CHANGES IN CULTURES SOLUTION CAUSED BY GROWTH OF WHEAT PLANTS

Date 1925	Time	Salt Used	Vol. of soln. c.c.	pH after	Ca Before	Ca After	Mg Before	Mg After	K Before	K After	SO_4 Before	SO_4 After	PO_4 Before	PO_4 After	NO_3 Before	NO_3 After	
5/25	8–5	KNO_3	50	5.6	0	0.5	......	....	12	0	0	0.07	......	....	18	+	
5/26	8–5	KCl	50	5.3	0	0.1	......	....	12	0	0	0.00	......	....	......	...	Much Cl
5/27	24 hrs.	$Ca(NO_3)_2$	50	7.3	7	1.7	......	....	0	0	......	....	......	....	14	0	
5/28	"	KH_2PO_4	50	4.0	0	0.7	......	....	16	0	......	....	38	+++	......	...	
5/29	"	$KHCO_3$	100	5.5	0	0.0	......	....	20	0	......	....	......	....	......	...	
6/1	3 days	KNO_3	100	6.6	0	Tr.	......	....	39	0	......	....	......	....	62	0	
6/2	24 hrs.	$NaNO_3$	50	7.4	......	......	......	....	......	...	......	....	......	....	18	0	
6/3	"	KNO_3	100	6.7	0	0	......	....	20	0	......	....	......	....	31	0	
6/4	"	$Mg(NO_3)_2$	100	7.2	......	......	6	+++	......	...	......	....	......	....	31	0	
6/5	"	KCl	100	7.0	0	0	......	....	39	+++	......	....	......	....	......	...	Much Cl
6/6	"	$(NH_4)_2SO_4$	100	3.0	......	......	......	....	......	...	48	+++	......	....	......	...	Before NH_4 18, After +++
6/8	2 days	$Ca(NO_3)_2$	100	6.8	14	++	......	....	......	...	......	....	......	....	29	0	
6/9	1 day	$MgSO_4$	100	5.8	0	0	8	++	......	...	32	+++	......	....	......	...	
6/10	"	KH_2PO_4	100	3.5	......	......	......	....	16	+	......	....	38	+++	......	...	

amount of the ion was indicated by the signs +++, less by ++, and still less by +.

The various ions were detected by means of the following reagents:

For Ca Ammonium oxalate
" Mg $Na_2HPO_4 + NH_4OH$
" K Sodium cobalti nitrite reagent
" SO_4 $BaCl_2$
" PO_4 Acid ammonium molybdate
" NO_3 Diphenylamine, .01% in H_2SO_4
" pH Phenolsulfonephthalein indicators

By examination of the table, it may be seen that when KNO_3 was used in small amounts, both anion and cation were completely removed from the solutions by the plants in nine hours, the solution remaining nearly neutral. When KCl, KH_2PO_4 or $KHCO_3$ were used, the K was absorbed, but not all the anions. When $Ca(NO_3)_2$ or $NaNO_3$ were supplied, the NO_3 was used up, but most of the cation was left in the solution which became alkaline. When $(NH_4)_2SO_4$ was given, much of both ions remained unabsorbed, but more NH_4^+ than SO_4^{--} had been absorbed, so the solution became acid. Also, when KH_2PO_4 was given, the absorption of K^+ being relatively greater than of H_2PO_4 —, the solution became more acid.

For demonstrating these effects to a class, the following procedure is suggested:

Three weeks or more in advance of the day of demonstration, prepare as many jars of plants as are needed for the several tests to be made. Some hours before the class meeting the plants are placed in the various solutions, portions of which are kept unused. At the time of demonstration, the same test is applied to the solutions before and after the plants have been grown in them. If properly managed, the difference between the two solutions before and after the action of the plants may be made easily visible to a good-sized class. The two test tubes, showing the test on the two portions of solution before and after the plants have grown in it, should be exhibited side by side.

For investigational purposes, the same bunch of plants may be used day after day if the roots are well washed in distilled water each time before being placed in a different solution.

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SPECIAL ARTICLES

NOTE ON MAGNETIC DECLINATION

DURING the total eclipse of January 24, 1925, magnetic observations were made at an isolated point near Ithaca, New York. The primary object of the investigation was to record any quick changes in declination of the earth's magnetic field during the time of the eclipse. While the device used could also record the slow gradual changes, it had no advantages in that respect over the vibrating magnet method ordinarily used.

A small bell type magnet, of short period of vibration, was suspended by a quartz fiber in a metal casing and carefully shielded from air currents. By means of a telescope about two meters away, the apparent motion of a cross hair in the telescope was observed as reflected from a small mirror fastened to

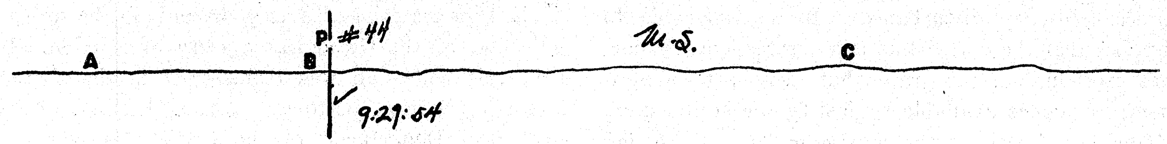

FIG. 1

the stem of the magnet. Attached to a sliding arm was a pointer which could be kept on the moving cross-hair image by the telescope observer. A pen on the other end of the arm recorded the fluctuations directly on a chronograph tape moving about 22 cm a minute, thus giving a continuous record of the declination. Figure 1 is an actual photograph of a portion of the tape, showing the magnetic variations of the earth's field at about 9:30. From A to B on the graph there is no irregularity, thus showing an absence of magnetic disturbance. However at B, the graph becoming very irregular gives evidence of some degree of magnetic storm or other disturbance of unknown origin. The small punch holes made by the recorder every half second served the double purpose of giving the exact time and forming a datum line from which to make measurements of the graph. A second recorder punched the tape at minute intervals as shown at P. The whole apparatus as used had been designed some time previously to record and study local magnetic disturbances, and its accuracy of recording may be greatly varied according to the needs. In case of any local disturbances known at the time, it was found very convenient to telegraph by Morse code any remarks to that effect directly upon the tape at the time of occurrence by means of the second recorder.

The record on January 24 started at about 8:30 continuing until 9:50. There was, throughout, a continual changing observed in the declination complicated by frequent evidences of magnetic storm. The declination increased very rapidly beginning at about 8:55, and reached a definite, fairly sharp maximum at 9:16, which lasted for about two minutes. After this point, it started to decrease at about the same rate as that of increase. However, instead of decreasing continuously, there was a reversal at 9:26 and then after a period of about eight minutes assumed a much slower but steady rate of change.

Figure 2 shows a contracted graph, obtained from measurements on the tape at the one-minute intervals. At the times marked by X the tape record showed various large irregularities, although there were in addition more frequent, smaller deviations. It will be noted that these positions correspond in general to the larger deviations from a smooth curve. The period T–T is that of totality and is marked by some irregularity, although this is probably due solely

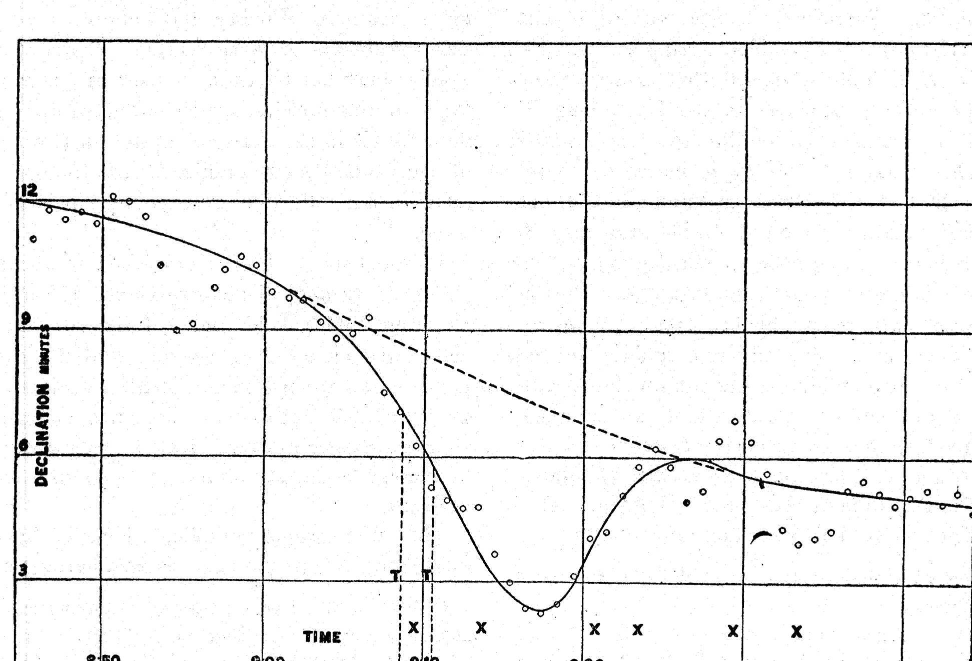

FIG. 2

to the ordinary disturbances. It is reasonable to suppose that the dotted line might represent the normal procedure of the graph, but there is no experimental evidence available to justify the supposition.

One peculiarity of the maximum effect is its lag of about seven minutes behind the period of totality. A second peculiarity is the unexplained reversal which occurred shortly after the maximum. The total angular variation over the period of measurement was of the order of ten minutes. A curve was also obtained the following day, over the same time limits, and showed a very quiet state of the magnetic field.

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ARCA PATRICIA SOWERBY, A MIOCENE FOSSIL FROM THE DOMINICAN REPUBLIC[1]

IN 1850 G. B. Sowerby[2] described *Arca patricia* and other Miocene fossils collected in the valley of Rio Yaque del Norte, Dominican Republic, by Colonel Heneken, a British army officer. This species, like many others described in the same report, was not figured. Almost every writer who has had anything to do with the Miocene mollusks of the Dominican Republic has made a guess as to *Arca patricia,* but none took the trouble to inquire about the type material. Sowerby compared this species with *Arca grandis* Broderip and Sowerby, a giant *Arca* living on the Pacific coast of Central America and northern South America. Therefore, it was natural to suppose that *Arca patricia* resembled *Arca grandis.* Following this lead Gabb supposed that *Arca patricia* is the giant Miocene *Arca* from the Dominican Republic that is remarkably similar to *Arca grandis.* Guppy, who examined the type material, merely commented that *Arca patricia* is "undoubtedly near *A. grandis.*" Maury followed Gabb and also recently used the name *Scapharca (Scapharca) patricia* for the large Miocene *Arca* from Trinidad. Pilsbry[3] thought *Arca patricia* might be *Arca chiriquiensis* Gabb, a species first collected from middle Miocene beds cropping out on Chiriqui Lagoon on the Atlantic coast of Panama close to the Costa Rican boundary. *Arca chiriquiensis* has an extensive distribution, as it has been found in Miocene beds in the Dominican Republic, the Republic of Haiti and Colombia. At all these localities it lived in water of low salinity.

[1] Published with the permission of the director, U. S. Geological Survey.

[2] For references see synonymy.

[3] Pilsbry, H. A., Acad. Nat. Sci. Philadelphia Proc., Vol. 73, pp. 405–406, 1922.

The type material of *Arca patricia* is in the foreign collection of the Geological Society of London. In 1911 this collection was transferred to the British Museum (Natural History). Mr. L. R. Cox, of the Geological Department of the British Museum, recently very kindly sent me a cast of the holotype that is so skilfully made that it looks like an actual shell. Mr. Cox informed me that the type material consists of about twelve specimens, but one specimen (Geol. Soc. London No. 12828) was selected by Blake and Sherborn as the holotype when they compiled the catalogue of type specimens in the collection of the Geological Society of London.[4] The cast shows that *Arca patricia* is very different from both *Arca grandis* and *Arca chiriquiensis;* and, as Mr. Cox suspected, it is the species to which Dall in 1898 gave the name *Scapharca (Argina) tolepia.* Dall's description of this species as an *Argina* misled Dr. Maury, so she gave another name to the same species—*Scapharca arthurpennelli.* The holotype of *Scapharca (Argina) tolepia* Dall (both valves in attached position, U. S. Nat. Mus. No. 113,801) was collected on Rio Amina, a northward-flowing tributary of Rio Yaque del Norte. The type locality of *Scapharca arthurpennelli* Maury is on Rio Mao, a northward-flowing tributary of Rio Yaque del Norte lying west of Rio Amina. The holotype of *Arca patricia* is a little larger than the holotype of *Scapharca (Argina) tolepia;* its posterior end is a little more extended, and its umbo is not so broad. Both specimens can, however, be duplicated in a series of about 150 topotypes of *Scapharca arthurpennelli.* Pilsbry and Johnson described three new subspecies of *Arca tolepia.* Some of these subspecies may not be valid in view of the variable features of this species, which is one of the most abundant fossils in the Cercado formation (lower Miocene) of the Dominican Republic. Gabb thought the specimens in his collection were young shells of the giant *Arca.*

In the lists of fossils published in the report entitled, "A geological reconnaissance of the Dominican Republic," Mansfield and I followed Maury in the use of the names *Arca patricia* and *Arca arthurpennelli,* as we wished to get stratigraphic results from almost 1,000 species of Tertiary mollusks in the shortest possible time. But it was inexcusable to overlook the identity of *Arca tolepia* and *Arca arthurpennelli.*

This picturesque muddle, which is the result of disregarding type material, is summarized as follows:

[4] Blake, J. F., List of the types and figured specimens recognized by C. D. Sherborn, F.G.S., in the collection of the Geological Society of London; verified and arranged with additions, p. 65, 1902.