stalks, the maximum height being reached about Aug. 1; but, as will be seen further on, the plants had acquired at that time less than one-half of their total dry matter.

A condensed summary of some of the observations made is given in the following table: —

During the week ending Aug. 14 the record shows that for this season an unusually large quantity of rain had fallen, and the plants which were analyzed that week showed a smaller quantity of dry matter than those of the week before.

Week Ending.	Number of Plants Measured.	Height of Plants (inches).		Field-Notes.	Dry Matter per Plant (grams).	Rain-fall (inches).	Average Daily Temperature, Fahr.			Percentage Composition of Dry Matter.				
		Extremes	Average.				Mean.	Maximum.	Minimum.	Ash.	Prctein.	Crude Fibre.	Nitrogen Free Extract.	Ether Extract.
June 12	2 5	11–26	16			.48	66	76	55					
19	225	23–43	31		4.5	.30	75	90	62	11.2	27.5	23.3	35.7	2 2
26	213	32–64	47		19.9	1.20	75	86	60	11.8	24.1	25.4	36.7	1.9
July 3	201	50–84	65		30.4	.03	72	85	58	11.5	19.1	28.1	39.4	1.9
10	189	57–91	73		50.0	.07	68	81	51	10.5	19.1	29.2	39.5	1.6
17	177	59–102	84		114.2	.47	72	86	57	8.9	15.7	30 6	42.8	1.8
24	165	64–111	96	Full tassel.	161.5	.20	73	86	60	7.9	12.1	29.1	49.2	1.6
31	153	81–115	98	Silks alone.	161.2	.67	68	80	54	7.1	11.3	28.1	51.0	2.4
Aug. 7	141	82–116	93	Pollen shed. Silks dead.	215.1	.01	71	87	55	6.0	10.8	26.7	54.6	1.8
14	129	82–118	98		200.0	1.35	74	94	62	6.8	10.8	29.5	51.2	1.5
21	117	82–118	97	Roasting ear stage.	256.0	1.28	75	86	67	6.2	10.3	27 5	53.9	2.0
28	105	82–115	97	Corn denting.	294.9	.13	62	74	50	5.7	9.3	24.7	57.5	2.6
Sept. 4	93	81–114	97	Husks turning brown.	349.5	.34	63	77	49	5.1	8.5	21.7	61.7	2.9
11	81	81–114	96		319.7	0	62	76	46	5.0	8.9	20.4	62.8	3.0
18	69	81–113	93	Husks dry. 50% leaves dead.	290.0	.0	73	90	57	5.2	9.7	19 7	62 5	2.8

The figures giving the grams of dry matter per plant and the composition of the dry matter represent an average per plant of the nine analyzed each week, or three hills of corn, each containing three plants. No attempt was made to separate the different parts for analysis, such as the ear, stalk, and leaves, but that part above ground was taken as one plant.

The rainfall during the season was considerably below the average, and is here given in inches: —

Average.	June.	July.	August.	September.
For ten years.	5.04	2.75	3.45	3.27
For 1891.	2.08	1.41	2.86	0.41

The record shows that the average maximum height per plant was attained during the week ending July 31; but it contained at that time only 46 per cent of the maximum quantity of dry matter.

The growth in dry matter continued till Sept. 4, and the decrease after that date probably was due to breaking off and blowing away of dry or dead portions of the leaves.

Assuming the total height per plant to be 100 inches and that it was 19 inches high June 12, or 19 per cent of its total height, also that the maximum growth in weight was 350 grams of dry matter, the percentage of the total height and weight attained each week is as follows: —

	June 12	19	26	July 3	10	17	24	31	Aug. 7	14	21	28	Sept. 4	
Height.	19	13	17	19	9	10	11	2 = 100 total.						
Weight of Dry Matter.		1.3	4 6	3 2	5 8	18.5	12	0	15.6	0	11.9	11.3	15.8	= 100 total.

The omission of two weeks in the record where no increase in dry matter was found is caused by the fact that we cannot have the plant and analyze it too.

The analyses of the dry matter show that 100 pounds of the corn plant has quite a different composition at the various stages of its growth. The percents of ash, or mineral matter, and also of protein are highest when the plant is young, and these decrease with age; while the nitrogen-free extract, or carbo-hydrates, increases in percentage as the plant matures.

Assuming that there are 10,000 corn plants per acre, which number it has been found is a fair estimate of the thickness of planting in Illinois, these analyses show that an acre of corn grown to maturity contains 7,716 pounds of dry matter, and this dry matter is composed of 394 pounds of ash, or mineral matter, 656 pounds of protein, and 6,666 pounds of carbo-hydrates.

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THE TOMB OF KING AMENHOTEP.

THE tomb of King Amenhotep IV. has at last been brought to light in the nekropolis of Tel-el-Amarna in middle Egypt.

Since the close of the year 1890 the direction of explorations in Egypt has been occupied in clearing the two most important groups of graves in the neighborhood of this site, which belonged to the eighteenth dynasty, and many tombs have already emerged from the heaps of *debris* under which

they lay concealed, and their entrance had been protected with iron doors.

One of these, No. 25 on the plan, has at last been identified as the long looked-for hypogeum of the king. The main entrance-passage, cut into the mountain to a depth of fifty metres, opens into a chamber supported by four pillars. To the right of this passage, another corridor, forty-five metres long, branches out, opening into an unfinished chamber thought to be that of the queen. Somewhat further, on the same side, are three chambers, two of which are decorated with paintings; and among these occurs the name of the young princess Aten-Macht, the second daughter of Amenhotep IV. The decorations on the walls of the king's chamber represent him surrounded by his family, in adoration before the sun. The condition of the tomb when found showed it to have been disturbed in ancient times, a fact for which the circumstances of this reign furnish abundant explanation.

Until 1887 all that was known of Amenhotep IV. was that he peacefully succeeded his great father, Amenhotep III., whose queen was a foreigner; but that having selected for his only god the life and light-giving sun-disk "Aten," and having attempted to establish his worship to the exclusion of that of other gods, and particularly of that of Amon, he antagonized the arrogant priesthood, whose growing power was already then a force that the Pharaohs must count with. In consequence of this, he found it expedient to leave Thebes and to remove his court and the seat of government to middle Egypt, where, at some seventy-five kilometres south of Minieh, he founded the new city, "Khu-n-aten," i.e., Splendor of the Disk, the site of which is now known as Tel-el-Amarna.

Consistent in his unconpromising hatred of Amon and his priests, he changed his own name in which that of the now discarded god of his fathers entered as an element, and was henceforth called "Khu-n-aten."

He seems to have been a devoted husband and father, and the worship he introduced — and which, after all, was but a return to ancient sun-worship, and therefore more of a reform than an innovation — seems to have been a lofty one, if one may judge from the aspirations kindled by it in the souls of its worshippers, as expressed in the beautiful hymns that have come down to us.

Khu-n-aten left only daughters. At his death his sons-in-law, who succeeded him, had not the strength to continue the struggle; they gradually abandoned his faith to return to the old popular worship, and the eighteenth dynasty closed with a period of disturbance, indicated by the shortness of the reigns.

Was Khu-n-ated only a religious reformer, a mere fanatical monotheist, who, as has so often been stated, was urged by a devout foreign mother to break with the traditions of his father's race, and whose blind intolerance tried to enforce his own views upon his people? or was he a shrewd, far-sighted prince, who, perceiving the danger to the royal power lurking behind the increasing pretentions of the Theban priesthood, sought to put a check upon their encroachments and to insure the independence of the crown by removing the court and by surrounding himself with foreigners, thus defying this formidable caste?

The latter view receives support from the fact that it is against Amon alone that the king's animosity was practically directed, and that, whilst the worship of the disk was the official religion of the capital, the names of the other divinities of Egypt remained undisturbed upon the monuments of his reign, and Amon's name alone was everywhere erased.

In 1887 the discovery of the archives of Khu-n-aten, consisting of some three hundred cuneiform tablets, containing important correspondence between Egypt and its Asiatic allies and tributaries, as well as official reports from royal lieutenants in foreign lands, threw a most unexpected light upon the condition of the ancient civilized world in the fifteenth century B.C. Among the many interesting glimpses thus obtained is a mention of Canaan in pre-Exodus times, found in a letter from the tributary king of Jerusalem, which reveals the existence of that city at that remote period.

The fact that the correspondence between Asia and Egypt was conducted in the Neo-Babylonian characters was alone sufficiently extraordinary to draw the attention of the learned world to Tel-el-Amarna and to the remarkable figure of the man who, in his day, filled not only that spot, but no doubt the whole civilized world, with his strong personality. There are many peculiarities connected with the monuments of his reign and with the art they betray that have never yet been quite satisfactorily explained; and despite all that has been written, and the ingenious theories that have been advanced on the subject, there still remains enough that is hypothetical to make any monumental discovery connected with this period of the greatest interest to scholars.

S. Y. STEVENSON.

A SIMPLE APPARATUS FOR THE PRODUCTION OF LISSAJOU'S CURVES.

THE requisites are a piece of thin glass tube or rod, a gas flame, and a slight knowledge of elementary glass working. The apparatus consists of a short piece of rod or tube which serves as a base or handle, to which is fused a glass thread ten or fifteen centimetres long and from one-half to one millimetre thick, carrying at its extremity a second and much thinner thread of about the same length, whose free end is fused into a small clear bead. Both threads are in the same line with the handle, and the whole forms a compound rod.

In constructing this rod, two glass threads of the kind already indicated are selected rather longer than required. They are fused together, and the connection straightened by a gentle pull while still soft. The double rod is then held near its centre, and the finer thread shortened until in vibration it appears, by persistance of the visual impression, as a sheet or cone. The thicker thread is next adjusted in the same way until the vibration of this double rod, when held by its thicker end, is sufficiently rapid. This thicker end is now attached to a larger piece of glass (the handle), and a very small bead formed at the other end. The exact position and weight of the bead required to form any given set of curves must be found by trial.

Now, holding the bead in a strong light, stand nearly facing the light, but so as to see the bead with a dark background, and tap the handle lightly with the finger-tips. If the adjustment is perfect, the bead will appear transformed into a shining curve, oscillating or rolling and twisting upon itself with inimitable grace like a living thing, and dying away with the decreasing amplitude of the vibrations.

These curves are represented approximately by the equations: —

$$x = a \cos m\theta$$
$$y = b \sin (n\theta + \alpha),$$

where a and b are the amplitudes, α is the phase-difference, and the ratio $m : n$ is a function of the time. When the