(3) *Colloids:*

The deposition of minerals as colloids and their subsequent crystallization, special attention being given to the sulfides. The studies should be carried on over a range of temperatures and pressures.

The effect of coagulation on size distribution of clay particles.

(4) *The physical chemistry of replacement at moderately high temperatures and pressures:*

Replacement in the geologic sense means the dissolving of one mineral or a group of minerals and the immediate deposition of another mineral or group in the place thus vacated, with no intervening formation of open spaces. An explanation of the physical chemistry of the large-scale replacement of essentially solid rock makes experimental work in the artificial production of replacements under closely controlled conditions of temperature and pressure highly desirable.

(5) *Radioactivity:*

The determination of the radioactive content of rock masses.

The determination of the helium content of rocks.

(6) *Differential pressures:*

The study of the physical and chemical conditions of formation of the "stress minerals," their stability fields and their orientation during crystallization. This research will involve investigation at temperatures ranging up to four hundred degrees Centigrade under differential pressures of many hundreds of atmospheres.

(7) *Determination of physical constants of geologic material:*

Determination of density, viscosity, porosity and the thermal and elastic constants of rocks and minerals in the laboratory.

The determination of as many physical properties as possible of rocks *in situ*, to be correlated with the constants determined by laboratory work on material typical of that studied in the field.

The change in physical constants with changes in temperature and pressure.

(8) *Rock deformation:*

Experimentation with scaled models that are dimensionally correct and the application of photoelastic techniques to the study of changes induced by stress.

(9) *Hydrodynamics:*

The principles of stream and wind action as ascertained by means of hydraulic laboratories and wind tunnels.

Investigation of the terminal settling velocities of masses ranging from small to large size.

The laws governing the orientation of unequidimensional particles under conditions of viscous, turbulent and plastic flow.

Rock permeability under special conditions, such as incomplete saturation, high pressure and high temperature.

(10) *Geophysics:*

Gravity instruments to determine gravity or gradient of gravity on land or on sea.

Seismic equipment for the investigation of general geologic problems, such as the extent of thrust faults and their change of attitude with depth, and the position and configuration of the floors of batholiths, and the structure of the continental shelfs and ocean bottom.

Tiltmeters to determine the body tides of the earth.

Magnetic equipment for investigation of geologic field problems or for investigation of magnetic properties of rocks and minerals.

Committee on Borderland Problems of Geology, Chemistry and Physics.

CHEMISTRY

G. E. F. LUNDELL
H. R. MOODY, *ex-officio* (*chairman*, division of chemistry and chemical technology)
GEORGE W. MOREY
HOBART H. WILLARD

GEOLOGY

E. S. BASTIN, *ex-officio* (*chairman*, division of geology and geography)
W. H. BUCHER
R. A. DALY
C. N. FENNER
BENO GUTENBERG
M. KING HUBBERT
T. S. LOVERING, *chairman*
W. W. RUBEY

PHYSICISTS

HENRY A. BARTON, *ex-officio* (vice-chairman, division of physical sciences)
FRANCIS BIRCH
I. S. BOWEN
C. C. MURDOCK

SPECIAL ARTICLES

MAGNETIC ANOMALIES NEAR WILMINGTON, N. C.

A RECENT paper by one of us presented the results of a reconnaissance survey of the magnetic anomalies of a portion of the North and South Carolina Coastal Plain.[1] Since the publication of this paper the survey

[1] Gerald R. MacCarthy, *Jour. of Geol.*, 44: pp. 396–406, 1936.

has been extended to include the region immediately east, north and northwest of Wilmington, N. C. As the investigation has halted temporarily, it seems advisable to present a brief report on our most recent work.

An Askania vertical field balance, Schmidt type, was used throughout the investigations. Observations, usually at half-mile intervals, were made along all the main and many of the minor highways. In towns observations were spaced as closely as possible; in localities where strong magnetic anomalies were detected they were taken at intervals of one-tenth mile. Although the swampy and often almost impenetrable nature of the intervening country precluded the running of transverses between highways, a fairly close network of highway traverses has been completed.

The magnetically disturbed area near Wilmington is a small portion of a zone of disturbance which is roughly parallel with the trend of the present coastline. The full extent of this zone is not known because our work has been confined to the region between central South Carolina and the area immediately northeast of Wilmington. The trend of this zone is roughly parallel with not only the coastline, but with the general regional trend of the Appalachian structures which are exposed farther to the northwest. It has been suggested that the magnetic disturbances are reflections of Appalachian type structures which are buried beneath the sediments of the Coastal Plain.[2]

The accompanying isogamic, or magnetic contour, map is based upon about 550 observations. The trend

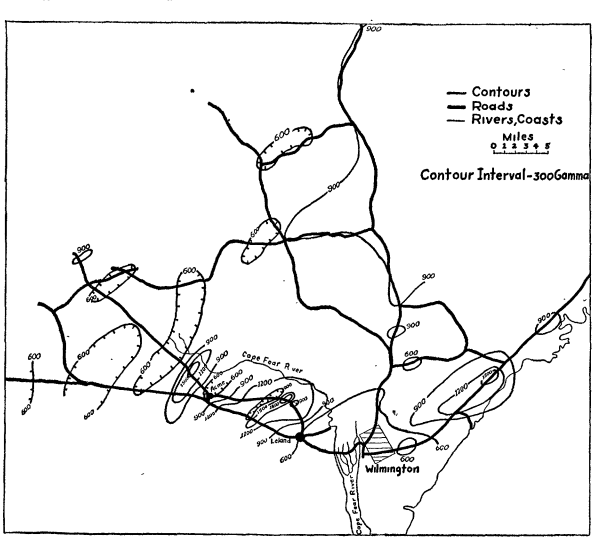

FIG. 1

of the magnetic structures outlined by these isogams is roughly northeast-southwest, coinciding with the trend of the disturbed zone of which they are a part. Most of the magnetic structures are elongated oval highs and lows, the major axes of which are approximately parallel with the general structural trends of the region. The group of distinctly linear and closely spaced highs and lows about twelve miles west of Wilmington is most striking. The maximum anomaly in this particular area is about 1,700 gammas above the regional average. A larger, but less intensely disturbed, area where the coastal highway (U. S. No. 17) follows the crest of a magnetic high for several miles, has been found about ten miles northeast of Wilmington.

The individual highs and lows vary from narrow crests and troughs to broad ovals, with the magnetic gradient steeper along the shorter than along the longer axis, and also steeper toward the northwest than toward the southeast. These facts suggest that the geologic structures responsible for the anomalies dip toward the southeast.

Unfortunately, the country just north and west of Wilmington, through which the axis of the "Wilmington Anticline"[3] should pass, is largely an almost impenetrable swamp. Evidence for or against the existence of this uplift might be expected in this area, but because of the nature of the country, observations have not been made there.

The region here discussed lies within that in which the "Carolina Bays"[4, 5, 6] are found, rendering problems of interpretation somewhat complicated. However, all the non-linear or "point" highs so far discovered in connection with these bays are elongated in a northwest-southeast or a north-south direction, whereas all the highs shown on the accompanying map have a northeast-southwest elongation. The remains of a large iron meteorite might produce a marked magnetic high, but magnetic lows—such as the one that crosses the Acme-Leland highway about five miles northwest of the town of Acme—can not have such an origin. Our present interpretation of the anomalies shown on the map is that they are the reflection of structure and perhaps of topography in the pre-Cretaceous rocks which are buried beneath the sediments of the Coastline Plain. The larger anomalies, such as the one northwest of Acme, are much greater than those usually found in regions of unconsolidated sediments and could be produced only by the presence of large masses of iron-rich material.

The anomalies of this region are not only of scientific, but of practical interest. Noticeable compass

[2] *Ibid.*, p. 405.

[3] The phrase "Wilmington Anticline" as here used refers to an anticlinal structure that has been suggested by L. W. Stevenson. See his paper in *Jour. Wash. Acad. Sci.*, 16: 260–480, 1926.

[4] F. A. Melton and W. Schriever, *Jour. of Geol.*, 41: pp. 52–56, 1933.

[5] W. F. Prouty, *Jour. of Geol.*, 43: pp. 200–207, 1935.

[6] G. R. MacCarthy, *Proc. Geol. Soc. Amer.*, for 1935, pp. 90–91, 1936.

deflections have been observed in this area and, judging by the observed effects associated with equally intense anomalies elsewhere, local interference with radio reception might be expected.

Financial assistance for the field work was received through a grant-in-aid from the American Association for the Advancement of Science.

GERALD R. MACCARTHY
H. W. STRALEY, III

DEPARTMENT OF GEOLOGY,
UNIVERSITY OF NORTH CAROLINA

EFFECT OF CERTAIN ENZYMES AND AMINO-ACIDS ON CROWN GALL TISSUES

THE relation of the crown gall of plants (caused by *Phytomonas tumefaciens*) to malignant tumors of animals is deservedly occupying the minds of pathologists. The status of this subject is excellently presented in a recent paper by Riker and Berge.[1] It is apparent that while the main trend of experimental work is toward determining the stimulatory factors in both crown gall and cancers, comparatively little has been done on the therapy of crown gall with the idea of the ultimate application of the results to cancers of animals. Crown gall and different types of sarcomas have been successfully treated by different forms of radiant energy.[2, 3, 4, 5] There seems to be a certain degree of similarity in response of plant and animal cancerous tissues to different types of physical treatment.

The author working with the crown gall on geranium (*Pelargonium zonale*) observed destruction of galls following injection of a mixture of *Erwinia carotovora* (the cause of a soft rot in carrots and other fleshy roots) strains into galls one month old. Gall tissue usually was completely broken down in from four days to a week, depending on the size of gall and environmental conditions. Galls on young tomato (*Lycopersicon esculentum*) and sunflower (*Helianthus annus*) plants were treated similarly and responded in very much the same way. After the destruction of gall tissue on geranium plants there was no new gall observed to appear after one year. Plants were always maintained in a good growing condition. Geranium plants inoculated with *E. carotovora* were never affected by the organism.

[1] A. J. Riker and T. O. Berge, *Amer. Jour. Cancer*, 25: 310–357, 1935.

[2] C. Arnaudi and G. Venturelli, *Rivista di Biologia*, 16: 61–80, 1934.

[3] Georges Lakhovsky, "L'origine de la vie," 175 pp. Gauthier-Villard et Cie. Paris, 1925.

[4] I. Levin and M. Levine, *Jour. Cancer Research*, 7: 163–170, 1922.

[5] J. W. Schereschewsky and H. B. Andervont. Publ. Health Report 43: 927–945, 1928.

This interesting phenomenon led to the supposition that enzymes or other specific compounds might be involved in the elimination of over-growth. With this thought in mind, the author tested diastase, papain, pepsin, cysteine hydrochloride, leucine, iso-leucine, tyrosine and tryptophane.[6] Cysteine hydrochloride was applied in view of the fact that this material was successfully employed in curing Jensen's sarcoma of white rats.[7] All preparations tested were used in the form of 0.1 per cent. water solution or as crystals. Galls employed for treatment were from one to two months old and ranged in size from 3 to 5 cms in diameter and were induced on geranium and sunflower by a rose strain of *P. tumefaciens*. Injection of materials was made by hypodermic syringe in the case of the water solutions. Dry powder (a few crystals in each case) was introduced into a very small incision made in the center of the gall. Sometimes the galls treated with crystals were afterward atomized with sterile distilled water to aid the diffusion of the material. Controls were represented either by injection of sterile distilled water into the galls or by incisions with a sterile scalpel. In all treated cases, except with tryptophane and tyrosine, the galls gradually collapsed, dried and remained on the plant as hard vestiges easily detachable. Pepsin and papain acted very promptly, while diastase and other compounds used mummified the galls of 3 to 4 cms in diameter in from ten days to two weeks. In all these tests there were used from 10 to 20 galls for each treatment, making a total of 180 galls with corresponding controls.

P. A. ARK

UNIVERSITY OF CALIFORNIA, BERKELEY

SEX DIFFERENCES IN ANEMIC RATS

IN the issue of SCIENCE for January 29, 1937, appeared a note by Margaret C. Smith and Louise Otis describing certain differences observed between male and female anemic rats in their response to various remedial measures. With those supplements incapable of promoting a maximal rate of recovery, the female rats responded better than the male rats. This was interpreted as a true sex difference, and the authors expressed the belief "that ignorance of this fact may explain some of the discrepancies of the same magnitude in the findings in various laboratories relative to the availability of iron in foodstuffs." Also, in 1932 Miss Helen Mitchell[1] observed an analogous phenome-

[6] Chemicals used were of the following brands: Papain-Merck. Diastase, pepsin, leucine and tyrosine-Pfanstiehl. One lot of pepsin from Parke, Davis and Co. Cysteine hydrochloride, isoleucine and tryptophane—Eastman Kodak Co.

[7] C. L. Connor, J. L. Carr and L. Ginzton, *Proc. Soc. Exp. Biol. and Med.*, 34: 374–376, 1936.

[1] *Amer. Jour. Physiol.*, 101: 503, 1932.