that the ice has not time to melt, with the result that it explodes. It continues its disintegrating process for a period of 24 hours and weakens the gorge wherever placed."

Meanwhile, more than a hundred charges of dynamite were placed in the ice by the Pennsylvania Railroad Co., at Brandon, where the depth of ice was 12 feet. The first charge was set off at 11 a. m., March 4, and the dynamiting was continued until March 9, when a channel almost a mile long and 100 feet wide had been blown through the supposed neck of the gorge.

The first use of the thermite was at Venango Yards, some 6 miles above the dynamiting operations at Brandon on March 4. The 200-pound charge caused a heavy explosion, and a spectacular display of fire, smoke, and steam, but apparently little melting of the ice.

Thermite was used almost daily between Brandon and Venango until March 9, when, in the words of a Pennsylvania News staff reporter, "Movement of the gorge was abandoned in the hopelessness of the insurmountable task."

On March 20, when the rain and warm weather caused the river to back up behind the gorge, as described above, Doctor Barnes began using thermite near Brandon. The gorge finally yielded, as previously related.

This is believed to be the first time thermite has been used for the purpose in this country, a matter of historical interest.

Opinions as to the effectiveness of the thermite in breaking up the Franklin gorge differ widely. Pennsylvania Railroad Co. engineers believe that the use of thermite at the strategic points was responsible for a decided disintegration of the ice, which resulted in the final breakup. Others, who were in close contact with the use of both dynamite and thermite, are of the opinion that the ice would have gone out at the same time from natural causes and with no more damage to property if neither had been used.

551.58 (755)

THOMAS JEFFERSON ON THE CLIMATE OF VIRGINIA

In 1788 the firm of Prichard & Hall, in Market Street, between Front and Second Streets, Philadelphia, published Thomas Jefferson's "Notes on the State of Virginia." Through the kindness of Dr. H. C. Frankenfield we are able to reprint a portion of this fascinating old work, the only change in form being the use of the modern lower-case "s." Let Jefferson himself write the rest of this introduction:

The following Notes were written in Virginia in the year 1781, and somewhat corrected and enlarged in the winter of 1782, in answer to Queries proposed to the Author, by a Foreigner of Distinction, then residing among us. The subjects are all treated imperfectly; some scarcely touched on. To apologize for this by developing the circumstances of the time and place of their composition, would be to open wounds which have already bled enough. To these circumstances some of their imperfections may with truth be ascribed; the great mass to the want of information and want of talents in the writer. He had a few copies printed, which he gave among his friends: and a translation of them has been lately published in France, but with such alterations as the laws of the press in that country rendered necessary. They are now offered to the public in their original form and language.

Feb. 27, 1787. . . .

QUERY VII

A NOTICE of all that can increase the progress of human knowledge?

Under the latitude of this query, I will presume it not improper nor unacceptable to furnish some data for estimating the climate of Virginia. Journals of observations on the quantity of rain, and degree of heat, being lengthy, confused, and too minute to produce general and distinct ideas, I have taken five years' observations, to wit, from 1772 to 1777, made in Williamsburgh and neighbourhood, have reduced them to an average for every month in the year, and stated those averages in the following table, adding an analytical view of the winds during the same period.

	Fall of rain, &c. in inches.	Least & greatest daily heat by Farenheit's thermometer.	WINDS								
			N.	N.E.	E.	S.E.	S.	S. W.	W.	N.W.	Total
Jan	3.192	38½ to 44	73	47	32	10	11	78	40	46	337
Feb	2.049	41 47½	61	52	24	11	4	63	30	31	276
March	3.95	48 54½	49	44	38	28	14	83	29	33	318
April	3.68	56 62½	35	44	54	19	9	58	18	20	257
May	2.871	63 70½	27	36	62	23	7	74	32	20	281
June	3.751	71½ 78¼	22	34	43	24	13	81	25	25	267
July	4.497	77 82½	41	44	75	15	7	95	32	19	328
August	9.153	76¼ 81	43	52	40	30	9	103	27	30	334
Sept	4.761	69½ 74¼	70	60	51	18	10	81	18	37	345
Octo	3.633	61¼ 66½	52	77	64	15	6	56	23	34	327
Nov	2.617	47¾ 53½	74	21	20	14	9	63	35	58	294
Dec	2.877	43 48¾	64	37	18	16	10	91	42	56	334
Total	47.038	8 A. M. 4 P. M.	611	548	521	223	109	926	351	409	3698

The rains of every month, (as of January for instance) through the whole period of years, were added separately, and an average drawn from them. The coolest and warmest point of the same day in each year of the period were added separately, and an average of the greatest cold and greatest heat of that day, was formed. From the averages of every day in the month, a general average for the whole month was formed. The point from which the wind blew was observed two or three times in every day. These observations, in the month of January for instance, through the whole period amounted to 337. At 73 of these, the wind was from the North; at 47, from the North-east, &c. So that it will be easy to see in what proportion each wind usually prevails in each month: or, taking the whole year, the total of observations through the whole period having been 3698, it will be observed that 611 of them were from the North, 558 from the North-east, &c.

Though by this table it appears we have on an average 47 inches of rain annually, which is considerably more than usually falls in Europe, yet from the information I have collected, I suppose we have a much greater proportion of sunshine here than there. Perhaps it will be found there are twice as many cloudy days in the middle of Europe, as in the United States of America. I mention the middle parts of Europe, because my information does not extend to its northern or southern parts.

In an extensive country, it will of course be expected that the climate is not the same in all its parts. It is remarkable that, proceeding on the same parallel of latitude westwardly, the climate becomes colder in like manner as when you proceed northwardly. This continues to be the case till you attain the summit of the Alleghaney, which is the highest land between the ocean and the Missisipi. From thence, descending in the same latitude to the Missisipi, the change reverses; and, if we may believe travellers, it becomes warmer there than it is in the same latitude on the sea side. Their testimony is strengthened by the vegetables and animals which subsist and multiply there naturally, and do not on our sea coast. Thus Catalpas grow spontaneously on the Missisipi, as far as the latitude of 37° and reeds as far as 38°. Perroquets even winter on the Sioto, in the 39th degree of latitude. In the summer of 1779, when the thermometer was at 90° at Monticello, and 96 at Williamsburgh, it was 110° at Kaskaskia. Perhaps the mountain, which overhangs this village on the North side, may, by its reflexion, have contributed somewhat to produce this heat. The difference of temperature of the air at the sea coast, or on Chesapeak bay, and at the Alleghaney, has not been ascertained; but cotemporary observations, made at Williamsburgh, or in its neighbourhood, and at Monticello, which is on the most eastern ridge of mountains, called the South West, where they are intersected by the Rivanna, have furnished a ratio by which that difference may in some degree be conjectured. These observations make the difference between Williamsburgh and the nearest mountains, at the position before mentioned, to be on an average 6⅛ degrees of Farenheit's thermometer. Some allowance however is to be made for the difference of latitude between these two places, the latter being 38° 8′ 17″ which is 52′ 22″ North of the former. By cotemporary observations of between five and six weeks, the averaged and almost unvaried difference of the height of mercury in the barometer, at those two places, was .784 of an inch, the atmosphere at Monticello being so much the lightest, that is to say, about one-thirtyseventh of its whole

weight. It should be observed, however, that the hill of Monticello is of 500 feet perpendicular height above the river which washes its base. This position being nearly central between our northern and southern boundaries, and between the bay and Alleghaney, may be considered as furnishing the best average of the temperature of our climate, Williamsburgh is much too near the South-eastern corner to give a fair idea of our general temperature.

But a more remarkable difference is in the winds which prevail in different parts of the country. The following table exhibits a comparative view of the winds prevailing at Williamsburgh, and at Monticello. It is formed by reducing nine months observations at Monticello to four principal points, to wit, the North-east, South-east, South-west, and North-west; these points being perpendicular to, or parallel with our coast, mountains and rivers: and by reducing in like manner, an equal number of observations, to wit, 421 from the preceding table of winds at Williamsburgh, taking them proportionably from every point.

	N. E.	S. E.	S. W.	N. W.	Total.
Williamsburgh	127	61	132	101	421
Monticello	32	91	126	172	421

By this it may be seen that the South-west wind prevails equally at both places; that the North-east is, next to this, the principal wind towards the sea coast, and the North-west is the predominant wind at the mountains. The difference between these two winds to sensation, and in fact, is very great. The North-east is loaded with vapour, insomuch, that the salt-makers have found that their crystals would not shoot while that blows; it brings a distressing chill, is heavy and oppressive to the spirits: the North-west is dry, cooling, elastic and animating. The Eastern and South-eastern breezes come on generally in the afternoon. They have advanced into the country very sensibly within the memory of people now living. They formerly did not penetrate far above Williamsburgh. They are now frequent at Richmond, and every now and then reach the mountains. They deposit most of their moisture however before they get that far. As the lands become more cleared, it is probable they will extend still further westward.

Going out into the open air, in the temperate, and in the warm months of the year, we often meet with bodies of warm air, which, passing by us in two or three seconds, do not afford time to the most sensible thermometer to seize their temperature. Judging from my feelings, only, I think they approach the ordinary heat of the human body. Some of them perhaps go a little beyond it. They are of about 20 or 30 feet diameter horizontally. Of their height we have no experience, but probably they are globular volumes wafted or rolled along with the wind. But whence taken, where found, or how generated? They are not to be ascribed to volcanoes, because we have none. They do not happen in the winter when the farmers kindle large fires in clearing up their grounds. They are not confined to the spring season, when we have fires which traverse whole counties consuming the leaves which have fallen from the trees. And they are too frequent and general to be ascribed to accidental fires. I am persuaded their cause must be sought for in the atmosphere itself, to aid us in which I know of but these constant circumstances; a dry air; a temperature as warm at least as that of the spring or autumn; and a moderate current of wind. They are most frequent about sun-set; rare in the middle parts of the day; and I do not recollect having ever met with them in the morning.

The variation in the weight of our atmosphere, as indicated by the barometer, is not equal to two inches of mercury. During twelve months observation at Williamsburgh, the extremes were 29, and 30.86 inches, the difference being 1.86 of an inch; and in nine months, during which the height of mercury was noted at Monticello, the extremes were 28.48 and 29.69 inches, the variation being 1.21 of an inch. A gentleman, who has observed his barometer many years, assures me it has never varied two inches. Cotemporary observations, made at Monticello and Williamsburgh, proved the variations in the weight of air to be simultaneous and corresponding in these two places.

Our changes from heat to cold, and cold to heat, are very sudden and great. The mercury in Farenheit's thermometer has been known to descend from 92° to 47° in thirteen hours.

It is taken for granted, that the preceding table of average heat will not give a false idea on this subject, as it proposes to state only the ordinary heat and cold of each month, and not those which are extraordinary. At Williamsburgh in August 1766, the mercury in Farenheit's thermometer was at 98° corresponding with 29⅓ of Reaumur. At the same place in January 1780, it was 6° corresponding with 11½ below 0 of Reaumur. I believe these may be considered to be nearly the extremes of heat and cold in that part of the country. The latter may most certainly, as, at that time, York river, at York town, was frozen over, so that people walked across it; a circumstance which proves it to have been colder than the winter of 1740, 1741, usually called the cold winter, when York river did not freeze over at that place. In the same season of 1780, Chesapeak bay was solid, from its head to the mouth of the Patowmac. At Annapolis, where it is 5¼ miles over between the nearest points of land, the ice was from 5 to 7 inches thick quite across, so that loaded carriages went over on it. Those, our extremes of heat and cold, of 6° and 98° were indeed very distressing to us, and were thought to put the extent of the human constitution to considerable trial. Yet a Siberian would have considered them as scarcely a sensible variation. At Jenniseitz in that country, in latitude 58° 27′ we are told, that the cold in 1735 sunk the mercury by Farenheit's scale to 126° below nothing; and the inhabitants of the same country use stove rooms two or three times a week, in which they stay two hours at a time, the atmosphere of which raises the mercury to 135° above nothing. Late experiments show that the human body will exist in rooms heated to 140° of Reaumur, equal to 347° of Farenheit's, and 135° above boiling water. The hottest point of the 24 hours is about four o'clock, P. M. and the dawn of day the coldest.

The access of frost in autumn, and its recess in the spring, do not seem to depend merely on the degree of cold; much less on the air's being at the freezing point. White frosts are frequent when the thermometer is at 47° have killed young plants of Indian corn at 48° and have been known at 54°. Black frost, and even ice, have been produced at 38½° which is 6½° above the freezing point. That other circumstances must be combined with the cold to produce frost, is evident from this also, that on the higher parts of mountains, where it is absolutely colder than in the plains on which they stand, frosts do not appear so early by a considerable space of time in autumn, and go off sooner in the spring than in the plains. I have known frosts so severe as to kill the hiccory trees round about Monticello, and yet not injure the tender fruit blossoms then in bloom on the top and higher parts of the mountain; and in the course of 40 years, during which it has been settled, there have been but two instances of a general loss of fruit on it; while in the circumjacent country, the fruit have escaped but twice in the last seven years. The plants of tobacco, which grow from the roots of those which have been cut off in the summer, are frequently green here at Christmas. This privilege against the frost is undoubtedly combined with the want of dew on the mountains. That the dew is very rare on their higher parts, I may say with certainty, from 12 years observations, having scarcely ever, during that time, seen an unequivocal proof of its existence on them at all during summer. Severe frosts in the depth of winter prove that the region of dews extends higher in that season than the tops of the mountains; but certainly, in the summer season, the vapours, by the time they attain that height, are become so attenuated as not to subside and form a dew when the sun retires.

The weavil has not yet ascended the high mountains.

A more satisfactory estimate of our climate to some, may perhaps be formed, by noting the plants which grow here, subject however to be killed by our severest colds. These are the fig, pomegranate, artichoke, and European walnut. In mild winters, lettuce and endive require no shelter; but generally they need a slight covering. I do not know that the want of long moss, reed, myrtle, swamp laurel, holly and cypress, in the upper country, proceeds from a greater degree of cold, nor that they were ever killed with any degree of cold in the lower country. The aloe lived in Williamsburgh in the open air through the severe winter of 1779, 1780.

A change in our climate however is taking place very sensibly, heats and colds are become much more moderate within the memory even of the middle-aged. Snows are less frequent and less deep. They do not often lie, below the mountains, more than one, two, or three days, and very rarely a week. They are remembered to have been formerly frequent, deep, and of long continuance. The elderly inform me that the earth used to be covered with snow about three months in every year. The rivers, which then seldom failed to freeze over in the course of the winter, scarcely ever do so now. This change has produced an unfortunate fluctuation between heat and cold, in the spring of the year, which is very fatal to fruits. From the year 1741 to 1769, an interval of twenty-eight years, there was no instance of fruit killed by the frost in the neighbourhood of Monticello. An intense cold, produced by the constant snows, kept the buds locked up till the sun could obtain, in the spring of the year, so fixed an ascendancy as to dissolve those snows, and protect the buds, during their development, from every danger of returning cold. The accumulated snows of the winter remaining to be dissolved all together in the spring, produced those overflowings of our rivers, so frequent then, and so rare now.

The answer to QUERY VII then closes with a detailed description of the phenomenon of *looming* as it affected distant hills visible from Monticello.