# A Theory of Cosmogony

Bible Students are acquainted with this consideration in Volume 6 of *Studies in the Scriptures*, pages 23-29. C. T. Russell quotes from Isaac N. Vail's book first published in 1874 titled: *Waters Above the Firmament*. With such a reasonable explanation of the Earths Canopy's following so closely the creative days it seems like no coincidence that Isaac Vail's first published this concept in 1874. A second edition was printed in 1902. Pastor Russell further quotes from articles in the *Scientific American*.

A full 400 page PDF version of Vail's 1902 edition of *Waters Above the Firmament or Earth's Annular System* is available at:
www.biblestudentarchives.com/documents/1902Vail-WatersAbove.pdf

The 131 page PDF version of Vail's 1905 edition of *The Deluge and Its Cause* is available at:
www.biblestudentarchives.com/documents/1905Vail-DelugeCause.pdf

For those wishing to explore some original source material, the following pages will be found useful.

1. The April 12, 1902 *Scientific American* note of Dr. Herz' discovery of a huge mammoth near the River Ebrosowka in eastern Siberia.

2. The May 10, 1902 *Scientific American* Correspondence to the Editor from Isaac Vail regarding "That Frozen Mammoth."

3. The January 21, 105 *Scientific American* supplement article by O. F. Herz with details of the 1901 discovery with photos. Two pages.

4. Quotes from *The Waters Above*, 1982 by Joseph C. Dillow regarding evidence from the mammoths.

The French government established a colony at Obok, and thence quite recently moved it to Jibouti, which a few years ago was a mere stretch of desert coast, but which, by the lavish expenditure of money, has now become an important town. It still grows, money is still forthcoming, and Jibouti looks to the future for its return.

Zaila has for numberless years been the point of departure for caravans for Abyssinia. It occupies the same position as before. No caravans ever started from the site whereon the new town of Jibouti now stands. In Zaila the British government has done nothing beyond watch over the caravan route and insure peaceful passage for all who use it. The old order of things continues under circumstances of improved security and a protection on which it is safe to rely. Eastern methods of transportation endure, but the British government protects it.

Jibouti, on the other hand, is a port newly established for the development of western improvements. Modern enterprise has subscribed capital to construct a railroad from the coast and secure the trade with Abyssinia. The enterprise is sound, but, like all undertakings in unknown countries, it has met with difficulties and delay. The country through which the line had to be made was waterless and studded with rocks. Want of funds frequently interrupted the progress of construction. Hostility on the part of the fierce Somali tribes, who gave no welcome to a substitute for the transport provided by the hire of their camels, was, perhaps, as great a source of trouble and loss as either of the others named. However, there is at present, in Jibouti, a large railway station of a size and importance sufficient to represent the existence and establishment of the most paying line in any country, and the rails have been excellently laid for 165 kilometers. The construction has now entered Abyssinian territory, where protection and control are beyond the hands of the French government.

When the railway is completed, if it succeeds, a great boon will have been bestowed upon all those who trade with Abyssinia, since that country may be opened up; but Abyssinians do not appear to be greatly attracted by European products. Till now there has been little demand for aught save rifles, revolvers, and cotton goods, among the inhabitants of Abyssinia. At present, however, there is a disposition on the part of merchants to make use of the railway. From the terminus now reached camels must be engaged and a caravan formed to continue the journey to Harrar. There are signs that this trial of the railway is premature, and cases have occurred and continue to occur, where goods dispatched from Zaila, though leaving subsequent to those sent by rail, have arrived in Harrar first. However, this is a matter which the merchants will inevitably discover themselves. The Zaila route, though known to be slow, is also known to be sure. For the present it must be expected that all traders will wish to try the railway, and a time of depression for Zaila is certainly near at hand. Then the caravans will depend on local trade, and that which is provided by a few conservative Arabs who prefer old ways to new.

## THE EXPANSION OF WINTER FARMING.

BY GEORGE E. WALSH.

The idea prevalent in some quarters that agriculture has not kept abreast of modern industrial developments is so far from the actual truth that occasionally the public is surprised by reports which indicate a change and revolution in methods and results of a most phenomenal character. In nothing has our agriculture changed more decidedly in recent years, however, than in the seasons of production. Science has deliberately set at defiance all the laws which govern the seasons of growth, and in the conflict it has proved a great triumph for man. Winter farming has become in the past decade an industry more profitable and successful than ordinary summer gardening or farming.

The demand for farm products in winter, when most of them are scarce and difficult to secure, has been responsible for the growth and expansion of winter farming. To-day this industry is of national importance, and adds millions of dollars to the wealth of our country. Lands that were formerly considered almost worthless have attained through this industry considerable value, and farmers who were disappointed at the outlook of their profession have suddenly discovered new means of reaping financial rewards for their labor and genius. Instead of following in the old ruts in vogue fifty years ago, they have branched out in entirely new lines to develop an industry that is as fascinating as it is profitable.

Naturally one thinks first of truck gardening, either under glass in the North in winter or along the belt of Southern States, when this subject is broached; but winter farming is not by any means confined to even this field. Winter dairying has become in the last five years one of the most profitable sources of farming, and it is pursued by the most progressive dairymen of the country with great success. By means of the silo, succulent food is stored away for winter feeding that produces almost as fine milk and cream as the June grass. The milk and cream in winter time are worth so much more than in summer that the dairymen find it profitable to provide good winter quarters for the best cows and to feed them with the best food.

The poultry farmer has likewise changed his methods, and by means of the incubator and brooder winter and spring broilers are produced to-day in enormous quantities for our tables. Winter poultry is to-day about the only product of the chicken farm that actually pays a good profit. The high prices obtained for spring chickens and broilers out of season have caused complete changes in this industry. Those who depend upon the eggs for their profits are endeavoring to induce the hens to change their season of laying, so that winter eggs will be had in abundance. Extensive experiments in winter feeding and winter breeding in glass-covered houses have produced results which encourage the poultrymen to believe that eventually breeds of hens will in time be reared which will lay their eggs in winter instead of summer. At present the results obtained are not entirely satisfactory.

Hothouse lambs have become important parts of our winter diet in recent years, and breeders have established enormous houses where these delicate animals can be reared and fattened through the coldest of our winter weather. The work is profitable, and the breeders are increasing the industry each year. Hothouse lambs are delicacies out of season at present, but in the future they may become an ordinary part of our regular winter diet.

Hothouse fruits and vegetables multiply in quantity and quality every year. The industry is expanding so rapidly that the annual winter supplies of these delicacies are running up into thousands of tons. Around Boston there are several hundred acres of land covered with glass where fruits and vegetables are raised for the winter markets. Jersey and Long Island are also centers of this industry, and hundreds of acres are now under cultivation right through the winter. These hothouse products bring high prices all through the winter, and from two to four crops are raised annually on the same land. In the spring, when the weather grows warm, the glass sashes are removed, and the plants for the summer markets are raised as easily as if the land had not been producing all winter. When the cold autumn frosts come, the glass sashes protect the new crop that has been planted for the Christmas holiday seasons. Then when these winter products are harvested, seeds for an early spring crop are sown, and by the time Easter is here fresh vegetables are again ready for picking.

The truck products raised under glass in winter receive the most modern intensive culture. The soil is of the richest, well heated by steam pipes, moistened properly, and sometimes lit artificially at night time by arc lights. The electric light tends to stimulate the growth of certain vegetables, and the season of maturity is thus rapidly hastened. The profits from this business often run from 50 to 80 per cent on the investment, and during the rough winter weather when Southern truck cannot reach the markets, prices for the vegetables raised under glass soar up to almost fabulous prices. Yet in spite of the great number of acres of land covered with glass and devoted to winter farming, the supply hardly keeps pace with the increasing demand, and there is ample opportunity for further expansion in this line.

Winter gardening and farming in the southern belt of States where the climate is warm enough to produce the products out of doors have spread with phenomenal rapidity in recent years. Whole sections of States have been reclaimed by this industry, and land that was worth only a few dollars an acre ten years ago sells to-day for two or three hundred dollars an acre. Our whole system of living and diet has been transformed by this industry, and our winter season is supplied with fruits and vegetables almost as freely as the summer.

The expansion of this form of winter farming has been due to the railroads and steamship companies operating lines along the coast or through the belt of States with climate and soil suitable to the business. The construction of refrigerator cars which would enable growers to ship their strawberries and tomatoes from Florida and Louisiana to New York or Boston in midwinter gave a great stimulus to the industry. It is now possible to land the most perishable fruits and vegetables in New York from the most distant gardens within seventy-two hours after picking and in perfect condition. Each year the source of the supply is extended. It was first the Carolinas, Norfolk and Georgia which monopolized this industry. Then Florida entered the field, and finally the gardens spread along the Gulf and included those in the Mississippi Valley. California made special efforts to ship her fruits and vegetables to Eastern markets in cars made for the purpose, and now Texas and even Mexico are entering the field with their peculiar farm products. There are some 60,000 refrigerator cars engaged in this traffic in the winter season, distributing the fruits and vegetables of the tropical and semi-tropical gardens and farms to the large cities of the North, South, East and West. The best of these cars are scientific products of modern genius, and they carry their loads of fruits as carefully as a Pullman palace car transports its millionaire occupant.

Strawberries from the Carolinas alone amount to some 12,000,000 quarts a year, while California pours across its borders some 193,000,000 pounds of fresh fruits. New York city alone absorbs some 4,000,000 packages of Southern vegetables every winter. All told, the winter farming which supplies the cities with their fruits and vegetables in the cold season represents an industry mounting up into many millions of dollars. All this is pure gain for the farmers and land owners, who formerly made little or nothing from the soil which is now brought under contribution to feed us with a winter diet of fruits and vegetables. The creation and expansion of the industry represents wealth added to the country just as surely as if new gold mines had been discovered which yielded annually a dozen million dollars' worth of the precious metal.

## SCIENCE NOTES.

Prof. Charles Wilson has announced to the Royal Society a new determination of the temperature of the sun. His figures are 6,200 deg. C. (11,192 deg. F.). It is stated that the absorption of the sun's atmosphere probably makes this temperature equivalent to 6,600 deg. C. at the surface.

Tests made of aluminium bronze at the Zurich Polytechnic show that the specific gravity rises and falls as the percentage of aluminium is increased or decreased. For soft alloys the maximum strength was obtained with three and four-tenths per cent of aluminium, for hard alloys with one and four-tenths per cent of aluminium. The addition of silicon increased the specific gravity, but reduced the elasticity. Iron added was not observed to alter the characteristics of the alloy in any great degree.

Near the River Ebrosowka, eastern Siberia, Dr. Herz states that he discovered a huge mammoth preserved in the ice. The animal had assumed a reclining position with its feet peculiarly bent beneath its body. Dr. Herz inferred that it had fallen down a declivity and had been instantly killed. Grass was found in the mouth of the animal, and food in its stomach. Two thousand years elapsed since that last mouthful of grass was torn from the sod. The animal was covered with a coat of rather thick, red-brown hair.

The steamship "Afridi," which dropped anchor in New York Harbor on March 23, brought with her a collection of rare animals for the New York Zoological Gardens. Among them is a three-year-old hairy-eared rhinoceros, one of the only four known to be in captivity; four bears from Korea and Japan; nine monkeys of the red-faced Japanese breed; one fox, one raccoon, two silver badgers, one sand badger, one wild boar, two yellow martens, one lynx, two civet cats, four salamanders, two peacocks, and six parrots. A valuable orang-outang, three gibbon monkeys and a leopard died on the voyage.

The British government has just completed the survey of the English section of the Victoria Nyanza, in central Africa, for the establishment of a steamer service on the lake in connection with the Uganda Railway, which has recently been completed. The surveying has occupied thirteen months and was carried out by two surveyors in two small steel boats. Every part of the British shore of the Nyanza was explored, aggregating over 2,200 miles of coast line, mainland, and islands. The latter have been accurately charted for the first time, and in parts the maps of the lake shore have been altered from their existent physical condition. The lake is studded with a very large number of islands of varying sizes, many of them densely populated. The British portion of the lake is about 135 miles from east to west, and about 90 from the north to the Anglo-German boundary, excluding the eastern gulf, 40 miles long, which has now been properly mapped. The lake is constantly subject to storms, which render it dangerous to navigation. Owing to this fact, and the smallness of the boats, it was not thought advisable to visit three small islands which were visible far out in the lake, but with these exceptions every island has been visited and mapped by the expedition. During the journey the surveyors discovered several islands inhabited by savages. Even some of the tiniest rocky islets were found to be tenanted by fishermen. Preparations are being made for the development of the lake traffic with the opening of the railway, and passengers leaving the train at Port Florence, on the lake shore terminus of the railroad, will step on board twin-screw steamers alongside the jetty, which will convey them to the different stations. One of the steamers for this service has already left England, and should be on the lake by June. Another steamer will follow. These vessels are each 175 feet in length and draw 6 feet of water.

### A NEW MEANS OF USING COMPRESSED AIR IN THE MANUFACTURE OF GLASSWARE.

In the production of hollow glass vessels there have always been two obstacles which from time immemorial have very seriously hampered the glass-blower. Of these obstacles, the first is that the inlet opening of the hollow vessel can never be larger than the end of the blowpipe. The second is that the hollow vessel thus produced can never be greater than the volume of air which a strong man can blow through the pipe, or the mass of glass which he can conveniently handle. The first obstacle has been partially, though indifferently, overcome by subsequent reheating and manipulation. By spurting water through his blowpipe, the glass-blower has succeeded in producing fairly large receptacles, for the expansive force of the steam generated assists the air from his lungs. But despite these ingenious makeshifts it has not been possible to blow a glass receptacle larger than a carboy having a capacity of 25 gallons.

Since the glass-blower's lungs have but a limited power, it was but natural that inventors hit upon the idea of employing compressed air. Philip Arbogast, of Pittsburg, as early as 1881 took out a patent for an invention which contemplated the use of compressed air and which has served as a foundation for subsequent attempts. But although compressed air has been widely employed in the manufacture of certain articles, it has never supplanted the human glass blower, particularly in the making of large receptacles.

A German inventor, Paul T. Sievert, now comes to the fore with a process that bids fair to solve the problem of blowing large vessels and overcoming the difficulties which have hitherto baffled the glass manufacturer. By means of this new process vessels varying in size and shape from the tiniest watch-glass to the largest bath-tub can be blown with a facility which has never been hitherto attained. That the Sievert process is capable of fulfilling these claims is clearly shown in the sixth of our figures. All the vessels pictured in the illustration were completely blown without any subsequent grinding or cutting. The time in which these receptacles were made is almost incredible. The production of the bath-tub was a matter of not more than five minutes. Several days in the cooling oven were, however, still required before the tub was ready for use. Moreover, the process of making these vessels is singularly clean. No rubbish heap of broken glass is to be seen anywhere in the Sievert plant in Dresden.

The means by which glass is blown into pots and tubs of any size will be best understood by reference to Figs. 1, 2, 3, and 4, representing the various stages in the blowing process. The apparatus employed consists of a thick, perforated cast-iron plate having the form of the opening of the tub to be produced. On the raised margin of the plate a separable frame is placed, held in position by locking-levers, which frame serves the purpose of confining the outer edge of the glass mass within the limits of the cast-iron plate. The combined plate and frame are mounted on a hollow shaft, journaled in suitable bearings and arranged to turn. By means of the hollow shaft and the perforated iron plate, compressed air can be forced into the molten glass. From a ladle suspended from a traveling-crane a sufficient quantity of molten glass is poured on the iron plate. Our first figure represents this stage.

The liquid glass flows over the entire plate and beneath the superposed frame surrounding the plate. Since the metal cools more rapidly at the margin, the glass begins to congeal and stiffen first at its outer edge. When this marginal rigidity has been reached, the entire plate and frame is turned through a half circle. Fig. 2 shows the plate as it is describing its half turn. The glass lies on the plate in a smooth, glittering layer. It is still hot, but not self-luminous; and for that reason its color is black in our pictures.

The glass no longer rests on the plate, but hangs therefrom, supported by the chilled and now rigid outer edge. But the central portion being still ductile and plastic begins to sink. In order that the glass may thus fall uniformly throughout its mass, a bed-plate, operated by rack-and-pinion and a chain-gear, is brought into contact with the slowly sinking bag of plastic glass. Upon this bed the glass spreads and forms the bottom of the tub. Fig. 3 pictures this stage of the process.

By allowing the bed to fall slightly the glass is pulled down and the walls of the tub formed. The glass has become cool and tough by this time. Through the hollow shaft and the perforated iron plate compressed air is now forced into the forming tub, the operator so controlling the current that the tub's walls can be given any inclination. When the tub has been given the desired form the air blast is cut off.

In order to release the finished tub from the perforated iron plate the parts of the superposed frame (now, however, located beneath the plate) are separated by means of the levers previously mentioned; the bed is allowed to descend still further; and the finished bath-tub, rigid, though still hot, is liberated from the grip of the frame and iron plate. Fig. 4 shows the completed product. The hot glass tub is now hauled on a cart to a cooling oven.

In exactly the same manner a glass receptacle of any size or shape can be blown. The weight of the plastic mass is no longer a hindrance to the glass-blower; it is even utilized in the production of the finished product.

The Sievert process is not limited to the making of pots, trays, tubs, bottles, and like utensils. It seems destined to have no small influence on our methods of making plate-glass. From the recent articles which have appeared in the SCIENTIFIC AMERICAN, our readers will understand that the window-glass which we employ is rolled out and then polished. Herr Sievert, however, intends to dispense with all rolling machinery and to blow his plate very much as he blows his bath-tubs and pots. So far as we are at present informed two methods are pursued in blowing plate glass, which methods are respectively pictured in Figs. 5 and 7.

The first of these methods consists in blowing a cylinder (Fig. 5) after the manner previously described; in allowing this cylinder to cool; in cutting it lengthwise into two parts and severing the bottom from the body; and in causing these severed portions to flatten into plates by the application of heat. The second of these methods (Fig. 7) consists in blowing glass into the form of a huge box by means of a cubical mold and in breaking away the five plates formed by the bottom and sides. Fig. 7 shows the box in process of formation and represents a gigantic bubble of glass 4 feet high and 5 feet wide, the thickness of the walls being somewhat more than one-tenth of an inch.

Although the Sievert process can be followed in blowing all kinds of receptacles, it is found in actual practice in the making of small utensils that the glass chills too quickly to be blown into shape. Another method has, therefore, been devised no less ingenious than the first.

We all know that a drop of water that has fallen upon a hot object—a stove, a glowing sheet of glass—does not come in contact with the hot surface, for the reason that it is buoyed up by a cushion of vapor. Nor does the drop boil rapidly away. It is slowly converted into steam and then gradually disappears. This "caloric paradox," as it is sometimes called by physicists, is profitably employed by the glass-blower; for, the water does not cause the glass to crack, and generates enough steam to assist in expanding the vessel at the end of the blow-pipe. Upon the same phenomenon Herr Sievert bases his method of forming small glass utensils, reversing it, however, by placing his hot glass on a layer of water instead of blowing water into his hot glass.

In order to make a developing tray such as every photographer uses, very hot and therefore very liquid glass is poured on a sheet of wet blotting-paper. The glass does not touch the paper, does not even scorch it, but dances on the wet surface as it flows in all directions. By means of a wet roller, such as every housewife uses in flattening dough, the glowing mass is distributed evenly in a thin layer. The plate thus formed is lifted with a pair of tongs and laid on a sheet of wet asbestos upon which it still continues to dance. Upon the plastic plate a mold of the tray to be produced is then placed. The steam generated, which is the cause of the restlessness of the plate, then forces the plastic mass up into the mold. The tray is finished. And thus it is possible to produce a glass vessel of any shape whatever.

### Zeppelin Ruined by His Airship.

Count von Zeppelin, who has the distinction of having built the largest of all airships, has been financially ruined by his aeronautical experiments. Unable to obtain means for carrying out his new projects, he is now breaking up the old framework of his airships in order to sell the aluminium of which they are composed. Zeppelin is sixty-seven years of age. He is something of a historical personage. He was military attaché of the German Embassy during the civil war, and made several balloon ascensions from battlefields of the South in 1863. He was the leader of the famous cavalry raid into France in 1870 which marked the commencement of hostilities of the great Franco-Prussian war.

### Austria Adopts the Braun Wireless Telegraphy System.

It is announced that Siemens & Halske, the owners of the Braun patents, have signed a contract with the Austrian government for the installation of the Braun system of wireless telegraphy on the Adriatic coast.

Several designs of hods are now made of steel, and they are said to be much lighter and more serviceable than those of wood. These are pressed out of a single piece of metal, which fact is said to account for their great durability.

## Correspondence.

### That Frozen Mammoth.

To the Editor of the SCIENTIFIC AMERICAN:

I have read with great interest in your issue of April 12, the note on the recent discovery of the body of a mammoth, in cold storage, by Dr. Herz in the ice-bound region of Eastern Siberia. This, it seems to me, is more than a "Rosetta Stone" in the path of the geologist. It offers the strongest testimony in support of the claim that all the glacial epochs and all the deluges the earth ever saw, were caused by the progressive and successive decline of primitive earth-vapors, lingering about our planet as the cloud vapors of the planets Jupiter and Saturn linger about those bodies to-day.

Allow me to suggest to my brother geologists that remnants of the terrestial watery vapors may have revolved about the earth as a Jupiter-like canopy, even down to very recent geologic times. Such vapors must fall chiefly in polar lands, through the channel of least resistance and greatest attraction, and certainly as vast avalanches of tellurio-cosmic snows. Then, too, such a canopy, or world-roof, must have tempered the climate up to the poles and thus afforded pasturage to the mammoth and his congeners of the Arctic world—making a greenhouse earth under a greenhouse roof. If this be admitted, we can place no limits to the magnitude and efficiency of canopy avalanches to desolate a world of exuberant life. It seems that Dr. Herz's mammoth, like many others found buried in glacier ice, with their food undigested in their stomachs, proves that it was suddenly overtaken with a crushing fall of snow. In this case, with grass in its mouth unmasticated, it tells an unerring tale of death in a snowy grave. If this be conceded, we have what may have been an all-competent *source of glacial snows*, and we may gladly escape the unphilosophic alternative that the earth grew cold in order to get its casement of snow, while, as I see it, it *got its snows and grew cold.*

During the igneous age the oceans went to the skies, along with a measureless fund of mineral and metallic sublimations; and if we concede these vapors formed into an annular system, and returned during the ages in grand installments, some of them lingering even down to the age of man, we may explain many things that are dark and perplexing to-day.

As far back as 1874 I published some of these thoughts in pamphlet form, and it is with the hope that the thinkers of this twentieth century will look after them that I again call up the "Canopy Theory."

ISAAC N. VAIL.

Pasadena, Cal., April 16, 1902.

### Crossing the Sahara by Balloon.

The aeronautical problem which is just now receiving most attention in France is a voyage across the great desert of Sahara. M. Deburaux considers it absolutely practicable to travel from Tunis to the Niger by means of the winds traveling in that region. He declares himself ready to make the experiment. Up to the present time his ambition has remained unrealized, for the reason that the necessary funds have not been forthcoming. To construct and equip a balloon with a carrying capacity of several passengers would entail a cost of about $160,000. For economical reasons the plan has been advocated of sending up an experimental balloon controlled by automatic devices. The expense involved in this undertaking would be only about $4,000.

The equilibrium of this experimental balloon is to be maintained by means of a steel cable weighing half a ton. Ballast in the shape of 5,000 pounds of water is carried in the tank. Automatic means are provided to discharge this ballast when the balloon falls to within 150 feet of the ground. The balloonette, which has figured so prominently in the Santos-Dumont airship, will be used to keep the gas bag in shape, in spite of the leakage of gas. Prof. Deburaux believes that the nomadic tribes of the desert, who might pick up this balloon, would probably convey the information of their find to civilization. But whether the nomads of the desert are sufficiently imbued with the scientific spirit, is a matter of some doubt. Perhaps a better plan would be to offer a reward for the return of the balloon or of some account of its fate.

### St. Louis Airship Races.

The conditions of the races for the capital prize of $100,000, offered by the World's Fair management have been published. Tentative rules for the time of the races, shape of course, type of airship, and the like have been drawn up. It has been definitely decided that $200,000 shall be appropriated for the contest, to be divided as follows: $100,000 for a grand capital prize; $50,000 to be divided into a number of subsidiary prizes; and $50,000 devoted to the conduct of the competition and the payment of general expenses.

## FROZEN MAMMOTH IN SIBERIA.*

By O. F. HERZ.

[ABOUT the middle of April, 1901, the Imperial Academy of Sciences of St. Petersburg was informed by V. N. Skripitsin, governor of Yakutsk, of the discovery of a mammoth in an almost perfect state of preservation, frozen in the cliff along the river Beresovka, the right tributary of the river Kolyma, about 200 miles northeast of Sredne-Kolymsk, about 800 miles westward of Behring Strait, and some 60 miles within the Arctic Circle.

Thanks to the courtesy of Finance Minister Witte, 16,300 rubles were assigned for the prompt dispatch of an expedition to examine and secure this valuable find. O. F. Herz, a zoologist of the Imperial Academy of Sciences, was appointed chief of this expedition; E. V. Pfizenmeyer, zoological preparator of the same institution; and O. P. Sevastianoff, a geological student of the Yuryevck University, his assistants. The expedition started from St. Petersburg on May 3, 1901, and its chief reached the mammoth region on September 9.]

August 31-September 5.—After reaching Mysova we were unable to proceed directly to the mammoth region for three or four days because of the absence of the Cossack Yavlovski, who did not return until September 3. He informed us that serious illness had prevented him from visiting the mammoth region in the spring, and consequently the find had not been covered with earth and stones to prevent its injury by rain and beasts of prey. Unfortunately, the summer rains had washed a mass of earth down the slope in which the mammoth lies, and this had considerably damaged the hind part of the body. Wolves and bears had caused further injury to the head.

As I did not personally see the Lamut, S. Tarabykin, who discovered the mammoth, I can only give the story of the find as told me by Yavlovski. The Lamut, while deer hunting, was led to the discovery by finding a tusk a short distance above the real find. Upon the mammoth's head there was but one tusk, which the Lamut and two companions chopped out. As the latter afterward informed me, there was no trunk. At the end of August, 1900, all three repaired to Kolyma, where they sold the ivory to Yavlovski, telling him of the discovery. The Cossack, being an intelligent man, investigated the find personally, procured small portions of the body as evidence, and reported to the police commissioner, who in turn informed the governor of the matter.

September 11, 1901.—It was so warm to-day that the soil became loose and easily handled, and I was enabled to begin the work of excavation. The body lies in a cliff that faces east and extends for a mile in a semi-circle. The mammoth is about 67 yards back from the bank of the river. There is an upper stratum of earth, covered with moss. Beneath this is a mass of loam and earth mixed with stones, roots, pieces of wood, and lamellar plates of ice. Underneath this alluvial layer there is a vertical wall of ice, which stands free above the mammoth. Upon this supposed ice incline are huge shapeless masses of earth, evidently moved downward by the thawing of the ice as well as the water falling from the upper "tiaga" or marshy forest at the top of the cliff. According to natives, the head of the mammoth was exposed two years ago by the breaking away of a mass of earth; the rest of the body in August, 1900.

* Extracts, translated for the Smithsonian Annual Report, from the diary of O. F. Herz, chief of the expedition of the Imperial Academy of Sciences of St. Petersburg to the River Beresovka for the excavation of the frozen mammoth.

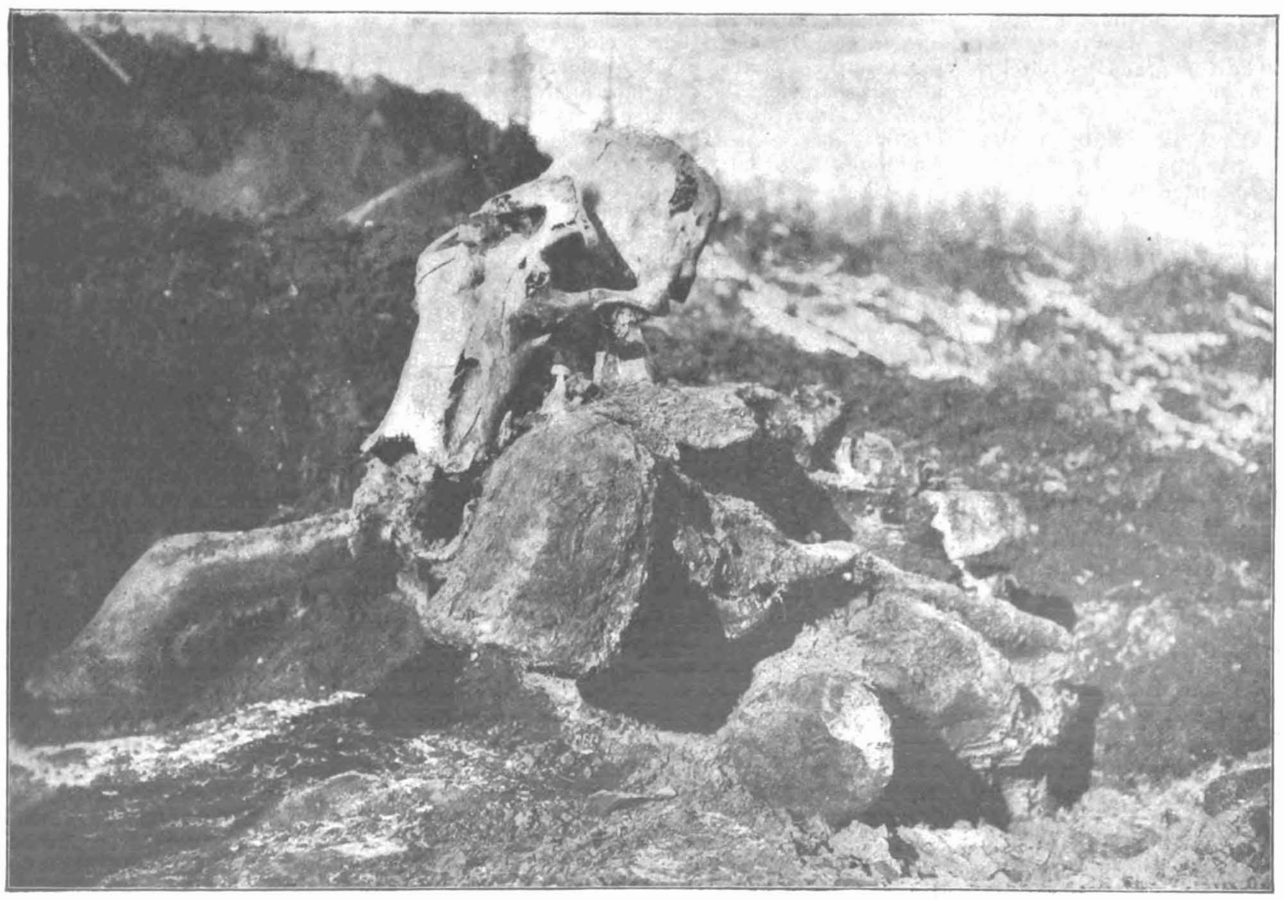
After taking some pictures, I began the excavation, and soon exposed the skull. To my great surprise I found well-preserved food fragments between the teeth, and this fact serves as proof that the animal died in this very position after a short death struggle. I found the marks made by the Lamuts in removing the left tusk, but I could find no traces of the right one.

LEFT FOREFOOT OF MAMMOTH.

At a depth of 27 inches we found the left fore-leg, still covered with hair up to the humerus, notwithstanding that the epidermis had completely rotted. In a frozen condition we may succeed in getting it to St. Petersburg. The hair appears to consist of a yellowish-brown under-coat 10 to 12 inches long with a thick, bristle-like upper coat, rust-brown in color, about 4 to 5 inches long. The left fore-leg is bent, so that it is evident that the mammoth tried to crawl out of the pit or crevice into which he probably fell, but apparently he was so badly injured by the fall that he could not free himself. Further excavation exposed the right hind-leg, which had become turned almost horizontally under the abdomen. Upon the left hind-leg I found portions of decayed flesh, in which the muscular bundles were easily discernible. The stench emitted by this extremity was almost unbearable.

September 12.—After we removed the earth from under the left leg, the thick underwool was exposed. Part fell out, but the remainder will be saved by bandages. The color may be described as roan. Five hoof-shaped blunt nails could also be seen at the end of the digits.

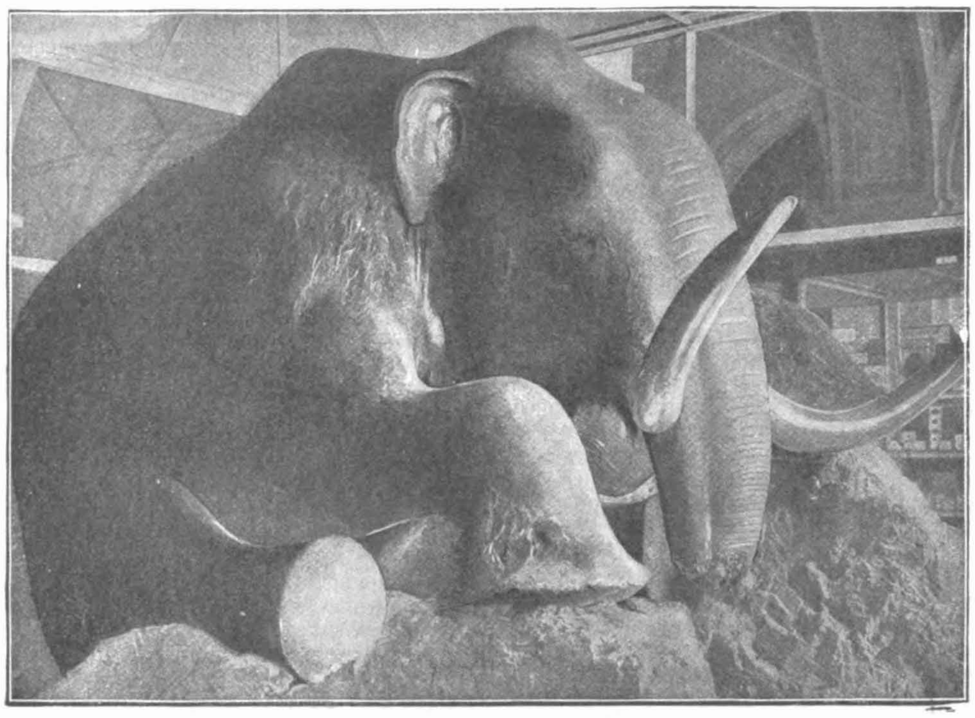
Considerable ice was found in uncovering the right fore leg, from which most of the hair was missing.



SIDE VIEW OF THE MAMMOTH AFTER PARTIAL EXCAVATION.

The leg was so placed as to indicate that the mammoth after falling had supported himself on this leg while attempting to step forward with the left one. We concluded that he had died while in this position, and that he had by no means been washed there by water from elsewhere. The presence of the thick wool showed that the animal was well adapted to endure cold. It is improbable that he died from hunger, for a large quantity of food was found in his stomach, which was similar to that found between his teeth.

September 14.—The mound was opened further south and southeastward, but no trace of the trunk was found. At a distance of about five inches from the upper edge of the sole of the right hind foot we found the tip of the tail. This tip is 9 inches long, with hairs 4 inches long, standing out in bunches around the end. The hair at the basal end is dirty yellow ocher in color, while further down it becomes much darker.



MAMMOTH FROM BERESOVKA IN THE ZOOLOGICAL MUSEUM IN ST. PETERSBURG, RECONSTRUCTED IN THE POSITION IN WHICH IT WAS FOUND.

September 15.—I stopped further excavation until my companions, who were left behind, can arrive, and Mr. Sevastianoff can make the geological survey. In order to be able to dismember the mammoth after the severe cold weather sets in, I intend to build a structure over the animal that can be heated. Meanwhile I covered the body with tarpaulin to protect it from the weather.

September 17.—According to my opinion, the entire cliff rests upon a glacier which was disintegrating and in which there were deep crevices. The water that flowed down from the "tiaga" and from the neighboring hills, mixed with earth, stones, and pieces of wood, gradually filled these crevices. The whole was later covered with a layer of soil, upon which a rich flora doubtless developed, that served as excellent food for mammoths and other animals. Whether this flora is identical with the present flora will be known when the food fragments found in the mammoth can be examined.

September 19.—The timber for the building of a house over the mammoth is already cut and prepared.

Despite the fact that the carcass is in a frozen condition, the smell emitted is very disagreeable.

September 20.—At the exact hour of my prediction, Mr. Pfizenmeyer arrived with the rest of the transport equipment. Mr. Sevastianoff, however, was not with him.

September 30.—To-day we made the first experiments in heating the house, and the arrangement appears to be excellent.

October 2.—To-day in clearing away the earth from the occiput and back, we exposed several broken ribs and several lumbar vertebræ. Under the middle part of the abdomen we found yellowish-brown underwool 8 to 12 inches long.

October 3.—After removing the last layer of earth from the back, the remains of food in the stomach were exposed. The latter was badly decayed, while the other organs, exposed later, were practically destroyed.

October 4.—We removed the left shoulder blade and part of the ribs, and then cleaned part of the stomach, which contained an immense quantity of food remnants. In the afternoon we severed the left foreleg.

October 5.—To-day we skinned the left side and exposed several ribs, mostly well preserved. Then we skinned the head, of which parts were preserved. In the afternoon we removed the left shoulder, upon which we allowed the tendons and muscular fibers to remain. The flesh from under the shoulder, which is fibrous and marbled with fat, is dark red in color and looks as fresh as well-frozen beef or horse meat. The dogs cleaned up whatever mammoth flesh was thrown to them. The skin on the left shoulder is three-quarters inch thick, and on the right side nine-tenths inch thick.

The longest hair found came from the shoulders. It is ashy or pale blond in color, and is probably what has been erroneously called the mammoth mane.

October 6.—We bandaged the left fore-leg, packed it in hay and then wrapped it in sackcloth. Later these things will all be sewed up in skins.

We then amputated the right fore-leg above the shoulder, and removed the shoulder bone, which was broken, evidently when the animal fell. The well-preserved flesh and fat will be packed for shipment. I collected several dry and frozen bits of blood.

October 7.—To-day we packed up the right leg. I succeeded in removing a further portion of the stomach, which I will take with me, in a good state of preservation.

October 8.—The left side of the broken pelvis was removed. The flesh beneath this was found frozen hard as a stone and well preserved. The crossbone or sacrum was found intact.

October 9.—To-day we cut off the hind-legs, experiencing great difficulty with the thigh bones, so strongly were they joined with the tibia. The color of the hair of the right hind femur varies from rust-brown to black.

October 10.—After removing about 270 pounds of flesh, we started to raise the abdominal skin, which weighed about 470 pounds, when to our great joy we discovered the entire tail. This is short and consists evidently of 22 to 25 caudal vertebræ. The length, measured at the underside, is only 14½ inches, while the circumference at the base is 13 inches. It was covered with long, bristly hair, rust-brown in color. We could not decide to cut up the abdominal skin, and will attempt to take it with us intact.

October 11.—To-day we performed the last operations on the mammoth, after which all the parts were brought into the winter house, and securely packed away for transportation.

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**Preservation of Plaster Casts.**—Upon complete drying, small objects are laid for a short while in celluloid varnish of 4 per cent, while large articles are painted with it, from the top downward, using a soft brush. Articles set up outside and exposed to the weather are not protected by this treatment, while others can be readily washed off and cleaned with water. To cover 10 square meters of surface, 1 liter of celluloid varnish is required.—Chemiker Zeitung.

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[Continued from SUPPLEMENT No. 1515, page 24276.]

## BREEDING AND HEREDITY.*

WILLIAM BATESON, M.A., F.R.S.

### SEGREGATION.

WHERE the proper precautions have been taken, the following phenomena have been proved to occur in a great range of cases, affecting many characters in some thirty plants and animals. The qualities or characters the transmission of which in heredity is examined are found to be distributed among the germ-cells, or gametes, as they are called, according to a definite system. This system is such that these characters are treated by the cell divisions (from which the gametes result) as existing in pairs, each member of a pair being alternative or *allelomorphic* to the other in the composition of the germ. Now, as every zygote—that is, any ordinary animal or plant—is formed by the union of two gametes, it may either be made by the union of two gametes bearing similar members of any pair, say two blacks or two whites, in which case we call it *homozygous* in respect of that pair, or the gametes from which it originates may be bearers of the dissimilar characters, say a black and a white, when we call the resulting zygote *heterozygous* in respect of that pair. If the zygote is homozygous, no matter what its parents or their pedigree may have been, it breeds true indefinitely unless some fresh variation occurs.

If, however, the zygote be heterozygous, or gametically cross-bred, its gametes in their formation separate the allelomorphs again, so that each gamete contains only one allelomorphic character of each pair. At least one cell division in the process of gametogenesis is therefore a differentiating or segregating division, out of which each gamete comes sensibly pure in respect of the allelomorph it carries, exactly as if it had not been formed by a heterozygous body at all. That, translated into modern language, is the essential discovery that Mendel made. It has now been repeated and verified for numerous characters of numerous species, and, in face of heroic efforts to shake the evidence or to explain it away, the discovery of gametic segregation is, and will remain, one of the lasting triumphs of the human mind.

In extending our acquaintance of these phenomena of segregation we encounter several principal types of complication.

*Segregation Absent or Incomplete.*—From our general knowledge of breeding we feel fairly well satisfied that true absence of segregation is the rule in certain cases. It is difficult, for instance, to imagine any other account of the facts respecting the American Mulattos, though even here sporadic occurrence of segregation seems to be authenticated. Very few instances of genuine absence of segregation have been critically studied. The only one I can cite from my own experience is that of *Pararge egeria* and *egeriades*, "climatic" races of a butterfly. When crossed together, they give the common intermediate type of northwestern France, which, though artificially formed, breeds in great measure true. This crossed back with either type has given, as a rule, simple blends between intermediate and type. My evidence is not, however, complete enough to warrant a positive statement as to the total absence of segregation, for in the few families raised from pairs of artificial intermediates some dubious indications of segregation have been seen.

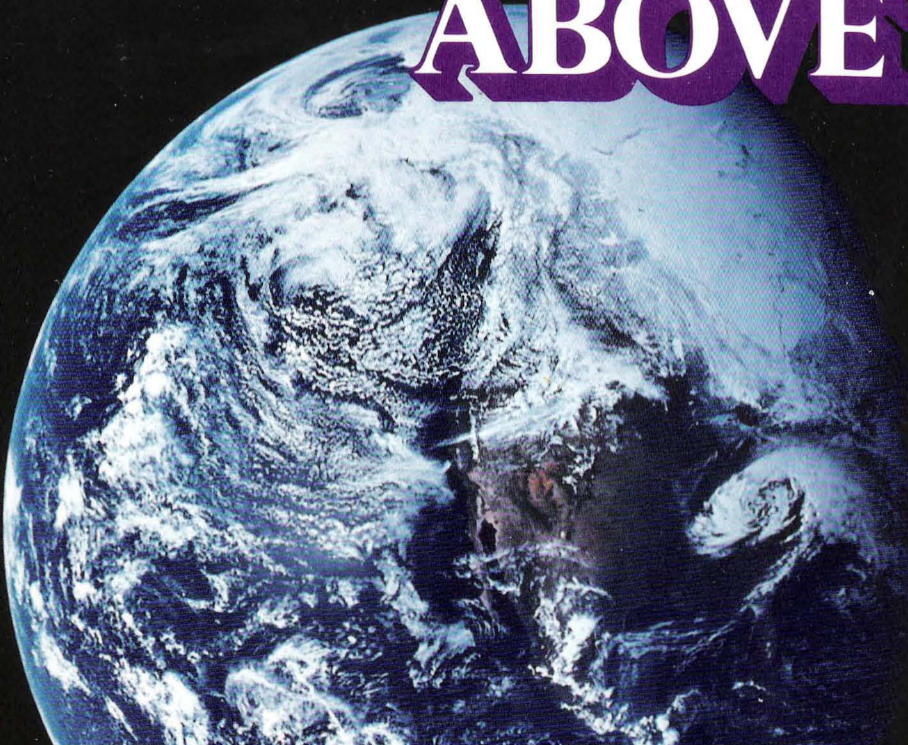
The rarity of true failure of segregation when pure

* Read before the section of zoology of the British Association for the Advancement of Science.

SKULL OF THE MAMMOTH WITH FOOD REMNANTS (*f*) BETWEEN THE MOLAR TEETH.

JOSEPH C. DILLOW

# THE WATERS ABOVE



EARTH'S PRE-FLOOD VAPOR CANOPY

FOREWORD BY HENRY M. MORRIS

Other writers have extensively documented the case for a global deluge. It is, however the effect of sudden cooling caused by the condensation of earth's pre-Flood canopy that is of particular relevance to this discussion. It is clear that the mammoths lived in a warm climate and after a continental-wide catastrophe became buried by the "countless thousands," and were then frozen into the muck of the permafrost. The fact that they were frozen into this muck is generally accepted. What contemporary geologists do not believe is that this freezing of the mammoth was a sudden affair that was accompanied by a general sudden climatic reversal. Not only does the evidence reveal a general climatic reversal described above, but there is evidence of local more drastic climate catastrophes also.

A striking illustration of this turned up in the stomach of the Beresovka mammoth (1901) where about 24 pounds of undigested vegetable matter were uncovered, possibly indicating (as will be discussed below) a sudden deep freeze (that is, in a few hours). The Russian scientist V. N. Sukachev, Who examined these remains, was able to identify many different species of plants, some of which no longer grow that far north, and others which grow both in Siberia today and also in Mexico.

## IDENTIFICATION OF STOMACH CONTENTS

The following list of stomach contents is compiled from the report of Sukachev, the Russian scientist who first examined them, with his comments, an extensive compilation of the remains by William Farrand, and a list given by Osborn with comments by botanist A. A. Case of the University of Missouri.

[Here follows a list of 60 unique identifiable varieties of plants.]

We may draw several general conclusions from these data:
(1) The presence of so many varieties that generally grow much to the south indicates that the climate of the region was milder than that of today.
(2) The discovery of the ripe fruits of sedges, grasses, and other plants suggests that "the mammoth died during the second half of July or the beginning of August."
(3) The Beresovka mammoth apparently did not feed primarily on coniferous vegetation, but mainly on meadow grasses.

(4) The mammoth must have been overwhelmed suddenly with a rapid deep freeze and instant death. The sudden death is proved by the unchewed bean pods still containing the. beans that were found between its teeth, and the deep freeze is suggested by the well-preserved state of the stomach contents and the presence of edible meat.

## Evidence of a Sudden Deep Freeze of Some of the Mammoths

Several lines of evidence seem to converge on the conclusion that at least some of the mammoths were frozen quickly at drastically reduced temperatures. Others, in fact most, froze much more slowly.

### The state of preservation of the stomach contents

When the list of stomach remains cited above was presented to Mahler and Lipscomb, professional botanists at the Southern Methodist University Herbarium, they were amazed. It seemed incredible to them that the remains could have been so well preserved that Sukachev was able to distinguish so clearly between the species. They were surprised because of the presence in the stomach of digestive juices, which act quickly to break down the vegetable material of the delicate parts of the plants that were found in the Beresovka mammoth. Since the elephant is not a ruminant (having a multichambered stomach), acid deterioration and enzyme activity would be major factors in breaking down the "cement" that holds together the cellulose in plant fiber. Since the mechanical action of the stomach would break up all vegetable matter within half an hour, the animal must have died within half an hour oj swallowing this food. According to the Dallas coroner, acid and enzyme action would completely dissolve the delicate parts of these plants within a matter of hours. He said he would be "shocked" to see them in recognizable form a day after the death of the animal.

Dr. C. W. Foley, a veterinary physiologist, was asked how long the delicate parts of these plants would last in the stomach of a mammoth after death. He responded, "I wouldn't think they would last more than a couple of hours, maybe more in a ruminant."

What precisely did Sukachev find? He discovered that the blossoms of the Alopecurus alpinus in the stomach were so well preserved that he could establish the species with exactitude. Apparently, in the case of the *Alopecurus alpinus* the delicate hair-like follicles on the leaves were so well preserved that Sukachev could relate them to a particular species. Even the color of the leaves — brown — was still intact, indicating that no leaching of the pigment occurred prior to freezing.

How long could such delicate plant remnants last in the stomach juices of a dead mammoth? Garriott and Foley indicated that they could last only a matter of hours and still be in recognizable form. In order to substantiate their estimates, an experiment was conducted with the aid of Dr. Larry Bruce, a gastro-intestinal physiologist with the University of Texas Health Science Center at Dallas. First, a solution of stomach fluid was prepared by mixing 70 micromoles of swine pepsin with a 0.1 normal solution of HCl with a pH of 1 (250 mg of pepsin per 100 ml HCl). To this solution a small amount of NaCl (0.9%) was added as a catalyst. This solution was then poured into four different beakers, each at a different temperature: 4°C, 17° C, 27° C, and 37° C.

After the temperatures had been established, some gladioli and carnations were compacted into the beakers so that the surface level of the solution corresponded to the top of the flower compaction. The stems, leaves, and flowers were all included. On the assumption that it was necessary to have delicate parts of the plants in order to identify them at the species level, these four solutions were left to act on the flowers until they were in each case beyond recognition. Although the observation of this process proved to be highly subjective, four categories of decay were observed:

A = first appearance of dye from the flowers in the solution;
B = the beginning of a loss of flower structure;
C = structural support completely gone, flower petal dissolved beyond recognition; and
D = leaching of flower petal pigment.