



# THE SIGMA ZETAN

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## THE MERITS AND POSSIBILITIES OF GREEN VEGETABLE SOY BEANS AS FOOD

(Some excerpts from a paper read by Thomas A. Rogers at a meeting of the American Soy Bean Association in Madison, Wisconsin in September 1939.)

"The soy bean is probably the oldest crop known. . . . .  
When the soy bean was introduced into the U. S. in the year 1804, it found use almost entirely as a forage crop. . . . . Prejudice and ignorance of food and food values have played an important part in hampering the more generous and liberal use of the soy bean for human food in this country. . . . . Many universities in this country have made exhaustive studies during the past four or five years in an effort to determine varieties of soy beans having special dietic value. Among the two-hundred or more edible types which have been tested, probably less than twenty show outstanding qualities for vegetable purposes. Through the efforts of research a green vegetable type soy bean has been developed with a richer, more nutty flavor than any other legume known." (Prof. Rogers went on to show the chemical composition of soy beans and to point out the interesting fact that this plant supplies the maximum amount of nourishment in the form of protein, oil, carbohydrate, vitamins, mineral salts, amino acids, lecithin, and the unsaturated fatty acids and does this with a minimum of soil depletion. He closes with this significant statement.—"The green vegetable soy bean is truly Nature's nutritional paradox."

**THOMAS A. ROGERS MEMORIAL NUMBER**

**THE SIGMA ZETAN**

Official organ of Sigma Zeta, a National Honorary Science Society

**National Officers**

National President .....	W. H. Eller, Kappa Chapter
National Vice-president .....	D. E. Miller, Xi Chapter
National Recorder-Treasurer .....	G. W. Faust, Zeta Chapter
National Editor .....	A. S. Lyness, Zeta Chapter
National Historian .....	S. M. McClure, Xi Chapter
Past National President .....	J. L. Glathart, Alpha Chapter

**THIS ISSUE OF THE SIGMA ZETAN**

is respectfully dedicated to the memory of

**THOMAS ARTHUR ROGERS**

Head of the Chemistry Department of Central State Teachers College, an active member, chapter sponsor, and national officer of Sigma Zeta for many years.

Born, January 1, 1887—Died, March 3, 1944

**PERSONAL TRIBUTES TO PROF. T.A. ROGERS BY THE NATIONAL OFFICERS**

This issue of our national publication should rightly be dedicated to the late Professor T. A. Rogers, who has recently passed away. In serving as National President for a year, and as National Recorder-Treasurer for six or seven years, he has probably given more time and energy for the cause of our organization than anyone else. During all the years of his association with Sigma Zeta he has maintained a sincere interest in its purpose and activities, and has always been liberal in his support by attending the national meetings and in sharing the responsibilities of the society in its efforts to attain its objectives. It was a real pleasure to work with him and we shall miss him.—

—W. H. Eller, National President, Sigma Zeta

Much of the success of Sigma Zeta, in its national aspects, depends on the interest and efforts of the national Recorder-Treasurer. Sigma Zeta was fortunate in having T. A. Rogers in this office through a number of very important years in the life of the organization. His leadership and qualities are best shown in that he has inspired in others the will and desire to "carry on." We regret his passing and our sympathies go out to the members of his family. But, his spirit lives on. May his work and life be an inspiration to those of us who are left behind.

D. E. Miller  
National Vice-President

Uncle Tom, as we knew him down in the chemistry laboratory, is gone. It is impossible to find words which will express the things we feel in our hearts when we try to pay tribute to a great man. His greatness found expression in a life well lived, in his character, in his relationships with his fellow men, in the example he set. Beloved and respected by all who knew him, he had a quiet but profound influence on his friends, his students, and his colleagues. Those of us who are left to carry on the work he has so nobly done, feel unworthy of the task, but the inspiration of his life and his example will help us to do it.

Gilbert W. Faust  
National Recorder-Treasurer

The Society of Sigma Zeta has reached a stage in the history of the fraternity when, for the first time, the Society loses through death a member whose leadership has guided the growth and directed the development of the organization since the days of the Society's founders.

These services of Thomas Arthur Rogers to the Society were given at a particularly critical time of need. The early enthusiasm that followed the founding of the first group of chapters had been replaced by the realization of the difficulties and labors inherent in the building of a stable organization. To this work, Professor Rogers devoted himself with diligence, ability, and ultimate success in the office of recorder-treasurer. The Society owes no small debt of obligation for his unstinted attention to this necessary but uninspiring task. This long period of service, plus his well considered counsel in the deliberations of the national officers, contributed in no small measure to the policies and practices that have given Sigma Zeta significant pre-eminence among the honorary science societies.

—S. M. McClure, National Historian

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The German noted hygienist, Dr. Ernst Friedberger, placed thermometers and other precision instruments beneath the clothing of men and women, and so measured the temperature and humidity next their skins. He found that the temperature next to a woman's skin is as much as ten degrees lower than next to a man's, and that the humidity is from a third to a half less.

—Popular Science

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Babies and blonds whose skins are naturally fairer and more delicate than others are more prone to have skin allergies than other forms of allergy. This holds true for Eskimos, who seldom have asthma but often have eczma. Vice versa for Negroes; they seldom have skin diseases, but frequently suffer from hay fever and asthma.

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Bread, beauty, and brotherhood are the three great needs of man. We shall create a new social order in which everyone who renders honest service shall have these things.

—Edwin Markham

## IN MEMORIAM

Thomas Arthur Rogers had been a Sigma Zetan almost as long as the society has existed. For many years up to the time of his passing on March 3, 1944 he gave unstintingly of his thought and energy both to the national organization of which he was Recorder-Treasurer for several years and to the Zeta Chapter of which he was a charter member. He believed in Sigma Zeta and it was his disposition to support wholeheartedly any cause or organization in which he had implicit faith. The ideals of honor, scholastic achievement, and scientific advancement which this national fraternity encourages, appealed very strongly to him because all these ambitions were a part of his own private life and he wanted college young men and young women to be motivated by the same worthy emotions.

Not alone to the organization but to its members as well, he was a true friend to all who knew him. Without consciously striving to do so, he invariably followed one of Dale Carnegie's principles for "making friends and influencing people" by seeming to be more interested in his friend than in himself. In a private conversation with a student or other friend he rarely ever talked of himself but would manifest a genuine interest in all that the other person was doing. One of his characteristic greetings which was so often heard about the college he served so long and so faithfully was the question, "How are you today?"

Because of his valuable counsel and unfailing loyalty to every social group of which he was a member he was asked to hold many official positions and particularly a large number of committee memberships in his church, his college and every other organization with which he was affiliated. In all such public services he will be greatly missed for a long time to come. But because of the everlasting nature of personal influence, and because his influence was always uplifting, every social group with which he chose to mingle will be the richer for a corresponding long period because he was a part of it.

As a citizen he was interested in his country, as a scientist he was interested in nature, as a teacher he was interested in education, as a friend he was interested in people of all sorts who had the good fortune to know him. In the ten years we have known him we had the privilege of dining with him, traveling with him, and even sleeping in the same bed with him. He was the type of person anyone should be proud to claim as a friend. His sense of fairness enabled him to see both sides of any question and kept him open-minded. He possessed a keen sense of humor but he appreciated only jokes that were fine and wholesome. He was clean, as every man ought to be. He was here yesterday, is gone today, and the world of the future will be infinitely better because he was permitted to live in it for nearly threescore years.

A. S. Lyness, National Editor

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## LETTERS FROM THE CHAPTERS

**Alpha Chapter, Alton, Illinois**

March 15, 1944

Dear Editor:

The Alpha Chapter expects to initiate several new members early in the spring quarter which begins March 27.

Our losses in membership have continued during the winter. We began last fall with four members; we have now but two left. We think the Sigma Zetan has become a very interesting publication. The Alpha Chapter had a very interesting meeting Feb. 2, observing "National Social Hygiene Day" before the entire student body of the college. We shall continue to remain active even with our reduced numbers. We look forward with pleasure for each new Sigma Zetan. It is a link that binds the chapters together so that the feeble may gain strength from the strong.

"All are but parts of one stupendous whole,

Whose body Nature is, and God the soul."

Very sincerely,  
E. E. List, Faculty Advisor

**Beta Chapter, Lebanon, Illinois**

March 25, 1944

Dear Editor:

The Beta chapter has received your letter asking for information for the Sigma Zetan. Since our letter in the last issue we have initiated one new member, Mr. Thomas T. Gordon. Although our chapter this year has been small, we have been fortunate in being able to reach several alumni members in or near Lebanon who have assisted at initiation meetings. These included two or more past officers.

It is the intention of the chapter to revive the Waggoner Memorial Trophy, a traveling cup intended to be awarded annually to an outstand-

ing science student. Since the award was allowed to lapse for a year or two, it is possible that at least one award will be made retroactive.

We would like to have about fifteen copies of the April Sigma Zetan. This will enable us to send some to service men.

Sincerely yours,  
C. J. Stowell, Recorder-Treasurer

**Kappa Chapter, Macomb, Illinois**

Dear Editor:

Despite a low enrollment and a sparse membership of approximately thirty the Kappa Chapter of Sigma Zeta in Western Illinois State Teachers College has managed to survive. Several of our boys are now in service and several are engaged as chemists in essential industries. William Hoover and Lowell Netherton are with the Sinclair Oil Company in East Chicago, Indiana, and Herschel Young is with a steel plant in North Chicago. Our president, Glenn Turnbull expects to leave soon for the navy.

War or no war, we expect to carry on just as well until the return of normalcy.

—Secretary

**Nu Chapter, DeKalb, Illinois**

March 29, 1944

Dear Editor:

Our college is not divided into semesters, but into Fall, Winter and Spring Quarters. Therefore, we do not take our new members into the organization until the middle of May. However, according to the records many students are going to be eligible for membership. The records are not final so I am unable to give you specific data.

We have lost three members during the Winter Quarter through graduation. Please send us thirty copies

of the April issue of the Zigma Zetan.

Our organization has been active this year in writing letters to former members who are now serving in the armed forces. Any extra copies we have of the Sigma Zetan, the members returning them, we send on to members in the service. They have greatly appreciated this and I suggest that other chapters do the same.

Our organization is also looking forward to the Illinois State Academy of Science that is coming to our campus in May. Sigma Zeta, the Nu chapter, will be very active in helping to make this event a success.

We will all be looking forward to receiving the new issue of the Sigma Zetan.

Sincerely yours,  
 Florence Kirchner  
 Secretary,

#### Rho Chapter, Indianapolis, Indiana

March 23, 1944

Dear Editor:

The Rho chapter, the war baby of Sigma Zeta, has survived a rather strenuous first year of existence and appears to have attained a fairly stable condition; in fact, the indications are that the infant will not only live but grow into a husky organization down in the Hoosier capital.

And this has been achieved in spite of quite drastic losses in membership both of faculty and students. Of the sixteen charter members, but two will be on the campus after Commencement next month. Seven of the original petitioners for the Rho charter were seniors in 1943, and the three juniors of last year, will be graduated at the end of the current semester—and **cum laude**, we hope!

The faculty membership dropped from eight to three. Dean W. E. Stoneburner has taken a position as psychologist with the veterans' rehabilitation service. Dr. Jas. H. Sample, former chemistry professor, is now doing paint research in Cleveland.

Mr. D. L. Smith, mathematics instructor, is an Army meteorology student at the University of Michigan. Mr. Paul M. Griffin, former physics instructor in the air cadet unit is now doing similar work at Ball State Teachers College. Griffin, incidentally, was the first Rho recorder and a Beta alumnus. Miss Mary Huey, head of the Home Economics Department is on leave of absence this semester because of illness.

Three seniors will also be lost at the April Commencement. Miss Alice Beecher, vice-chairman of the chapter, whose efficient work marked the installation and early meetings of the group, is completing her degree at Indiana University. Miss Frances Keeling, who succeeded Mr. Griffin in the recorder's office, will receive her degree with a double major in biology and home economics. Merrill Geible, also a biology major and laboratory assistant in that department, is the third of the chapter's seniors. Miss Mary Alice Moore, a junior and editor of the program papers, expects to receive her degree at the close of the summer semester.

In spite of these past prospective losses, the members of Rho have been busy affecting the organization of the group and establishing the chapter; twelve of the seventeen meetings were business or initiation sessions. Eight new members have been initiated, and contacts have been made with the local science alumni of the College. The latter is a policy that should add both present support and future stability to the chapter.

On the scholastic side, the chapter sponsored a series of monthly science programs, each given under the supervision of a particular science department. While the chapter assumed responsibility for the series and members furnished much of the programs, it has been the policy to invite papers and talks from each department in turn. Approxi-

mately a third of the titles on the programs were by non-members. Four such programs have been presented and the April meeting will be sponsored by the Department of Biology.

The chapter adopted as a second activity the reorganization of an old geological collection left to the College by the late Dr. John A. Cummins, a former member of the science staff. This work has progressed rather slowly but is proving of much interest to the members who have been students in geology and geography.

And finally, the Chapter is just a bit proud of the scholastic record of the group; at the annual honors day program on March 1, every eligible member of the chapter was on President Good's honors list.

The Chapter officials for the coming year were elected on March 20, the final business meeting of the semester. Jos. A. White '45, a junior biology major, is chairman; an alumnus, Wm. E. Schaefer '35, is vice-chairman. Miss Bonniè Polk '45 is editor of the program papers and Professor S. M. McClure is recorder-treasurer.

What was done in the first meeting of this school year, held last November, was reported in the December issue of the Sigma Zetan. Other meetings held later are outlined below:

### PHYSICS PROGRAM MEETING

December 13, 1943

1. History of the Noblitt Observatory by Dean Cravens
2. Physics Journals in the College Library, by Jos. A. White '45
3. The Life of J. Willard Gibbs, by Mary Alice Moore '44
4. \*Vectors and Their Uses, by Professor J. E. Dotterer  
\*Invited talk

### HOME ECONOMICS PROGRAM MEETING

January 31, 1944

1. \*Demonstration of Cake Making by Emily Keck '45 and Dorothy Watson '44
2. \*Aralac, by Lucille Chaille '46  
\*Invited demonstration and paper

### GEOLOGY AND GEOGRAPHY PROGRAM MEETING

February 21, 1944

1. Cataloging the Cummins' Collection, by Louis E. Bever '43
2. Minerals of the Cummins' Collection, by Gordon L. Adams '43
3. \*Major Physiographic Areas of Indiana, by Kathryn L. Deal '44
4. \*Current Earth Science Literature Available in the College Library, by Robert L. Foreman '46
5. Semi-precious Stones of the Silica Minerals, by Mary Alice Moore '44  
\*Invited papers.

### BIOLOGY PROGRAM MEETING

Date and Program not available now

On March 20 the following persons were initiated as active members in the Rho Chapter: Mark R. Bradford, Herbert D. Hiatt, Blanche E. Penrod, William E. Schaefer, and Alva E. Stoneburner all of Indianapolis.

S. M. McClure, Recorder-Treasurer

### **Xi Chapter, Muncie, Indiana**

Dear Editor:

The XI Chapter of Sigma Zeta is still carrying on regardless of the handicaps we have encountered. We now have fourteen student active and six associate members on campus. Besides these and eleven regular faculty members we have three Sigma Zeta members who are part of the faculty under the A.S.T.P. Paul Griffin from the Beta Chapter, Richard Hammond from our own chapter and Carol Belinsky are these three.

Mrs. Belinsky is a former Ball State student, but at the time she attended, Sigma Zeta was not on campus. We felt she should be an active member now that she is back.

During the last term we initiated four actives and six associates into our Chapter. We have not lost many members this year through enlistments in the armed service, only three, I believe. Most of the boys left before this year started.

At our meetings we have had some very interesting speakers. Dr. P. D. Edwards, one of our Math. Professors, spoke on "Mathematics in Navigation". He showed us many of the instruments as well as the methods used in navigation in aviation. Dr. Farrin Hoover, one of the A.S.T.P. Professors spoke on oil wells, giving us some very interesting information on how they are drilled and the expense encountered. At the last meeting we had two student papers presented, copies of which I am sending you.

We, with the help of the convocations committee, brought Dr. Therman B. Rice, Commissioner of the Indiana State Board of Health, to the campus for a regular all student convocation.

We are planning to visit Ball Brothers Glass Factory at our next regular meeting and have a picnic, if the weather permits, at our last meeting.

There was one change made in our officers. Opal Lamberson, the secretary, finished last term and is teaching now. To fill her place for this term, Opal Lamm was appointed our new secretary.

As for suggestions for making the Sigma Zetan more interesting, I especially like the letters to the Editor. The suggested initiation ritual caught my interest, as I had the task of making one for our initiation at the first of the year. It seems to me—and no doubt this has been said before—that the organization should have a

definite ritual that all the chapters should use. Of course it would be subject to variations to meet the needs. By this I mean, at some initiations one or two members are taken in and at others a much larger group. If you have to repeat the same thing individually it becomes monotonous for a large group. I think there should be an oath taken by everyone—all at the same time. I do not know how much can be done with the subject for the duration but I would like to see it worked through in the not too distant future. There is a committee working on this subject and I think it should have the full cooperation of every member of all the chapters, as to suggestions for this ritual.

If we can assist you in any other way feel free to call on us.

Sincerely,  
Gladys Clem, President

#### Zeta Chapter, Stevens Point, Wis.

March 27, 1944

Dear Editor:

The last few months has seen several important changes in Zeta Chapter. We are mourning the loss of a well loved chemistry instructor and secretary-treasurer, T. A. Rogers. He taught chemistry in Central State Teachers College for 30 years, and has been director of the chemistry department since 1923. He was vitally interested in his work, being instrumental in securing and planning a new laboratory here which is one of the finest in the state. Besides being a sponsor to Zeta Chapter, he has served the national organization as grand master scientist and grand recorder-treasurer. Almost every year he has taken student delegates to the national conclave. While his leadership and work has earned for him his widespread distinction, we who knew him personally will feel his loss more greatly. His smile and greeting of "How are you today," is



something that we shall long remember.

We are also losing the active services of another loved member, Gilbert W. Faust, who has received a commission of ensign in the United States Navy Reserve. He has been an instructor here at CSTC for the past nine years, teaching chemistry and physics. He has been a very active member in our chapter and an especially capable national recorder-treasurer. His good advice and sound judgement in national as well as local affairs will be missed. We all wish him good luck in this new phase of his life.

Now for the activities of Zeta Chapter. At a special meeting called for the purpose of taking action concerning the charter of Our Lady of

the Lake College, we voted to approve the charter. We also decided to help with the Victory Carnival presented at CSTC by preparing a side show. Betty Puariea headed the committee selected to plan for it. After the meeting Mr. Rightsell, head of the physics department, gave a talk on flying. For the side show at the Victory Carnival Gilbert W. Faust, Robert H. Rifleman, William L. Terrill and Percy Voight demonstrated Bernoulli's principle, various electromagnetism and high voltage electricity demonstration, action of cathode ray, and oxidation of 3-aminophthalhydrazide in a one tenth normal solution of sodium hydroxide.

Sincerely yours,  
Harriet Grant  
Active Chapter Member

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### ARE THERE TOO MANY PEOPLE IN THE WORLD?

A paper presented at one of the recent meetings of the Alpha Chapter by E. E. List, Faculty Adviser.

Certainly in some parts of the world there are more human beings than the region can comfortably support. This disturbing fact comes as a great shock to those who believe that every mother who brings a child into the world confers a favor on society and ought to be encouraged to repeat that favor as often as possible. Sooner or later the question of excessive population must be faced sincerely, frankly and with common sense. The unlimited breeding of human beings brings on starvation and death.

The vicious circle of poverty—large birth rate more poverty—must be broken otherwise Nature will remedy the situation by increasing the death rate. A higher standard of living usually brings about a lower birth rate and in turn this permits a higher standard of living. We can no longer shut our eyes to this aspect of our economic life.

There are outcries from people who believe that everything is for the best and that Nature should be left alone, but we know that such an attitude breeds nothing but misery.

How to go about this problem, is the question. **Education** naturally suggests a solution, but general education requires a long time and we need relief at once, in some parts of the world. In Mexico the Government proposes to sterilize criminals. This is a logical step, since like trends are apt to be reproduced, there is no sense in letting asocial elements multiply at the expense of decent society. Eugenists have long urged this limiting influence on the defectives, both mental and physical. The criminal and the idiot have no place in modern society and should be eliminated as far as possible.

Public Health Societies offer a quick solution. By maintaining a full time Public Health officer in each county, of each state, with a corps of nurses to survey the field and contact every person in the area, an educational wave

of improvement would spread out over the entire country. In this way child-spacing, birth control and planned parenthood ideas could be introduced to the most ignorant and the least progressive elements as well as advice on Social Hygiene and the Patent Medicine racket and other vices, when it is needed most. Margaret Sanger has long been the world's most eminent authority on this subject.

The following is taken from a leaflet published by the "Eugenics Society of Northern California". The Differential Birth Rates Law works in a population as unceasingly as the ocean tides. In a few generations a population can change radically. Assume all births will live. Then if 1,000 Harvard graduates averaged three children each they would have 27,000 great-grand children. If 1,000 gangsters averaged 8 children apiece they would have 512,000 great-grand children. One Harvard man might hold off one gangster. His great-grand son would have to combat 18, at the above rate. To save our civilization, we must reduce the birth rate of the undesirable stock in the world.

There was no finer stock than the "Mayflower" type which produced Longfellow, Thoreau, Whittier, Prescott, Emerson. Today that stock is decreasing because many defectives are breeding like rats. Is it any wonder that our national intelligence is lowered each decade? There are some optimists among a small group of experts in population planning who believe that this decline in our high grade stock can be arrested. The beautiful Snowy Egret, once almost extinct, now due to conservation efforts of the Audubon Societies, has been restored to former numbers. Egret-like the comeback is possible for high grade human stock.

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### ALL ABOUT NOTHING

A Paper by—Eleanor Bonham, Kappa Chapter, Macomb, Ill.

This is about nothing, which is something. Perhaps you have never realized the value of nothing, but let me tell you that the people of the Middle Ages didn't have it and had a dreadful time getting along without it.

The people who should have done something about this a long time ago were the ancient Greeks, but they seemed to think that they were too good for it. They couldn't conceive nothing as being something, so they did nothing about it. They managed to get along without nothing, as most of them were efficient mathematicians who could make out without the nothing they didn't have.

The Roman numeral system was very difficult to manipulate so the average man four hundred years ago counted on his fingers, removing his shoes if the numbers exceeded ten. If they exceeded twenty, he either had to look up a six-toed friend or hire a professional calculator. Being a professional calculator was quite a racket. The only prerequisite was ownership of an abacus or a counting board and knowing how to move the counters in order to add and subtract. A few learned scholars knew how to multiply and divide, but mastery of multiplication and division was not a bread-earning talent.

The Indians knew something about nothing, and in the tenth century the Arabs adopted the Indian numeration, translating the "sunya," symbol for nothing, into Arabic "sifr," meaning void. This number system, with its "sifr" or "zephirum" which became the Italian "zero", was introduced into Italy at the beginning of the thirteenth century. The system was also introduced into Germany where "cifra" represented nothing, but in both Italy and Germany the new numeration was greatly resisted. People went right on not knowing whether the combination of a three and a two meant 32, 3020, or 3200.

Like prohibition, laws against the use of the new numbers succeeded not in abolishing the evil, but in spreading it by bootlegging. Then, as now, people were not willing to accept anything which would lose them their jobs. Acceptance of the system would mean that every man who could read could figure for himself and wouldn't have to go to the professional calculator when he ran out of fingers and toes.

For four centuries, this new system was at a complete standstill. When it was finally accepted throughout Europe, new developments were made in mathematics which could never have been made with the clumsy Roman numerals or the abacus.

So, friend, reflect upon your many blessings, including logarithms and the slide rule, and be glad that you live in an era when we know all about nothing.

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### VECTOR MULTIPLICATION IN THE STUDY OF THE GYROSCOPE

(A paper by Gladys Clem, President of Xi Chapter, Muncie, Ind.)

A heavy mass of large moment of inertia set rotating at a high speed about an axis is called a gyroscope. One of the simplest examples is a spinning top.

The question arises as to why the top does not fall because of the force of gravity. For this explanation the top must be understood to mean a rigid body with an axis of symmetry, acted on by the force of gravity. A point on the axis of symmetry is fixed. Thus the ordinary top is idealized by supposing it to terminate in a sharp point and to spin on a surface rough enough to prevent slipping.

The simple motion of the axis of the top is called steady precession. In steady precession, the axis of symmetry of the top describes with constant angular velocity a right circular cone with the vertical for axis. At the same time the top spins about its axis of symmetry with constant angular velocity.

Two things to consider are forces and motion. The forces affecting the action of the top are the kinetic energy due to the motion and the force due to gravity. Opposite to these forces is the moment of force caused by the force of gravity acting on the mass of the top.

If a gyroscope has both ends of the axis fixed instead of just one as in a top, and a force is applied at right angles to the axis of spin, the resulting direction of motion is not the sum of two vectors as obtained by the parallelogram law for the addition of vectors because the motion can be shown to go in a direction at right angles to the plane of the other two vectors.

To explain this vector, the multiplication of vectors is used.

There are two kinds of multiplication of vectors. One is known as the vector product or cross product, the other as the scalar product or dot product. We are concerned here with the cross product.

By definition:  $\mathbf{A} \times \mathbf{B} = (A \cdot B \sin \alpha) \mathbf{n}$

Where  $\mathbf{n}$  is a unit vector perpendicular to the plane determined by  $\mathbf{A}$  and  $\mathbf{B}$ .

The multiplication table is set up as follows:

	<b>i</b>	<b>j</b>	<b>k</b>
<b>i</b>	0	k	-j
<b>j</b>	-k	0	i
<b>k</b>	j	-i	0

Where  $\mathbf{i}$ ,  $\mathbf{j}$ , and  $\mathbf{k}$  are mutually perpendicular unit vectors.

This is the table for a right handed system of coordinates. If a left handed system is used, the signs of the products are reversed.

Some idea as to how the use of cross multiplication applies to the gyroscope is shown by taking the expression for the time derivative of the velocity vector.

$$p(\sin x \mathbf{k}) \times (A p \sin x \mathbf{i} + C s \mathbf{k})$$

The first quantity is equal to the angular velocity and the second the angular momentum. If the expression is multiplied out by the above multiplication table the result will be:

$$p \sin x (A p \cos z - C s) \mathbf{j}$$

There are three types of spinning tops. One where there is a steady precession, second where the axis of the top nods up and down, and third where the top spins with its axis vertical.

This third type is equivalent to the gyroscope supported at two points of the axis. It is used in many practical applications, such as the gyro-compass and the gyrostabilizer in ships, airplanes and torpedoes.

—Gladys Clem

### A GLIMPSE OF RADAR

by Glenn Turnbull, Kappa Chapter, Macomb, Ill.

In the wake of the present war lies probably one of the greatest contributions that modern science has given to the world. You have surely guessed it—radar.

Radar essentially means radiolocating and ranging. In 1922 American scientists discovered that objects crossing the path of radio signals interfered with reception. Later in the stages of development it was found that radio waves could be reflected from objects and picked up by a receiver. Therein lies the basic principle of radar. Through fog, storm, or darkness, radar spots planes and ships revealing distance, position, type of plane, ship, or objective, speed they are traveling, and many other essential facts valuable in the realm of war.

Actually radar waves are not precisely the same as radio waves. As we know, radio waves are sent out in all directions with some directional effect in the case of loop antennas. To be reflected back from an object these ultra-high-frequency waves must be guided. Naturally the apparatus used for this purpose is called a wave guide. Generally they consist of a rectangular or round hollow tube. At one end is located some sort of transmitting antenna from which waves are sent out. These waves like those sent out by any transmitter are confined by the conducting walls of the wave guides. Just as the ordinary sky wave is bounced back and forth between the earth and ionized Heaviside-Layer in the sky, so will electric and magnetic lines of force be bounced back and forth against the walls of the wave guide and so propagated down the guide. As it leaves the guide most of the wave will continue out into the air and part will be reflected back. If the end of the guide is flared into the shape of a horn, various directional effects will be obtained.

Sometimes wave guides are called scanning tubes. The operator uses a receiver in conjunction with the transmitter. For instance, if his radar waves strike a plane as he scans the sky, the wave will be reflected back and picked up by the receiver. Generally connected to the receiver is some form of a cathode ray oscilloscope. This apparatus throws the wave on a fluorescent screen from which, by its characteristics taken, determined by the reflecting surface, the expert can obtain invaluable information.

Today we have radar controlled guns and planes. Even as this is written, experiments are being carried out involving transmission of power by radar—experiments that may determine the destiny of the world.