thought that the higher and more remote pebbles (800 to 850 feet) represent invasions by floating ice at the time of the first cutting of the Manchester col, which may have been originally about 850 or 900 feet. Ridges in the vicinity of Manchester now show elevations ranging up to 1,000 feet above sea level. Pebbles occurring in Kentucky at points near to the major drainage at elevations ranging from 720 to 750 feet are taken to represent subsequent ponding during the latter cutting of the Manchester col, and possibly those at Ironton, Portsmouth and Cincinnati. Ridge elevations at Ironton now range between 800 and 850 feet; at Portsmouth between 900 and 950 feet; and at Cincinnati (Dayton, Kentucky-Walnut Hills, Ohio) between 850 and 860 feet.

The section involved in this ponding in eastern Kentucky has not been topographically mapped except in part. Barometric elevations run throughout this section indicate that the highest ridges will range from 1,000 to 1,200 feet. At the highest level of ponding, ridge topography in this section would have appeared insular, the region resembling somewhat the Thousand Islands region of the St. Lawrence. A study of the elevations of these pebbles, their position and the gradient of some high level fluvatile gravels and terraces may possibly bring out the fact of uplift in the southwestern part of the section subsequent to the Pleistocene. The period of ponding at an elevation of 850 feet appears to have been short, as terraces apparently were not widely developed. There is no evidence now in hand to prove the extension of glacial ice lobes into this part of the state. Stratified drift is absent and ridge topography does not show a general beveling. Ponding in northeastern Kentucky at this time very possibly covered an area of about 2,000 square miles.

The occurrence of pebbles at high levels on that part of the drainage of the Licking River which adjoins the Little Sandy River may mean (1) that these ponded glacial waters flowed over one or more low divides in this interior part of Kentucky, and (2) that these southern cols were in direct competition for a time at least with those which were removed at such northern points as Manchester and elsewhere. To accept this theory the assumption of regional uplift in Morgan County and vicinity during and subsequent to the Pleistocene becomes a necessity. Yet this assumption would seem to be far more plausible than (1) a high damming of the Licking River and (2) glacial ice floating southeastward along the serpentine course of the Licking over 100 miles to the Elliott County line.

If the Morgan–Elliott County passes thus brought into prominence were indeed temporary debouchures for impounded glacial waters, to the superior hardness of the lower Pottsville clastics of this region and some coincident regional uplift may be ascribed the present course of the Ohio River bordering northeastern Kentucky. Had the Coal Measure sediments of Morgan and Elliott counties less competently met the erosive action of surging glacial waters the course of the then formative Ohio River would undoubtedly have been directed up the valley of the Little Sandy River and down the Licking River. Such a hypothetical change in the pattern of the Ohio River would have (1) reduced the area of Kentucky by 2,500 square miles, (2) placed Lexington, the heart of the Blue Grass Region, within 35 miles of the Ohio, and (3) profoundly altered the history and economics of the entire lower Ohio valley.

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TEMPERATURE AND MUSCULAR EXCITABILITY

THE influence of temperature on muscular excitability is a problem yet unsettled, although numerous investigations on it have been published. Controversy continues among investigators, who have found different optimal temperatures; some place the optimum at or near 30° C., while others have found it at or near 5° C., and still others have determined two optima situated at these two levels.

The majority of investigators have taken the height of the contraction curve as the indicator of muscular excitability. This indicator, however, is not accurate because many factors may modify it. In my experiments I have used the threshold of contraction when induced break shocks, measured by Martin's method[1] in Z units, were applied to the gastrocnemius muscle of the frog. After the animal was pithed the muscle was excised and placed in a moist chamber surrounded by a water-jacket. The Achilles tendon was directly connected to the myograph. Temperature changes were induced gradually to insure a close correspondence between the reading of the thermometer in the moist chamber and the actual state of the muscle. The threshold was assumed when a minimal movement of the lever made its mark on the drum. The changes in the temperature were made in different ways. At times room temperature was the point of departure, and the temperature was lowered or raised gradually. At other times the start was made from high or low temperature. In the course of longer experiments the range was traversed repeatedly; up and down, down and up. A determination of threshold was usually made after each increment or decrement of one degree.

The results which I have obtained prove that the

[1] Martin: "The Measurement of Induction Shocks," New York, 1912.

threshold is lowest when the muscle is at or near room temperature (18–20° C.). Both the rise and the fall in temperature cause a remarkable rise of the threshold. In the following tables the results of two different experiments are given; it is clear that the lowered excitability, as the temperature is increased or decreased, can not be ascribed to fatigue, because the reverse change occurs on returning to room temperature.

TABLE I

Temperature ° C.	Threshold Z units
19 (Room)	19
14	35
9	45
4	71
0	99
5	80
10	60
15	40
20	36
25	43
30	49

TABLE II

Temperature ° C.	Threshold Z units
17 (Room)	29
0	250
5	185
10	54
15	35
20	32
25	40
30	71
35	344

The height of the contraction curve proves not to be related to the degree of muscular excitability, for although *within certain limits* the excursion of the lever is increased by raising or lowering the temperature and beyond these limits is decreased, the threshold of excitation under the same conditions continues to present higher and higher values. Furthermore, the increase in the height of the contraction curve may be only apparent, as shown by Kaiser,[2] who explained it as a consequence of the imperfection of the apparatus commonly used.

Further experiments will be carried out on this subject with currents of longer duration than those used in the present experiments in order to take into consideration the important evidence adduced by Lucas and Mines regarding the relation of the duration of the stimulus to its stimulating value.[3] In view of the results already obtained, however, enough support seems to exist for the following conclusions:

(a) Neither warming nor cooling increases the excitability of frog muscle—instead, they diminish it;

(b) The optimum temperature at which the excitability of frog muscle appears greatest is that at which the muscle has been maintained before the period of experiment, *i.e.*, the room temperature.

This last conclusion agrees with the conception of Abbott,[4] who states that "for every organism there is an optimum temperature at which it grows and thrives best, and this is apt to be the normal temperature in which the organism naturally occurs."

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2 Kaiser: *Zeitsch. f. Biol.*, 1896, XXXIII, 157.

3 Lucas and Mines: *Jour. of Physiol.*, 1907, XXXVI, 334.

4 Abbott: "General Biology," New York, 1914, 244.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE STANFORD UNIVERSITY MEETING OF THE PACIFIC DIVISION

THE eighth annual meeting of the Pacific Division of the American Association for the Advancement of Science, held at Stanford University June 25 to 28, proved to be fully up to the high standard set by previous meetings. In scientific and popular interest, social features and wholesome enthusiasm, the meeting was all that could be desired. The hospitality of the people of Palo Alto and of Stanford University and of the faculty and officers of the university, in the entertainment of the members of the association and visiting friends, was a marked feature of the meeting.

The total registration was 355. Among those in attendance from distant points were Dr. L. O. Howard, chief of the U. S. Bureau of Entomology, Washington, D. C., a former president and for many years the permanent secretary of the association; Dr. J. McKeen Cattell, president of the association; Dr. George Henry Falkiner Nuttall, Quick professor of biology, Cambridge University; and Dr. T. D. A. Cockerell, of the University of Colorado.

GENERAL SESSIONS

Although the formal opening of the meeting occurred on Wednesday, June 25, one of the affiliated societies—the Western Society of Soil Management and Plant Nutrition—began its sessions on Tuesday morning, June 24.

The registration office was opened Wednesday morning. At the noon luncheon on Wednesday a research conference was held, as has been customary. At this conference President David Starr Jordan presided, and the following named persons presented papers: Dr. Herman A. Spoehr, of the Coastal Laboratory, Carnegie Institution, Carmel, California, on "Photosynthesis"; Dr. Ernest C. Dickson, of the Stanford University Medical School, San Francisco, on "Botulism"; Professor James C. Clark, of Stanford University, on "High tension electrical transmission."

On Wednesday evening, the retiring president, Dr. David Starr Jordan, gave an address on "Science and sciosophy,"[1] following which was given a public re-

1 This address was published in full in SCIENCE for June 27.