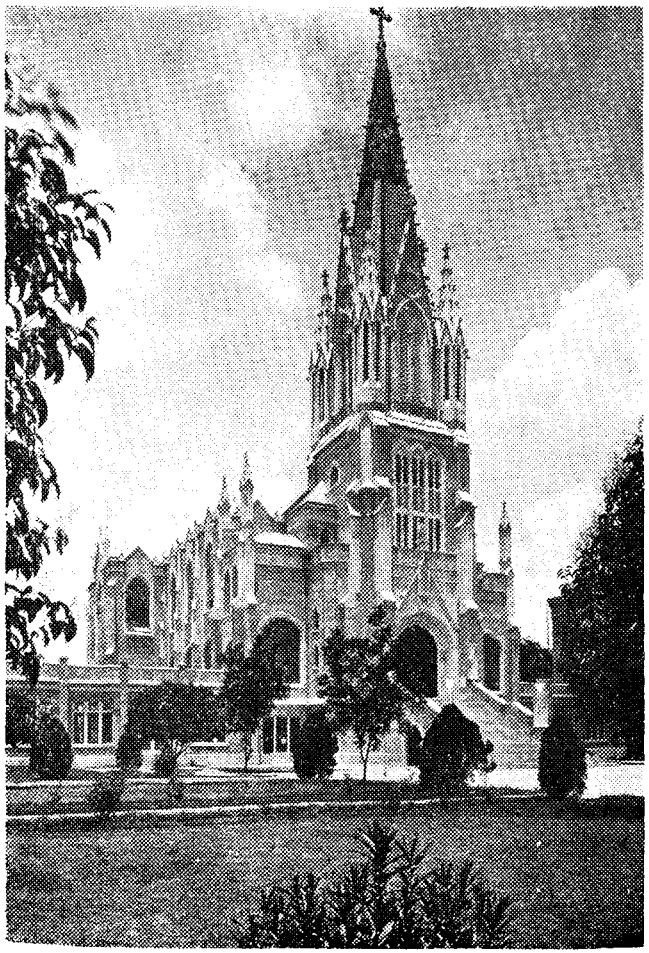


SCIENCE BUILDING
Our Lady of the Lake College

OUR LADY OF THE LAKE NUMBER

THE SIGMA ZETAN

Official organ of Sigma Zeta, a National Honorary Science Society



THE CHAPEL
Our Lady of the Lake College
Home of the Sigma Chapter
San Antonio, Texas

DEDICATION

We are glad to dedicate this issue of the Sigma Zetan to the

SIGMA CHAPTER

our newest member to receive a charter. It was organized on the campus of Our Lady of the Lake College (1943) at San Antonio, Texas

To honor the new chapter and to extend our greetings and best wishes to our new friends in the Lone Star State this issue is designated as

Our Lady of the Lake Number

KNOWLEDGE IS POWER

An Editorial

The writer of this article was not promoted from an eighth grade class to the first year of high school in the usual manner but had to fulfill the requirements for high school entrance by passing a common school examination conducted under the direction of a county superintendent. Knowledge of the common branches as taught in an ungraded country school supposedly provided the necessary preliminary preparation for the examination. Reviews for several weeks preceding the date set for these tests were made in the evening at the kitchen table of the old farm home by the light of a kerosene lamp. We had never owned a note book of any kind and when a wish was expressed for one to use in these contemplated reviews, our Mother purchased a small paper bound book containing ruled paper and bearing on its front cover this success-motto: KNOWLEDGE IS POWER: THERE IS NO KNOWLEDGE THAT IS NOT POWER. That notebook has been in our possession from that day to this: the quotation was an inspiration then, and still carries with it a challenge for self-improvement.

The expression "Knowledge is Power" was used by Lord Bacon; but it had its origin long before his time, in the saying of Solomon, that "a wise man is strong; yea a man of knowledge increaseth strength". "But mere knowledge is not power", asserts another writer, "it is only possibility. Action is power; and its highest manifestation is when it is directed by action." Still another writer has stated that "knowledge is power in the same sense that wood is fuel. Wood on fire is fuel. Knowledge on fire is power. There is no more power in knowledge than there is in stones or stars, unless there be a spirit and life in the knowledge, which give it its energy. In proportion as men have this spiritual power they become strong in the world."

Man is not merely the highest of the animals in a strict sense—the crowning work of the Creator. Man is a creative spirit, possessing some of the creative genius of his Creator. The urge to improve his environment is instinctive in his breast. It is deplorable that much of this inventiveness has been used in the past to prepare more and more terrible weapons of war to be utilized in the extermination of his enemies. It would be so much more helpful if he could regard ignorance, prejudice, superstition, and intolerance as his chief foes—the greatest obstacles in the pathway that leads to the enlightenment of the human race.

We of the U.S.A. do not possess the sum total of all human intelligence but we are in a position to lead the world in that respect. It is surely within the realm of possibility that after peace is accomplished and there is no more need to transport such huge quantities of tanks, trucks, planes, ammunition, guns, bombs and other munitions of warfare across the seas, that our planes and ships may be used to carry test tubes, blue prints, books, printing presses, typewriters, agricultural implements, automobiles—space and time will permit the listing of just a few—across the oceans to the east, to the west, and to the other nations of the Western Hemisphere for the stimulation of the pursuits of peace.

We shall need to acquire knowledge as long as we live. But the mastery of facts alone will profit us nothing. Learning is expensive. It costs heavily in time, energy and resources. If as an accompaniment or as a supplement to the knowledge, we have the will and the determination to appropriate all that we know for the aggrandizement both of ourselves and of our fellowmen, society in general will benefit from our efforts. This whole process is not only costly but difficult. It was Shakespeare who wrote these words for one of his players: "If to do were as easy as to know what were good to be done, chapels had

been churches and poor men's cottages princes palaces." Men and women who have achieved greatness in all walks of life have been both knowers and doers. Higher education, supplied by our colleges and universities, is available for an ever increasing number of young people as the years go by but only for those who have dreams of useful tasks to be performed and who have the ambition to realise those dreams will knowledge be power.

NEWS FROM THE CHAPTERS

SIGMA

Our Lady of the Lake College, San Antonio 7, Texas

Affiliated 1943. Fourteen charter members.

President, Onice Feille

Vice president, Sister Mary Clarence

Secretary, Frances Elaine Wagner

Treasurer, Faye Schuchart

Historian, Alda Gianotti

The sigma Chapter of Sigma Zeta was formally installed at Our Lady of the Lake College on October 23, 1944. Dr. J. L. McMahon, President of the College, presided as chairman representing the National Council, and Marguerite Higgins acted as recorder. Ceremonies closely followed the ritual of the organization. Following this installation, a banquet dinner was held in the Annachacho Room of the St. Anthony Hotel.

At Our Lady of the Lake College there is a junior science organization, The Curie Science Club, which is sponsored by the Sigma Chapter. The following is the account of one of their meetings as published in the daily newspaper Nov. 3rd:

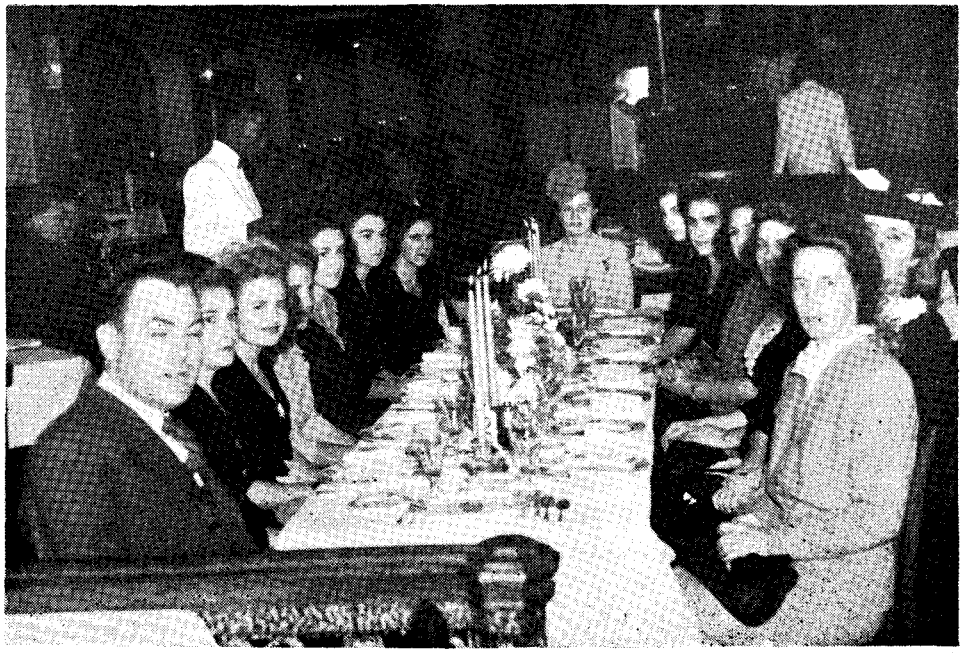
"Science has been a link to promote cultural relations between the United States and Mexico", declared Augustin Aragon Leiva, distinguished Mexican scientist, in addressing the Curie Science Club at Our Lady of the Lake during his recent visit to San Antonio.

Mexico is making great strides forward, according to Professor Leiva, though scientific research there has always been overshadowed by that done in England and the United States.

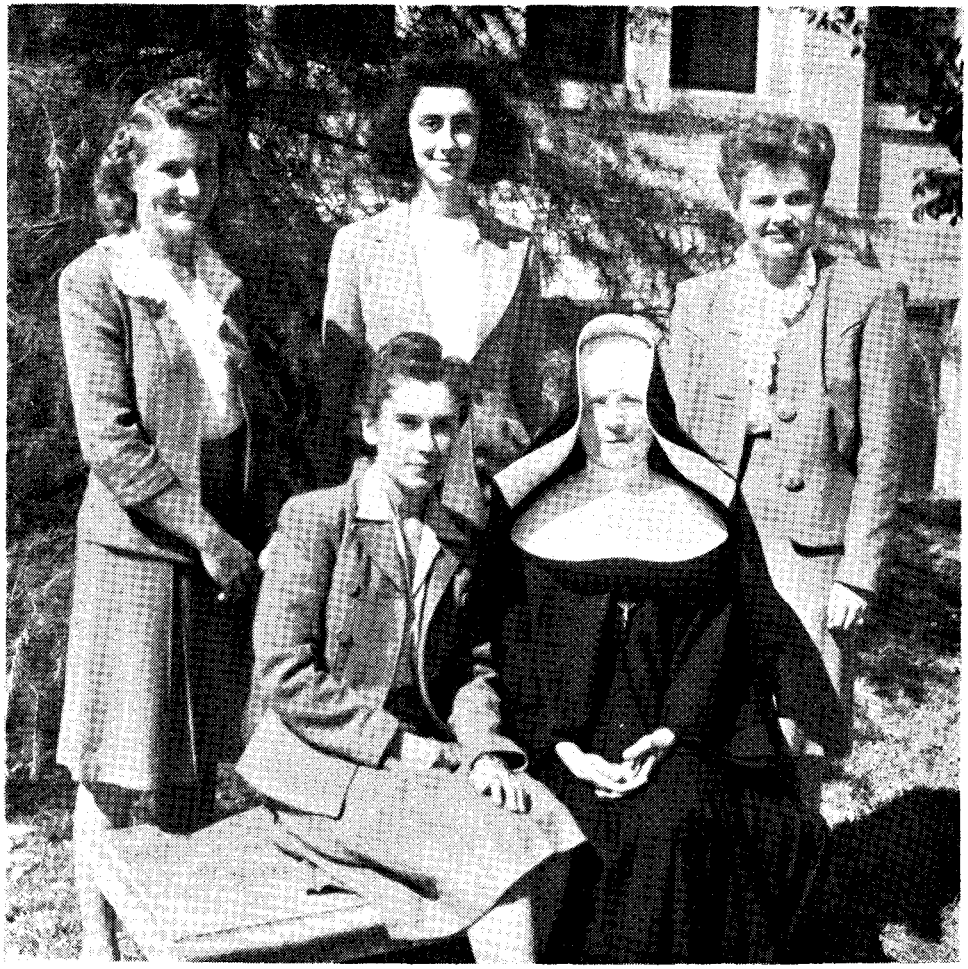
During the lecture he gave a rapid survey of what Mexican scientists have achieved, stressing the spirit of friendliness which now exists between American and Mexican workers in the field.

"It has been a delightful surprise," he said in closing, "to address the Curie Science Club here; as we have at the University of Mexico a recently organized club with the same name. They will be delighted to know that in San Antonio they have a sister club, and I am sure they would welcome correspondence."

From here Prof. Aragon Leiva went to Washington to confer with Watson Davis, director of science clubs in America, before going to Cuba to organize affiliated branches of science clubs there.



Initiation Banquet of the Sigma Chapter



Officers of the Sigma Chapter:
Seated, Left to right—Onice Feille, President; Sister Clarence, Vice President.
Standing, Left to right—Faye Schuchart, Treasurer; Alda Gianotti, Historian; Frances Elaine Wagner, Secretary.

ALPHA

Shurtleff College, Alton, Illinois
Affiliated, 1925

Up to Nov. 12, 1944 no officers for the current year had been elected. Four faculty members were reported. No student members.

Organization was planned for the next meeting at which time Prof. G. H. Hess of the Department of Economics was expected to relate his experiences in South America. At the time the approval of Alpha Chapter for the petition of the Sigma Chapter was sent in last February, Prof. E. E. List, faculty sponsor, wrote the national secretary as follows: "Who knows?—this may be the beginning of a large southwestern growth for the society."

XI

Ball State Teachers College, Muncie, Indiana
Affiliated, 1938.

December 11, 1944

Dear Editor:

The Xi Chapter of Sigma Zeta started the year 1944-45 with a meeting on November 30. The meeting was opened with the showing of the movie, "Scientists for Tomorrow".

Those who were to become associate members were then asked to leave the room and a very impressive initiation service was held for those becoming active members: Nora Fuller, Helen Hunter, Francis Hutson, Helen Layton, Pauline Moreland, Marion Rector, Betty Mae Resler, Lorenna Shinn, and Robert McCreary, a new faculty member at Burris, our laboratory school. The initiation service was led by Mable Anderson, Mary Helen Wyrick, and Harriet Simmons, the remaining active members of the organization.

The nine associate members were then brought in and recognized. A short business meeting followed at which time officers were elected. Mable Anderson is our new president; Harriet Simmons, Vice- President; and Helen Hunter, Secretary.

The business meeting was followed by a social hour with refreshments.

Sincerely,
Helen Hunter, Secretary

LAMBDA

State Teachers College, Mansfield, Pennsylvania
Affiliated, 1936

October 27, 1944

Dear Editor:

Our organization has dissolved, at least for the duration, t herefore I have no report to make or news tc give.

Sincerely yours,
Janett M. Leberman
Formerly Acting Faculty Sponsor

MU

State Teachers College, Mankato, Minnesota
Affiliated, 1937

At the Commencement Exercises last spring Miss Charlotte Mitchell was granted the Sigma Zeta Recognition Award, which goes to the senior who has maintained the highest scholastic standing throughout the Four-Year Science & Mathematics Course.

Dr. G. M. Wissink, faculty sponsor until this year, is now working in the Central Laboratory of the Consolidated Water Power and Paper Company at Wisconsin Rapids, Wisconsin. Prof. C. J. Hoyt, of the Mathematics Department is the new sponsor for the Mu Chapter. A letter just received from Prof. Leonard A. Wood, Chemistry and Mathematics assistant, states there will be six active members at Mu this year.

RHO

Indiana Central College, Indianapolis 3, Indiana
Affiliated, 1942
President, Joseph M. White
Vice President, William E. Schaefer
Recorder-Treasurer, S. M. McClure
Active Members: Faculty, 5; Students 5; Total 10

Graduation, federal service, and war work has all but "exterminated" the Rho Chapter. When college opened last autumn, two students and four faculty members constituted the active chapter membership. Joe White, a senior biology major, and Bonnie L. Polk, another senior and assistant in the Department of Biology, are the student actives.

In addition to those who are in active service or in war work, Rho lost three members by graduation. Merrill Geible, former biology assistant, is in the theological seminary before entering medical school in preparation for work as a medical missionary. Frances Keeling, recorder-treasurer last year, is teaching science in the high school at Lapel, near Indianapolis. Marialys Moore, who was graduated *magna cum laude* at the close of the summer session, is vacationing briefly before returning to the research laboratory of an industrial company here in Indianapolis.

Three juniors have been elected to membership and are to be initiated soon. The initiates are Hadley P. Harper of Lexington, Illinois, assistant in the Department of Chemistry; Marjorie Jo Langford of Metcalf, Illinois; and Martha H. Talbott of Decatur, Ill. Both Miss Langford and Miss Talbott are biology majors and both were on the honors list at the autumn convocation of the college for recognition of scholarship.

Although the student members are unexpectedly few this year, Rho is fortunate in having a number of interested science alumni living in Indianapolis and suburban University Heights where Central is located. These alumni have stabilized the chapter during the past and promise to be even more effective in 1944-45. One of the alumni, Wm. A. Schaefer, is now vice-president of the chapter and several committees include one or more of the graduates.

One of the more outstanding contributions of the alumni has been the arrangement of programs, particularly after the student members found departmental programs too great a burden. At the final meeting of last year, Dr. W. R. Brenneman, associate professor of zoology at Indiana University and a Central graduate, spoke on endocrine research at the State University. Dr. W. R. Stoneburner, an alumnus and former dean of men, now a psychologist at the veterans' rehabilitation hospital, told of his work at the first summer meeting. Prof. W. G. Gingery, Principal of the Washington High School of Indianapolis, spoke at the second summer meeting on maps and map projections, a field in which he is a recognized authority.

The program for the current year is at present incomplete. The monthly meetings of September and October were business meetings leading to the November initiation meeting. An inter-departmental program of papers is being prepared and will probably be given in December. In the second semester, the alumni are expected to present one or more guest speakers and plans are being made for an astronomy meeting at the Noblitt Observatory on the campus.

The chapter project of classifying and cataloging the Cummins Geological Collection is progressing very slowly because of the lack of qualified student help. Some identification and cataloging has been done during the past year and the chapter plans to continue the work in 1944-45.

ZETA

Central State Teachers College, Stevens Point, Wisconsin
Affiliated, 1929
President, Bernadine Peterson
Recorder-Treasurer; A. S. Lyness

Active members: Faculty 5; Students 10; Total 15 . Associate members 2

Only one of last year's student active members returned to the campus this year and she was elected presi-

dent for 1944-45. At a regular meeting on October 18th seven new active members were initiated. Since then two more active members and two associate members have been added to our chapter roll.

At the regular November meeting of the chapter, Nov. 15, Prof. R. M. Rightsell of the Physics Department, a government licensed aviation instructor, presented the use and reading of the U. S. Coast and Geodetic air navigation maps or "sectional maps" as they are frequently called.

Unlike automobile road maps, which are used to map objects as in a horizontal view, these navigation maps picture the country as it appears from the air above.

Mr. Rightsell closed the discussion by explaining the most common instruments found on the instrument panels of airplanes and compared them to those found in automobiles.

GAMMA

Medical College of Virginia, Richmond, Virginia
Affiliated, 1927
Thirteen new active members were initiated early this semester.
Dorothy J. Tonjes is the treasurer, and Alice V. MacDonald is secretary

KAPPA

Western Illinois State Teachers College, Macomb, Illinois
Affiliated, 1935
President, Helen Bailey
Vice-President, Betty Long
Recorder-Treasurer, Jean Fritz
Historian, Dorothy Loring
Editor, Martha Lee
Active members: Faculty, 14; Students, 7; Total, 21

BETA

Beta Chapter, Lebanon, Illinois
McKendree College
Affiliated, 1926

November 29, 1944

Dear Editor:

The Beta chapter at McKendree College reopened its work in October, 1944, with only the faculty members present, as all active student members had left the campus on account of graduation, entrance into the armed forces, or entrance into war work. However, since October we have pledged three new candidates: Dr. H. P. K. Agersborg, head of the department of biology; Miss Mildred Joseph, biology major; and Mr. Frank Snyder, chemistry major. The pledges will be initiated sometime during the present semester.

On account of our small membership, we are not starting any new projects. However, we have revived the Waggoner Memorial Trophy, a traveling cup intended to be awarded annually to an outstanding science or mathematics student. The 1943 award was voted to Paul Matthew Griffin, who is a chemist in a research laboratory of the Delco-Remy Division of General Motors Corporation in Muncie, Indiana. The 1944 award was voted to Lieutenant Cyril Dean Curtis, who is serving in the armed forces as a meteorologist. The names of these students, with the dates, have been engraved on the cup.

The Beta Chapter is carrying on in spite of difficult conditions and expects to do so for the duration of the war.

Sincerely yours,
C. J. Stowell
Recorder-Treasurer

EPSILON

December 7, 1944

Otterbein College, Westerville, Ohio
Affiliated, 1929

EPSILON CHAPTER SIGMA ZETA

President, Janet Shipley
Recorder-Treasurer, Esther Smoot
New Actives Initiated, 8 (2 already gone to Army)
Total Net Actives, 14
New Associate Members (also net), 17, Professors, 5

Meetings:

October 18—formal initiation
—talk on history and nature of Sigma Zeta by President
—refreshments

Nov. 1—Ann Hovermale talked on her experience as assistant X-ray technician.

No. 15—Jane Hullitt spoke on "Carnivorous Plants"

Dec. 6—Christmas Party—professors provided entertainment and served refreshments of cake and coffee.

Prospective plans for the future:

Visit to Batelle Institute

Movies of scientific interest

Blood Donor Party (open to whole student body)

SOME SUGGESTIONS OFFERED BY THE CHAPTERS IN THEIR ANNUAL REPORTS

RHO CHAPTER

"Several of the other chapters sent the Rho chapter greetings, etc, at the time of installation. It's a nice custom and ought to be encouraged. Accordingly, the date of installation ought to be made known in advance to each chapter and reminded of the event.

NU CHAPTER

"I think that the National office has been doing an excellent job of connecting the chapters together, expecially through the Sigma Zetan. Because these are abnormal times, little can be done in our estimation.

ALPHA CHAPTER

"1. Encourage the various chapters to publish papers in the "Sigma Zetan" This ought to tie them together until we can have a Conclave again after the war.
"2. Perhaps a circular letter 3 or 4 times a year, between issues of the "Sigma Zetan", giving news and items of interest.
"3. "We must be patient, "sit tite," mark time, plan for the future during the war just as we had to do during the depression."

XI CHAPTER

"Each chapter have a program per year devoted to the national organization."

NEW CHAPTERS IN PROSPECT

Communications have recently been received and promptly answered by the National Secretary in which full information is sought concerning Sigma Zeta by interested persons at the Mary Washington College of the University of Virginia, Fredericksburg, Virginia and Incarnate Word College of San Antonio, Texas. Let us hope that our first word from these colleges will not be the last.

ANNOUNCEMENT

According to present plans there will be an April Number of the Sigma Zetan published in April, 1945. The success of this issue, as for all such official organs, depends upon the willingness and promptness of the various chapters in sending in Chapter News and other suitable material for publication. The dead line is April 1st. Suppose we all cooperate to make the last issue of the school year the best.

—Editor's Note

SULFA DRUGS

(A paper read by Miss Onice Feille, President of Sigma Chapter, Our Lady of the Lake College, San Antonio, Texas, before the Collegiate Division of the Texas Academy of Sciences, meeting in Galveston, Texas, Nov. 9, 10, & 11, 1944)

The sulfa drugs constitute a powerful new weapon on man's ageiong fight against disease. This is not to say that the battle against disease has been won. For a large number of diseases, the sulfa drugs have so far proved unavailing. They are poisonous, mildly so for some people, very seriously so for others. They have drastically cut the death rate and time required for recovery in a great number of diseases, and are now being used as a routine precaution against peritonitis.

The introduction of sulfanilamide as a therapentic agent for use in humans against hemolytic streptococcal infections (1935) marked the beginning of a new era in medicine—the era of Chemotherapy. This development and the advances made in the few years since 1935 have revolutionized the therapy of many diseases and have reduced the mortality in some to remarkably low levels.

The development of the sulfa drugs, on the chemical side, is neat and scientific and well planned, but it did not start that way. Sulfa therapy resembles another far-reaching medical technique—the X-Ray—in that its origin was non-medical. But there is also a difference; the X-Ray was seized on by the medical profession within a few months after its appearance, while the curative qualities of sulfanilamide remained unsuspected for more than twenty years.

Back in 1906 a student by the name of Gelmo was majoring in chemistry at the Vienna Institute of Technology. Gelmo chose as his research project the synthesization of a new chemical compound from coal tar.

There were already hundreds of coal-tar derivatives; some useful some simply cluttering up the text books. Gelmo added one more, calling it para-amino-sulfonamide.

When Gelmo's dissertation appeared in 1908, it was duly read by the staff of the great German chemical trust, I. G. Farbenidustrie. They tried out every new compound on the chance that it might be of some use to the trust—and to the German Empire. They found a modest utility in Gedmo's creation. Colorless itself, it made some of their dyes faster for washing and milling.

In 1919, the bactericidal properties of certain compounds including sulfanilamide, were referred to in passing by two Rockefeller Institute chemists. They promised a further report by a medical colleague; however, the report never appeared. Had this lead been followed, some fourteen years and hundreds of thousands of lives might have been saved. As far as it is known today, no attempt was made at that time to apply this compound to the control of bacterial infections until the early 1930's. Credit for the discovery of the effectiveness of sulafnilamide in the treatment of human diseases goes to a number of workers. The observation was made in 1932 by Domagk that a dye, Prontosil, given by mouth protected mice against otherwise fatal cases of hemolytic streptococci. This was possibly the first significant observation of a series that have led to the discovery of the remarkable powers of sulfanilamide. In 1935, some French workers found that the dye had its effect because in the body it is broken down to yield sulfanilamide which is the therapeutic agent.

In 1936, workers of Johns Hapkins confirmed these experimental findings. In contrast to the remarkable recoveries affected in many cases, the administration of the drug is attended with serious toxic reactions in some instances. Some patients develop skin rashes, anorexia, dizziness, psychosis and cyanosis.

The drug is readily absorbed and passes into the blood stream and tissues when given by mouth. It is eliminated from the body in the urine, partly unchanged and partly as a conjugated derivative with acetic acid formed in the liver. The drug penetrates all fluids and tissues of the body and is present in these with the exception of bone and fat in about the same amount as in blood. This rapid diffusion and penetration of the drug is undoubtedly one of the factors which makes it a successful chemotherapeutic agent.

Sulfa pyridine proved to be more effective in the treatment of pneumonia, but due to the fact that this drug frequently causes nausea, and vomiting, and occasionally causes in the urinary tract, concretions which may prove serious, attempts were made to find other drugs equally effective in the treatment of pneumonia. Sulfathiazole, the third of the series, was thought to be the answer. Sulfathiazole is as efficient as sulfapyridine in the treatment of staphylococcus infections. It is less disagreeable for the patient than sulfapyridine, but it does cause renal concretions and probably more skin rashes than the other sulfa drugs. Sulfathiazole is also used to eliminate bacterial contamination in stored plasma. To preserve whole blood and blood plasma, sodium sulfathiazole is added to freshly drawn blood in amounts sufficient to make a 0.2% solution. The fluid plasma is immediately available for use and the small amount of the sulfonamide compound present is no serious objection to its intravenous use.

Sulfadiazine, the most recent of these drugs to be introduced for the treatment of systemic infections, appears to produce fewer toxic reactions than the other drugs, and to be equally effective in the treatment of various bacterial infections with the possible exception of staphylococcus infections. Sulfadiazine given prophylactically to members of the armed forces to protect them from meningitis in case of a threatened epidemic, will not affect their ability to perform tasks requiring hand-eye coordination and swift reaction.

Sulfaguanidine, the least toxic of the sulfa-drugs because of its poor absorption, is fairly water-soluble, and therapeutically active on various bacteria. The favorable results in the treatment of bacillary dysentery with sulfaguanidine, gave Dr. Huang, of Kweilin, China, the idea of trying it in Asiatic cholera, which is also a disease that attacks the intestinal tract. He conceded that sulfaguanidine could give an unexpected effect in the treatment of this disease.

Experience with respect to the use of various sulfonamides in the treatment of infectious diseases of the colon is reported. Of the sulfonamides commonly used for this purpose, sulfasuxidine, or succinylsulfathiazole, was found most satisfactory, Because absorption of this compound from the gastro-intestinal tract is very slight, the drug is practically free of all toxic manifestations, and can be administered in large doses over long periods of time. One of the most important factors in the treatment of ulcerative colitis is the prevention of recurrences; it is suggested that perhaps the continuous administration of sulfasuxidine may logically meet this problem.

Sulfamerazine or sulfamethyldiazine, a new sulfonamide with a molecular weight of 24.3 is a white crytsalline substance, poorly soluble in water and the common organic solvents. It is readily soluble in dilute acids and dilute alkalies, and may be converted into the sodium salt which is soluble in water. Experimental and clinical evidence indicates that sulfamerazine is approximately as effective as other sulfsonamides in the treatment of pneumococcic, meningococcic, and gonococcic infections.

Bacteria-destroying sulfa drugs may be the solution to the problem of one type of shock in battle casualties, animal experiments indicate. Eliminating two of the three major theories of shock causes—that nerves and local loss of body fluid are involved—the experiments demonstrated that the non-acute or chronic type of shock resulted from blood poisoning by bacteria. "Amazing", the scientists state, is the observation that no deaths or symptoms of shock resulted when dogs with crushed muscles were given doses of sulfamerazine locally, intravenously, or by mouth. "If bacteria are not present the toxic factor is not formed and shock does not result", the experimenters conclude.

A new drug effective against the kind of germs that cause gas gangrene in wounds has been developed. Dr. Klumpp, president of the Winthrop Chemical Co. of New York calls it sulfamylon, and says it is superior to other sulfa drugs in infections with anaerobic bacteria. These germs grow without air, include the group that causes gas gangrene, and are especially prolific in the soil of France. Besides its effectiveness against anaerobic bacteria, sulfamylon has two other advantages over other sulfa drugs. Its anti-bacterial activity is not affected by pus or other wound discharges and is not neutralized by para-amino-benzoic acid.

Encouraging results in treatment of tuberculosis with sulfabenamide, a special kind of sulfa drug, have been reported; however, no conclusions are as yet warranted as to its curative value. No harmful, or toxic effects resulted even when almost an ounce was given within 16 hours, or when over a protracted period. One patient received over 2,000 grams (about 5 lbs.) during a 16 month period without harm.

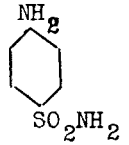
Sulfabenamide differs greatly from other sulfa drugs now in use. It has a fatty acid linked to it and is soluble in fatty materials. The waxy outer coat of the tuberculosis germ may act as a barrier to the penetration of other sulfa drugs, whereas a fatty acid sulfa drug such as sulfabenamide might get through this barrier to attack the germ. The small dosage that can be used, because the drug remains in the body for a long time, is another property which makes it ideal for protracted treatment such as is necessary in tuberculosis.

Although some highly scientific procedures are involved whenever the sulfa drugs are correctly administered, the mechanism of their behavior in the body is still uncertain. It does not appear that the drug kills bacteria directly. It does, however, slow down their reproduction. Just how bacterial reproduction is slowed down remains problematical. According to one theory, sulfanilamide neutralized enzymes which are essential to bacterial nutrition. The bacteria, being deprived of their essential enzymes, are unable to utilize the food around them, and they starve in the midst of plenty.

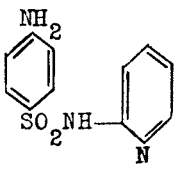
In military surgery, sulfa drugs are of the utmost importance. Every American soldier who enters the field of operations is provided with a box of twelve sulfanilamide tablets to be taken internally to prevent infection should he be wounded. Wounds packed with sulfanilamide powder seldom become infected, and heal faster. They are equally valuable in the treatment of burns and all kinds of injuries in which the defenses of the body against infection have been broken down. The process of synthesis and transmutation does not stop with sulfanilamide; it only begins there. Sulfanilamide is the most familiar, but some of the other drugs are even more useful to mankind. They are made in the same way—by detaching a hydrogen atom at one end of the atomic structure and substituting a subsidiary structure.

Sulfanilamide is a synthetic derivative of aniline which is formed by the addition of first a sulfonic acid group and then an amido group. All of the compounds in common usage are closely related to sulfanilamide.

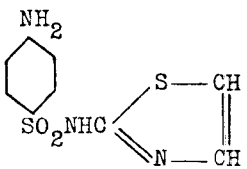
The relation in the following formulas shows how the formation of the sulfa derivatives is simply a substitution of a subsidiary group for one of the hydrogen atoms of the amido group.



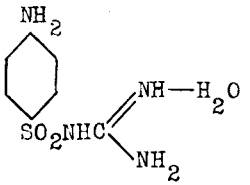
Sulfanilamide



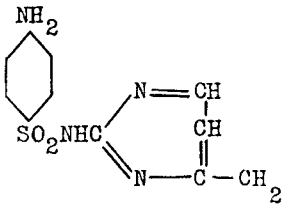
Sulfapyridine



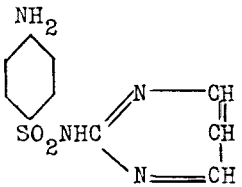
Sulfathiazole



Sulfaguanidine



Sulfamerazine



Sulfadiazine

Over 5,000 closely related compounds have been synthesized during the past few years. What new disease these sulfa drugs and those yet to be discovered will cure, only time can tell!

The Utilization of Laboratory Wastes
IV. The Preparation and Purification of Copper Sulphate

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The subject of this paper is the preparation of chemicals from laboratory by-products, or as the title indicates, "utilization of laboratory wastes". The purpose, however, is not primarily economic but serves rather as an introduction to under-graduate research. At the same time it is possible to prepare chemicals in this manner of a high degree of purity, probably as good or better than the more expensive quality sold by supply houses.

This paper is the fourth from this laboratory; other preparations previously made were zinc sulphate, potassium chloride, and ferrous sulphate.

During the first World War the importation of many chemicals, particularly reagents of research grade, were cut off by the blockade of Germany and Austria. While this shortage was most acute in the organic field, many of the potassium salts could not be obtained in quantity, and rose to prohibitive levels.

At this time the University of Illinois began the preparation of some of the scarcer inorganic compounds and the Eastman Kodak Company started its program of organic preparations which now literally number into the thousands and have made the United States independent of any other nation in this field.

The sources of copper wastes in the freshman laboratory are such experiments as the preparation of sulfur dioxide by the action of sulfuric acid on copper. Other experiments, as in the use of cupric oxide in illustrating oxidation and reduction, furnish other cooper compounds. Metallic copper from waste turnings, foil, wire, and the like also find their way into the "waste copper container".

All this material is heated with sulfuric acids until the metallic copper is dissolved and the other copper salts are changed to the sulphate. Since sul-

furic acid is strong, stable, and has a higher boiling point than most of the other common acids, heating until sulfur trioxide fumes are evolved will remove most of the other acids from solution. For instance, if cupric chloride was in the mixture, it would react with sulfuric acid and form copper sulphate and hydrochloric acid; the latter would boil off at a temperature much below the boiling point of sulfuric acid. The solution then would contain copper sulphate and the sulphates of other metals, such as iron and zinc. Insoluble matter, as sand or carbon, would probably be present in small amounts.

After dilution, insoluble impurities may be removed by filtering. The filtrate can then be concentrated by boiling until copper sulphate crystallizes out, since copper sulphate is more soluble in hot than in cold water. Moreover, crystallization from solution should give a pure product. These two successive steps seem simple but are the fundamental principles involved in the purification.

After a crop of crystals has been obtained on cooling, the solution may be drained off and evaporated down until saturated at or near the boiling point. On cooling, a second crop of crystals may be obtained. This process may be repeated until most of the cooper sulphate is obtained relatively free from impurities.

However, in crystallization, certain ions, particularly the iron ion present in the solution, may replace the cooper ion in the crystal lattice. A few other metallic ions act similarly. Another source of impurity is the absorption by the mass of crystals of a little of the solution, very much like the absorption of water by a sponge. Hence, these crystals may contain small amounts of all the soluble salts in the solution.

The different crops of crystals are now made into a fairly concentrated solution with distilled water and boiled with a small amount of nitric acid to oxidize iron to the ferric state, in which condition it will not crystallize with copper sulphate. At the same time the small amount of soluble impurities are highly diluted. A second series of crystallization then should yield a relatively pure product, free from iron and containing but a fraction of a percent of the soluble impurities absorbed mechanically among the crystals. The crystallization may be repeated from three to five times and an almost chemically pure product obtained.

The size of crystals can be controlled by the rate of cooling which in turn controls solubility and rate of crystal growth. Rapid cooling gives small crystals while slow cooling favors larger crystal size.

As but two crystallizations were made, these crystals may be less pure than those previously made. However, by the ordinary methods of qualitative analysis, no metals other than a faint trace of sodium were detected.

OUR INHERITANCE FROM THE ICE AGE

A paper read at a recent meeting of the Alpha Chapter by E. E. List of the Department of Biology and Geology in Shurtleff College.

Admiral Byrd has given us a picture of the Ice Age conditions which still prevail on the Antarctic Continent. These same conditions prevailed recently, geologically speaking, upon North America and by their presence left a valuable heritage for mankind.

Illinois has been particularly fortunate in this regard. The destructive forces of five great ice waves have brought fabulous stores of natural resources and made them available for our use.

The geologist in order to unravel the story of the past must study the agents and forces as they exist today, and learn from these sources how to reconstruct former conditions. For every effect there must be a definite and understandable cause, so we study the present forces to better understand the past.

There are two types of glaciers existing today: (1) the valley glacier and (2) the continental glacier. The first is found in the high valleys of mountain ranges. The "ice river" flows out of the valley to the foothills and melts. At the same time it plucks rock material from the sides and bottom of the valley. Anything immovable is polished and striated and left in the valley. Each winter vast accumulations of snow pack down to form ice and this flows out into the lower valley during the summer.

The glacier does not flow as one large piece of ice but with a differential motion—the grains or crystals of ice tumble over each other like buckshot in a bag, exchanging places without breaking the crystals. In this way the debris becomes mixed throughout the ice.

The material carried along in this way by the ice becomes the moraines when dropped as the ice melts.

The continental glacier is an ice cap on a continent, covering all or part of the land mass as is the case in Greenland and at the South Pole at present. Here are vast masses of snow piling up so high that it is forced to move out in all directions and if part of it reaches the ocean the ice breaks into pieces and floats away as icebergs to melt in warmer waters.

Fortunately for us ice floats. If ice did not float all the water on earth would long ago be locked at the poles as ice and the rest of the earth would be bone dry. The erosion of a continental glacier is somewhat similar to the valley glacier, but on a larger scale. The snow accumulates on the continent in huge amounts and then moves out in all directions.

This occurred in Europe as well as in America during the recent ice age some 30,000 to 50,000 years ago. There were three centers of origin in Canada, (1) In Quebec, (2) Just west of Hudson Bay, and (3), In British Columbia. From these centers the ice moved south over the U.S.A. to a point near Marion, Illinois. There were, perhaps, five different waves of glacial periods allowing vegetation and animals to migrate back and become established. Even today we do not know whether we are living in one of the interglacial periods or whether the ice age is over for a while.

It is well established that we are living in one of the critical periods of the earth's geological history. These ice waves modified the early topography of the northern states. The centers of origin suffered greatly by erosion, having lost most of the soil. The outer belt gained most by a drift deposit varying from a few inches to 600 or 700 feet in thickness. In the Mississippi Valley the drift is from 20 to 40 feet thick.

The drift is a heterogeneous mixture of weathered and unweathered material and on the sides is a deposit of outwash made up of sand and gravel. On top of this drift is a wind blown dust from the adjacent river flats covering thousands of miles of our best farm land up to 50 feet or more in thickness.

The ice age was long and complex. In many places many layers of drift are found sometimes including peat and other evidences of warm climates. The epochs in order of occurrence were as follows: 1. Nebraskan, 2. Kansas, 3. Illinoian, 4. Iowan, 5. Wisconsin. The interglacial periods were much longer than the glacial periods. Not only was the pre-glacial topography profoundly altered but old drainage lines were also notably changed. Valleys were filled, river basins altered, and many lakes created. This is now revealed by well borings. The most important event was the glacial origin of the Great Lakes all of which owe their existence to glaciers except Lake Superior.

Glaciation has given Illinois not only flat or gently rolling farm lands but also rich productive soils. Much of the land is mantled with young drift or loess in which weathering has progressed just far enough to make the soil highly fertile and not too far to leave it sterile. The soil is young enough to contain all the plant foods and also possesses all the physical qualities of a good soil.

However, it will require the intelligent cooperation of the farmers, if the soils are to continue to produce as they have done in the past.

Ground water is abundant in the drift of the drift-covered area. The largest and most available supply occurs in the sand and gravel areas, and which may be tapped by drilling anywhere.

Sand and gravel are furnished by the glacial out-wash and this has become one of the important industries of the state. Millions of cubic yards of sand and gravel are available in the fan-like deposits beyond the moraines. Millions of dollars worth have been taken out and yet the total reserve has scarcely been touched.

Moulding sand—partial weathering has given it binding quality—is also very abundant. Old river beds uncovered by new river valleys contain falls, rapids, and steep rocky gorges in which power sites abound. Glacial lakes, long, narrow, and deep, filled with clear, cool water are a sign of a young topography and furnish a delightful vacation land.

At the beginning of the ice age a great many animals and plants existed. Since then two types of evolution have been noted, 1. Expansive, rapid propagation, strange and grotesque types prospered. 2. Repressive, adverse conditions making struggle for existence fierce changed life to produce the more frugal, better fitted, and more intelligent forms of animals. The Ice Ages with recurring cold climates was such a time. Only hardiest forms survived. It is one of the principles of biology that adverse conditions up to the breaking point, bring out the best in any organism or group of organisms.

It was in this setting in Europe, where adaptability and intelligence were at a premium, that man began to emerge from his primate ancestry. The Java man (Pithecantropus erectus) is believed to belong to the first or second glacial epoch. The Heidelberg man appeared at about the time of the second glaciation. Not much is known about these early races of human beings. By the third interglacial period the Neanderthal man was scattered all over Europe and by the fourth glacial period a great race of men, the Cro-Magnon, had over run most of Europe, also. This was a fine race of men and we include them in our own species **Homo sapiens.** The ice age drove men to the caves and developed the mental side as well as the physical. In the caves are found bones, char coal and sketches of animals on the walls.

When Louis Agassiz announced the glacial hypothesis, **world wide refrigeration,** the world was aghast. So overwhelming was the evidence and so convincing the logic of the arguments and so fruitful the philosophy that today the hypothesis is accepted by all enlightened people. It is one of the outstanding triumphs of the scientific method of thought and has contributed much weight to current scientific technique and philosophy.

During the closing years of the last century, deposits of ancient glacial till have been found widely scattered all over the land masses in every geological era called glacial tillites. Even in the period (Archeozoic) at the very dawn of geologic history, perhaps 1,000,000,000 years ago.

So it seems that glaciation has been a perfectly normal and fairly common episode in the history of the earth and will continue, without doubt, as long as the sun illuminates the earth. This leads to a critical re-examination of the old view that the earth was once hot and gradually cooling would become cold and dead in time. In place of this theory we now have the optimistic and hopeful view of a long and peaceful future for mankind, if we can learn to live together peacefully.

At the present time man's worst enemy is man himself as "Man's inhumanity to man makes countless thousands mourn". The great German poet Goethe once said, "Against stupidity even the gods fight in vain."