

NUMBERS, *one* and *sixty*, serve in this view to define, or to describe, the *length and direction* of the new or constructed line BC; at least if the latter number (*sixty*) be combined with the consideration of a certain *hand*, or *direction of rotation*, towards which the old line BA may be conceived to *turn*, in the plane of the triangle (or of the paper), as indicated by the *curved arrow* in the figure.

(7) The foregoing view, although not precisely the same with that adopted by Euclid himself, in his exposition of the elements of geometry, is at least consistent therewith; and has been made the basis of an important and modern method of calculation, respecting *directed lines in one plane*, which seems to have been first introduced about the commencement of the present century, by Argand in France, and for which Professor De Morgan of London has lately proposed the name of *Double Algebra* because it recognizes and employs *two numerical elements* (such as the numbers 1 and 60 in the foregoing example), as required for the joint determination of the *length and direction of a straight line*. And it is now to be shown what is the nature of the passage that has been made, by the author of the Lectures on Quaternions, from such a *double system* of algebraic geometry, to what may be called, by analogy and contrast, a *quadruple system* of calculations respecting directed lines, or a system of QUADRUPLE ALGEBRA.

(8) This passage from the one system to the other may be said to consist mainly in the consideration of the *variable plane of an angle*. If, after tracing the equilateral triangle ABC on a *card*, which at first rests on a horizontal *table*, we then lift up that card, with the figure traced thereon, and lay it on a sloping *desk*, the triangle in its new position takes also a *new aspect*; it faces a different *region* of space, and may be conceived to *look at*, or be looked at by, a *new point of the heavens*, which is *not now the vertical point* (or zenith), as before. This *new aspect of the figure*,

or of the *plane* (or desk) on which it is now situated, is the *new circumstance* introduced, in the transition from Double to Quadruple Algebra. And in fact it is easy to see that this new circumstance, of the *varied position of the figure*, namely, of the triangle, or simply (if we choose) of the ANGLE ABC, requires the consideration of *two new numerical elements*. For we have now *two new questions* to answer, or *two new things to determine*: namely, 1st, the *slope of the desk* (or inclination of the plane), suppose forty-five degrees, conducting to a *first new number*, 45; and 2nd, the *direction of the edge* (or, technically speaking, the line of the nodes), where that slope meets the table, and which may deviate from the line of north and south by any other number of degrees, suppose seventy, giving thus a *second new number*, in this case 70.

Science News Letter, March 4, 1933

The dark film which appears inside an aluminum pan when certain kinds of water are boiled in it is reported to have no effect on health, and can be easily removed by stewing apples or other acid fruits in the pan.

PHYSIOLOGY

Growth-Checking Substance May Control Cancer Tissue

GROWTH of tissues, stimulated by the presence of naturally occurring compounds containing the sulfur-hydrogen combination known as "sulfhydryl" and designated with the chemical symbol SH, is checked by compounds containing the same combination in a partially oxidized condition. This, in summary, is the result of research by Dr. Frederick S. Hammett of the Lankenau Hospital, Philadelphia. If sustained by further experiments, Dr. Hammett's discovery will be of immense importance both scientifically and practically.

Dr. Hammett announced his discovery that sulfhydryl-containing compounds accelerate growth at a meeting of the American Philosophical Society three years ago. At that time he also suggested that a growth-checking action might be expected of the same compounds in an oxidized or partially oxidized condition.

Following up this lead, one of his

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colleagues, Dr. Gerrit Toennies, attempted the preparation of such a growth-checking compound. He has now obtained it in a sub-oxidized sulfur derivative of cysteine, a compound present in all cells. In a communication to *Science*, Dr. Hammett says, "Dr. Toennies' brilliant success puts in our hands a compound of inestimable practical and theoretical value, the outcome from which no one can predict."

One of the outcomes which Dr. Hammett is reluctant to predict may be a hopeful new point of attack on the perennially urgent problem of cancer.

Cancer consists essentially of an uncontrollable condition of growth in otherwise normal tissues. With a potent naturally occurring growth-controlling compound in hand, something may be done toward getting this unruly growth tendency in check. It is to be emphasized, however, that the work in its present stage cannot be regarded as the discovery of a cancer (Turn to Page 142)

Water power will account for exactly the same percentage of the total energy derived in 1950 as in 1930, namely, 8.1, although the energy applied by hydro-power will be greater than in 1930.

Whereas bituminous and anthracite coal accounted for 60.3 per cent. of the total energy derived in 1930, it will account for only 46.6 per cent. in 1950. Petroleum and its natural products, including also natural gas and natural gas gasoline, will show a marked rise. Accounting for only 31.6 per cent. of the total energy derived in 1930, they will account for 45.3 per cent. in 1950.

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JOSEPH PRIESTLY

—born 200 years ago, an early American scientist (by immigration) explains why he held to the phlogiston theory

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cure, and that much more research along this special line would have to be carried out before any one could dare to try this or any similar compound on a human patient. Nevertheless, the mere existence of a compound with known definite growth-controlling powers from natural sources gives license to hope that this may eventually be one of the practical results.

Dr. Hammett and Dr. Toennies carried on their researches both in Philadelphia and at the Marine Experimental Station of the Lankenau Hospital, which is located at North Truro, Mass.

Science News Letter, March 4, 1933

MINING

Enriching Ores Foreseen To Support Steel Industry

IF THE IRON deposits of the Lake Superior region are to continue to supply the American steel industry, a few decades hence it will be necessary to concentrate or enrich the iron ore before it can be shipped profitably to the steel mills, Frank J. Tolonen of the Michigan College of Mining and Technology reported to the American Institute of Mining and Metallurgical Engineers meeting in New York.

Billions of tons of ore are available if the iron content can be increased by artificial means so as to make it cheaper to transport. Mr. Tolonen suggested various methods of ore beneficiation:

1. Seemingly most practical is the concentration of the ore into a product suitable for blast furnace reduction. This is most important because of the vast capital investment involved as well as because the blast furnace process will undoubtedly continue to be the chief method of pig iron production.

2. Direct reduction of the iron oxide

into metal, followed by magnetic separation from the gangue.

3. Production of iron directly from the ores by leaching and electrolytic precipitation.

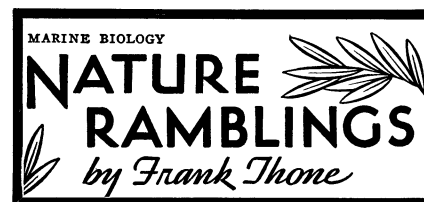
4. Production of pure iron oxide by chemical leaching and precipitation.

The use of heavy fluids as separating media in gravity concentration has shown encouraging results, Mr. Tolonen said. This method depends on the fact that a liquid will float material less than its own specific gravity, while heavier material will sink. Consequently, if a liquid can be found with a specific gravity a little greater than the gangue rock, it will float off the latter, while the iron particles will fall to the bottom without being mixed with worthless rock.

Such a liquid has been found, he continued, in acetylene tetrabromide, which has a specific gravity of 2.9, sufficient to float off the barren rock. Unfortunately the cost of such a solution is too high for use in practical ore dressing. Consequently the investigators borrowed an idea from oil drilling, and made an artificially heavy solution by introducing ore slimes into the liquid and using mechanical agitation to prevent their settling. This gave the requisite specific gravity.

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Discovery of new gold fields in Africa, 40 miles distant from older producing areas, was the outstanding accomplishment of geophysical prospecting during the past year in the opinion of F. W. Lee of the U. S. Bureau of Mines. Prospecting with a delicate magnetometer, the engineers located gold fields that promise to equal in size half of the present gold fields and rank in value with the famous Far East Rand.



Homer of the Eels

DR. JOHANNES SCHMIDT, Danish biologist and oceanographer who died in Copenhagen on February 22, occupied one of the most unique positions in the whole history of marine science. He was the Homer of the eels. For many years he followed the migrations of these strange but valuable fish, and solved riddles about their ways of life that had been standing for thousands of years.

Epicures in Roman days and nobles of the Middle Ages alike prized eels, but never knew where they came from. Because nobody ever saw an eel's egg or an infant eel, folk lore and superstition clustered thick about their long lithe bodies.

Johannes Schmidt set himself the task of finishing out the life history of the eels. For many years he followed their migrations, and at last traced their whole strange Odyssey. The adult eels, he found, swam from their European rivers most of the way across the Atlantic, and at last, in a deep part of the ocean north of the West Indies, laid their eggs and then died. The young eels began their return journey shortly after they were hatched, and with no guides at all found their way back to their ancestral rivers in Europe. How and why, are still mysteries.

Then Johannes Schmidt traced the migrations of eels of other continents. North American eels, he found, also migrate to deep water in the Atlantic, somewhat to the north of the breeding ground of the European eels.

Within the past few years, Dr. Schmidt's researches on the eels of southern Asia and eastern Africa traced similar routes of migration to breeding grounds in the Indian Ocean.

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