

# The birth of modern meteorology



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*Cover: A follower of Galileo, the scientist Evangelista Torricelli (1608-1647), invented the barometer in 1642 by inverting a glass tube filled with mercury in a container also filled with mercury.*

*Flammarion, L'atmosphère, Paris 1925. Library of the Musée d'histoire des sciences*

## From observation of natural phenomena to meteorological forecasts

For several centuries before becoming a scientific discipline in its own right, meteorology was restricted to the observation and description of “meteorites”, atmospheric phenomena (hail, rain, tornados, cyclones, lightning, auroras) that did not seem to obey any known laws of physics.

The birth of meteorology coincided with the scientific revolution and the appearance of the first measuring instruments – thermometers, barometers, hygrometers, anemometers – which quantified observations that had hitherto been subjective.

During the 19th century, meteorology developed through continuous observation of the four main parameters of temperature, pressure, humidity and wind, initially at a continental scale then worldwide.

# The thermometer

## Objective measurement of temperature

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Thought to have been invented by Galileo, thermometers appeared in Italy at the end of the 17th century. They were quickly adopted in many fields including medicine, chemistry and physics. Thermal expansion of a liquid (alcohol or mercury) enclosed in a sealed glass tube was the main method used.

Liquid expands as it is heated and contracts when it cools. The first thermometers, made by craftsmen, were difficult to compare with each other. Scales were often arbitrary and the number of graduations were different from one instrument to the next. It wasn't until the mid-18th century that the boiling and freezing temperatures of water were (generally) taken as fixed points.

***Thermoscope (replica)***  
*MHS 1882*  
*Alcohol, glass, 20th century*

# The temperate degree of the earth

## 0 on the thermometer

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In 1738, the Genevan surveyor and scientist Micheli du Crest (1670-1766) made a thermometer that he claimed was the first instrument to be universal. It could be made in a number of identical models based on the dimensions of the tubes and the purity of the alcohol used. Measurements could therefore be compared easily.

Another feature of Micheli's thermometers is that they display 100 degrees of heat and 30 degrees of cold. One hundred corresponds to the boiling point of water. 0 is defined as Temperate, (around 8°C) equivalent to the temperature, assumed to be constant, prevailing in the cellars of the Paris Observatory. According to Micheli, this temperature, a kind of natural reference found in all caves and cellars on the earth's surface, is much easier to measure than the freezing point of water which is confused with that of melting ice.

The universal thermometer of Micheli du Crest was quite well received by scientists at the time, but did not supplant the thermometer invented by the Frenchman René-Antoine Ferchault de Réaumur (1683-1757) from 1730, and its scale between 0 (temperature at which water freezes) and 80 (point at which alcohol boils).

In 1742, the Swedish astronomer and physicist Anders Celsius (1701-1744) invented a mercury thermometer with the boiling point of water at 0 degrees and the freezing point at 100. Fifteen years later, another Swede, the botanist Carl von Linné (1707-1778) improved Celsius' instrument by reversing the scale thus giving us the first modern thermometer.



***Alcohol thermometer, after Micheli***

*MHS 2165*

*Wood, glass, alcohol, unsigned, 18th century (?)*

# Maximum-minimum thermometers

## Retention of maximum and minimum temperatures

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The most frequently used thermometers in meteorology are those that show maximum and minimum temperatures registered between two readings. These thermometers appeared in the 18th century. They were equipped with small markers which moved in the tube, driven by mercury or alcohol.

To record the maximum temperature, the metallic marker is pushed in front of the mercury column as it expands. When the mercury retracts, the marker remains in place in the tube, indicating the highest temperature.

To record minimum temperatures, the thermometric liquid used is generally alcohol into which a small enamel tube which serves as the marker, is inserted. When the temperature drops, the alcohol moistens the marker and draws it along as it contracts. As the temperature rises, the alcohol expands and flows between the tube and marker which remains in place. The part of the marker opposite the reservoir then indicates the lowest temperature.



**Maximum-minimum thermometer**

MHS 581

Pictet collection

Wood, glass, alcohol, mercury, Bellani, Milan, 1802

# Barometers

## Weighing the air

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The first appearance of a barometer was in 1643, the work of the Italian Evangelista Torricelli (1608-1647) who showed that the weight of ambient air is counter-balanced by a 760 mm column of mercury, a metallic liquid which is 13 times denser than water. Torricelli's experimental installation introduced the principal of the barometer. A long glass tube open at one end is filled to the top with mercury. The tube is then turned over in a bowl of mercury with the open end sunk into the mercury in the bowl. The tube partly empties. The mercury settles at a height of about 760 mm, which corresponds to the atmospheric pressure on the surface of the mercury in the bowl. In the upper part of the tube, until then full of mercury ... a vacuum!

During the same century, the Frenchman Blaise Pascal (1623-1662) replicated Torricelli's experiment on the summit of the Puy de Dôme, at 1000 m altitude. He observed that the weight of air, in other words atmospheric pressure, reduces with altitude.

Inspired by the experimental designs of Torricelli and Pascal, the barometers which made their first appearance in the 17th century were often rudimentary. Several adjustments were therefore made to improve reliability and legibility: purification of the mercury used, a very large bulb, an inclined tube, a circular dial, etc.



### **Dial barometer**

MHS 80

Pictet collection

Wood, glass, Torr , Paris, end 18th century

# Field barometer

## Calculating altitude from atmospheric pressure

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The first barometers were designed to take observations in a fixed location. In order to transport them scientists had to empty out the mercury then refill before taking new measurements, being careful not to allow air bubbles to form in the glass tube. The operation took a long time and was awkward.



In the 18th century, barometers became portable. To avoid the movement of the mercury breaking the glass during transport, barometers were made with U-shaped tubes. Some had a bottle shaped reservoir at the lowest portion of the tube, others had taps to close off the mercury. The major innovation which definitively transformed barometers into field instruments was a bowl of variable capacity. The mercury reservoir into which the vertical glass tube was inserted was equipped with a leather base. During transport, a screw could be tightened to elevate the leather base so that the mercury completely filled the tube and the reservoir.

Amongst other refinements, a float was introduced which showed the level of the mercury, visible through a small window, which could easily be brought back to zero on the barometric scale. Finally, the instrument was often encased and protected by a wooden cylinder which could serve as a tripod while taking measurements in the field.

Portable barometers were particularly used for determining the altitude of measuring stations from the height of the mercury column and the temperatures of the air and of the mercury according to barometric formulae set out by, amongst others, the Geneva physicist Jean-André De Luc (1717-1817).

***Barometer with a variable reservoir***

*MHS 1059*

*Pictet collection*

*Wood, glass, brass, Gourdon, Geneva, 19th century*



**Measuring pressure in the field**

*Amédée Guillemin, les phénomènes de la physique, Paris, 1869*  
 Library of the Musée d'histoire des sciences

**Portable siphon barometer**

MHS 2000

Wood, glass, Paul, Geneva, 1788

An example of a portable barometer developed by the Genevan physicist Jean-André De Luc, improved by Marc-Auguste Pictet (1752-1825) and made by Jaques Paul (1733-1796) in 1788 in Geneva. This type of instrument accompanied Horace-Bénédict de Saussure (1740-1799) during his ascension of Mont Blanc in July 1787.

The curved glass tube has two unequal branches. A semi-porous tap made of fishbone (to allow the mercury to seep through when the pressure difference was too wide) allowed the mercury to be enclosed in the long branch of the tube during transport. A mobile indicator facilitated reading of the height of the mercury. This instrument originally had two thermometers, one to measure the temperature of the mercury the other (missing) to measure the air temperature.



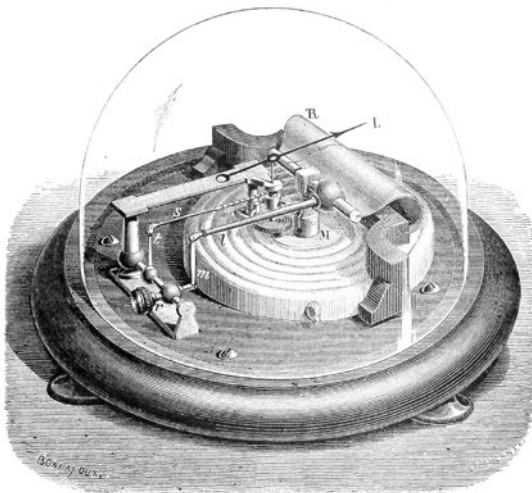
# Aneroid barometer

## Capsules replace mercury

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Because of the toxicity of mercury, classical barometers using mercury are now only used in meteorological institutes. They have been replaced by electronic barometers in which air pressure is measured by a capsule made of a piezoelectric material whose electrical resistance varies as a function of the constraint exerted by the weight of the air.

It is possible to buy other types of aneroid barometers which work without mercury. These instruments appeared at the end of the 19th century. They are equipped with small metal capsules containing springs, hermetically sealed in a vacuum. Under the effect of air pressure variations, the springs which form the walls of the capsule expand or contract. These deformations are mechanically amplified by levers which move a needle in front of a display dial. From the mid-19th century, some aneroid barometers have become recording instruments by virtue of incorporating a marker pen and a roll of paper moved by clockwork.



**Aneroid capsule barometer**  
*Alphonse Ganot, Traité de physique,*  
*Paris, 1884*  
*Library of the Musée d'histoire des*  
*sciences*



**Aneroid barometer**

MHS 2009

Aluminium, brass, glass, Malacrida, Toulon, end 19th early 20th century

# Anemometers

## Measuring wind speed

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The wind blows when there are temperature differences in the air and therefore differences in pressure. It always flows from high to low pressure.

The first anemometers appeared in the 15th century. They were essentially a metal ball which swung at the end of a vertical arm. The stronger the wind the greater the swings. This type was replaced by pressure anemometers. A vertical plate was exposed to the wind. The angle of inclination of the plate indicated the strength of the wind. From the 18th century anemometers equipped with blades or cups appeared and are used in the present day. The speed of the wind is proportional to the speed of the rotation of the instrument.

A weathervane is often attached to an anemometer in order to indicate the direction of the wind.

### **Anemometer**

*MHS 12*

*Steel, brass, lead, Paul, Geneva, 18th century*

An anemometer with a vertical plate invented by Horace-Benedict de Saussure by the Geneva maker Jaques Paul. The force of the wind is literally weighed by weights placed along the arm of the beam to maintain the plate exposed to the wind vertical.



# Atmospheric humidity

## Measuring the amount of water vapour in the air

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The atmosphere naturally contains water. Clouds, fog, mist and one's glasses fogging up all attest to this.

The first hygrometers, designed to measure humidity in the air, appeared in the 17th century. Most of them used properties found in organic materials such as woolen yarn, oat-beard, or gut which change in weight or size with changes in humidity.

In the mid-18th century, the Genevan naturalist Horace-Bénédict de Saussure invented a hair hygrometer which became a great commercial success. More than 100 examples were sold, and foreign makers continued to produce them right up to the beginning of the 20th century.



***Hair hygrometer***

*MHS 355*

*Brass, Paul, Geneva, around 1780*

It exploits the hygroscopic properties of human hair, that is, elongation in humid conditions and retraction in dry conditions. The instrument consists of a brass frame on which is stretched a human hair from which the grease is removed beforehand. One end of the hair is fixed with a screw, the other is rolled around a pulley attached to a needle which moves along a dial scaled from 0 (point of absolute dryness) to 100 (extreme humidity). The hair is kept under tension with the help of a counterweight which is wound around the second pulley groove.



**Dew-point hygrometer or Daniell hygrometer**

*MHS 224*

*Glass, wood, bone, Newman, London, around 1820*

Invented by John Frederic Daniell (1790-1845), the eponymous hygrometer measures the temperature at which dew forms. One bulb, coloured, contains ether, the other is wrapped in a band of gauze. A thermometer is placed in the coloured sphere. A second thermometer fixed to the stand of the instrument, measures the air temperature. When the humidity is measured, the air temperature is recorded by the central thermometer. Ether is then dripped onto the gauze in order to cool it through evaporation. This causes the pressure in the tube to drop. Boiling under pressure reduces the amount of ether in the bulb and gradually reduces the temperature until mist appears on its outside wall due to condensation of moisture in the air.

# Relative humidity

The influence of temperature and pressure on the amount of water contained in the air

Before successfully commercialising his hair hygrometer, Saussure used it in his laboratory to carry out detailed research into hygrometry, a largely neglected field of physics at the time. He published his findings in *Essais sur l'hygrométrie* in 1783 which means that he is sometimes looked upon as the father of modern meteorology. Of particular note in the publication is the double-entry table indicating the weight of moisture within a given volume of air as a function of temperature at a constant pressure. The figures clearly show that the weight of moisture in the air increases as the temperature rises. Saussure thus showed, but without naming it, a new fundamental parameter of meteorology: relative humidity or, in other words, the relationship between the quantity of water in the air relative to

Temp. Deg. du therm.	- 10	- 5	0	+ 5	+ 10	+ 15	+ 20	+ 25	+ 30
40	0,8971	1,1067	1,1653	1,6843	2,0779	2,5634	3,1625	3,9016	4,8134
45	1,0676	1,3171	1,6248	2,0045	2,4749	2,9952	3,6952	4,5588	5,6242
50	1,2197	1,5047	1,8563	2,2909	2,8211	3,4852	4,2997	5,3045	6,5442
55	1,4116	1,7414	2,1483	2,6503	3,2696	4,0335	4,9761	6,1199	7,5737
60	1,6411	2,0246	2,4976	3,0599	3,7737	4,6554	5,7434	7,0856	8,7415
65	1,9204	2,3691	2,9226	3,6055	4,4489	5,4871	6,7697	8,3518	10,3036
70	2,2277	2,7482	3,3903	4,1824	5,1596	6,3651	7,8526	9,6878	11,9518
75	2,5525	3,1507	3,8375	4,7342	5,8404	7,2059	8,8888	10,9661	13,5289
80	2,8955	3,4734	4,2850	5,2862	6,5213	8,0459	9,9251	12,2446	15,1062
85	3,1095	3,8361	4,7324	5,8381	7,2022	8,8859	10,9654	13,5231	16,6834
90	3,4035	4,1987	5,1797	6,3900	7,8831	9,7259	11,9977	14,8016	18,2607
95	3,6946	4,5578	5,6227	6,9420	8,5640	10,5659	13,0340	16,0800	19,8379
98	3,8739	4,7790	5,8956	7,2731	8,9725	11,0699	13,6558	16,8472	20,7844

Table indicating the quantity of water contained in a square foot of air as a function of the temperature and the rate of humidity measured by the hygrometer.

H-B de Saussure, *Essais sur l'hygrométrie*, Fauche. Neuchâtel, 1783-1788

the saturation maximum. The warmer the air, the more water it can contain in the form of vapour. Inversely, when the air cools, the vapour condenses in the form of water droplets.

Relative humidity varies with air temperature. During the day, as the temperature rises, relative humidity falls while absolute humidity remains unchanged. For meteorologists, knowing the relative humidity (which depends on air temperature and pressure) is very important because it enables forecasts of precipitation.

At the beginning of the 19th century, psychrometers made their appearance. These instruments were specially designed to measure relative humidity. They were equipped with two thermometers, one exposed to the air while the other was wrapped in damp muslin. The drier the air, the higher the evaporation and the greater the drop in temperature in the dampened thermometer. The difference in temperature between the two thermometers is reported on a psychrometric table which gives the relative humidity.



***Sling psychrometer***

*MHS 2773*

*Aluminium, glass, Météosuisse, 20th century*

# Machine to simulate the aurora borealis

A real experimental apparatus to demonstrate an incorrect theory

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If there is one meteorological feature that has long intrigued scientists, it's the polar aurora which occurs in the high latitudes of the North and South Poles. In past centuries many theories about their causes were proposed: showers of fire, violent storms, etc. During the 19th century, it was noticed that the aurora disturbed the operation of compasses and telegraph lines. Scientists thus thought that the aurora could be caused by electricity being released from the Poles to the upper atmosphere.

The Genevan physicist Auguste de la Rive (1801-1873) thought that the colourful and shifting lights were the result of interactions between electricity and earth's magnetism. In order to prove it, he built an experimental apparatus which simulated the aurora in two large glass cloches partly emptied of air and submitted to high voltage electrical discharges. The



***Machine to simulate the aurora borealis***

*MHS 501*

*Wood, glass, steel, brass, De la Rive, SIP, Geneva, around 1850*

cloches, representing the Poles, are placed on each end of a large wooden ball containing a magnetised pole which symbolises the earth and its magnetic field. When electrical current is fed into the cloches (through an induction coil), red and blue lights are formed which turn slowly around the magnetised pole, just as the aurora in the sky.

Made and commercialised by the Société d'instruments de physique of Geneva (SIP), the machine to produce the aurora was sold to laboratories and research institutes all over Europe.

As to De la Rive's theory, it lasted for about 50 years until the Norwegian physicist Kristian Birkeland (1867-1917) showed through experiment and field observation, that the Polar aurora have an extraterrestrial origin and that it results from interactions between high energy particles emitted by the sun and atmospheric constituents.



### **Northern lights**

*Amédée Guillemin, Les phénomènes de la physique, Paris, 1869*  
*Library of the Musée d'histoire des sciences*

# Waterspouts

## Apparatus to demonstrate their formation

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Belonging to the meteor category, in other words unexplained natural phenomena, waterspouts and tornados were historically popular subjects of study for physicists who tried to explain their origins and causes. For some time, it was even thought that waterspouts were of volcanic origin.

Developed by the Genevan scientist Jean-Daniel Colladon (1802-1893), the apparatus to demonstrate 'the formation of rising waterspouts' used a bladed current meter turned by hand. Sawdust added to the water made the rising movements visible which enhanced simulation of the phenomenon.

How waterspouts are formed is still not completely understood by meteorologists. They occur mainly during stormy weather in summer when there are very steep thermal differences between the hot water of a lake or the sea and cool surrounding air. Horizontal air currents suddenly veer upright sucked up by the upward movement of clouds, and form the reversed funnel of the spout.

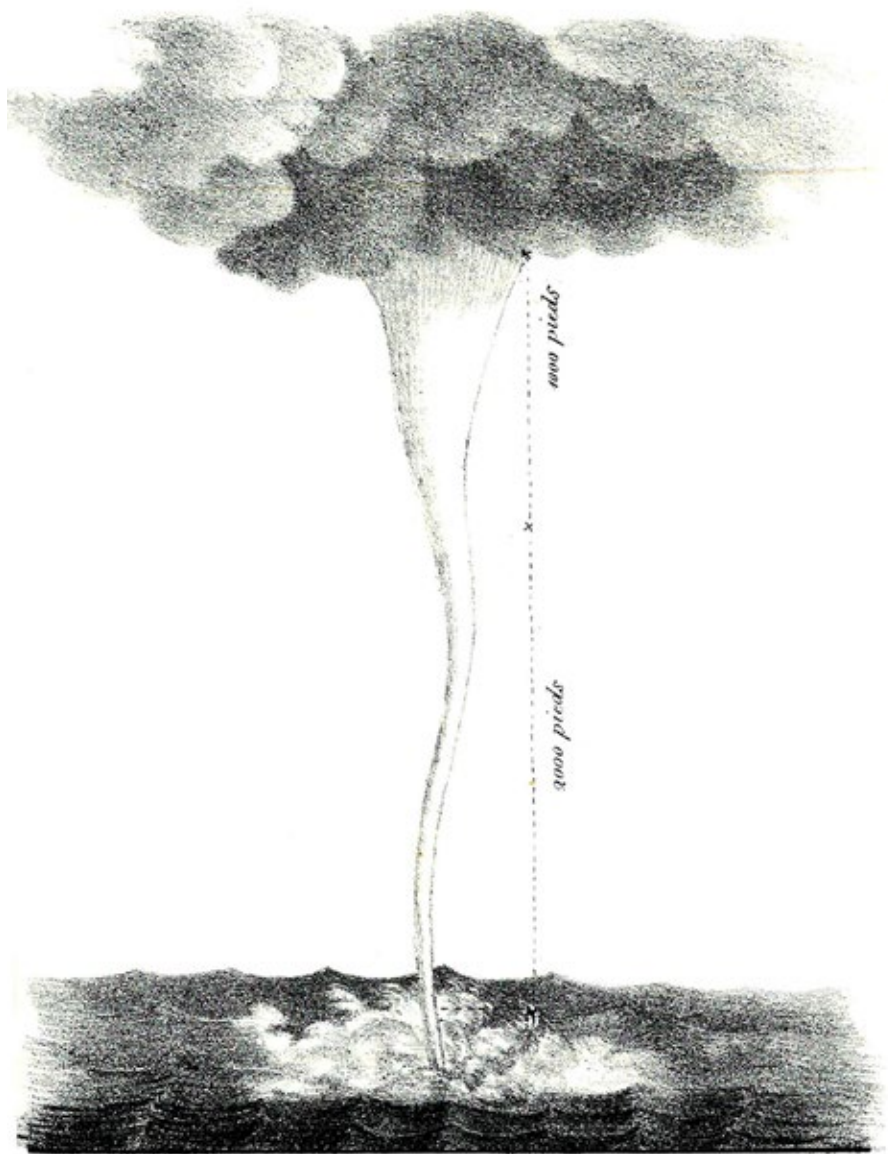
Jean-Daniel Colladon designed the instrument in the hope that it could be copied and used for instruction in mechanics and physics workshops. It figured for a number of years in the sales catalogues of the Société d'instruments de physique (SIP) of Geneva for 150 francs.



***Apparatus for the demonstration of waterspouts***

*MHS 230*

*Iron, glass, brass, Colladon, Geneva, 1887-1896*



***Waterspout on Lac Léman (Lake Geneva)***

*Bibliothèque universelle des arts et des sciences, tome 36, Geneva, 1827*  
*Library of the Musée d'histoire des sciences*

# The birth of modern meteorology

## Establishment of measuring stations across Europe

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From the 18th century, physicists who had access to barometers, quickly established a link between weather and atmospheric pressure. On the approach of a weather event (rain, storm, tempest), the mercury column fell. It climbed back up when good weather returned. In Geneva, observation showed that pressure was at its highest under northerly winds and that it dropped under southerly or south-westerly winds.

In the mid-19th century, as a result of research into destructive storms, scientists realised that meteorological phenomena are not local but that they originate, move and occur on a continental scale. The first of a network of measuring stations was built in Europe at this time. Thanks to measurements made by the stations the role of atmospheric pressure in the variation of weather was conclusively proven. Zones of high and low pressure were measured over the whole of Europe and transcribed onto maps. Meteorologists discovered that wind follows isobars (lines of equal pressure). In the Northern hemisphere, winds circle clockwise in an anticyclone (zone of high pressure) while in a depression (zone of low pressure) they circle anticlockwise.



**Isobars shown on a map**  
*MétéoSuisse, 11 October 2020*

# The history of meteorology in Geneva

More than two hundred and fifty years of continuous measurement

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Geneva has a long tradition of weather measurement. Measurements were begun in 1760 and have continued uninterrupted until the present. Several well-known scientists sacrificed themselves to the task of carrying out measurements several times a day: Jacques-André Mallet (1740-1790), Marc-Auguste Pictet (1752-1825), Jean Senebier (1742-1809) and Frédéric-Guillaume Maurice (1750-1826). The measures taken were generally pressure, temperature, humidity, electricity in the air, cloud cover and magnetic declination.

Measuring weather was largely a response to agricultural needs. Natural resources were limited in the Geneva area so it was important to plant varieties of cereals and vegetables that were well-adapted to the climate. These measurements, which began before the industrial revolution, mean that the climate of Geneva is one of the best-documented in Europe.



**Geneva Observatory and its meteorological station, around 1880**

*CIG/Bibliothèque de Genève*

JOURNAL DE GENEVE.

Samedi 27 OCTOBRE 1787.

Octobre.	Baromètre.				Thermomètre.				Hygromètre.				Électromètre.		
	Levor du S.	h. sup.	mil.	Couch. du S.	Levor du S.	h. sup.	Gr. du S.	Levor du S.	h. sup.	Gr. du S.	Levor du S.	h. sup.	Gr. du S.	Levor du S.	Gr. du S.
18) Jeudi	26.11.	7	26.10.	1	26.9.14	+ 4.4	8.3	+ 9.0	100.	98.	91.	0.7	12.0	0.5	
19) Vendredi	26.10.	15	26.10.	7	26.10.7	+ 4.4	7.0	+ 5.3	97.	94.	89.	0.0	0.6	1.0	
20) Samedi	26.10.	15	26.11.	1	26.11.1	+ 1.6	8.6	+ 6.3	97.	87.	84.	1.0	0.7	1.3	
21) Dimanche	26.11.	14	26.11.	11	26.11.11	+ 1.1	7.7	+ 5.6	100.	78.	84.	0.3	4.0	8.0	
22) Lundi	27.0.	8	26.11.	14	26.11.8	+ 0.6	8.6	+ 6.7	100.	79.	86.	1.0	1.2	0.6	
23) Mardi	26.11.	11	26.11.	12	26.11.8	+ 6.0	8.6	+ 7.8	95.	96.	99.	0.4	0.2	0.3	
24) Mercredi	26.11.	11	26.11.	11	26.11.11	+ 6.1	10.0	+ 7.1	100.	86.8	86.5	0.0	0.0	1.3	

Octobre.	État du Ciel.				Vent.				Pluie en 24 h.	Temp. en 24 h.	Hum. de la nuit.	Déliv. de la pluie.
	Levor du S.	h. sup.	mil.	Couch. du S.	Levor du S.	h. sup.	Gr. du S.	Cours du S.				
18) Jeudi	Cl. & Nua.	Couvert.	Couvert.	S.	S.	N. N.	S.	2.3	0.8	11.	50	55
19) Vendredi	Couvert.	Nuaq. épais	Nuaq. ros.	S.	N. N.	S.	N.	1.3	1.0	9.3	51	57
20) Samedi	Couvert.	Nua blanc.	Nuaq. noir.	O.	N.	N.	N.	0.0	0.1	9.	50	51
21) Dimanche	Nuaq.	idem.	Cl. N. noir.	O.	N.	N.	N.	0.0	0.2	9.	50	51
22) Lundi	Brouill. nu.	idem.	Couvert.	O.	N. N.	S. E.	N. E.	0.0	0.8	10.	51	51
23) Mardi	Couvert.	Couvert.	idem.	O.	N. O.	N. O.	N. O.	1.2	0.1	10.5	50	55
24) Mercredi	Brouill. nu.	Nuaq. bl.	Nuaq. noir.	O. O.	N. N.	S.	S.	0.0	0.2	10.5	49	51

Octobre.	Se. No.	Position des Planètes le 20.			
		Levor du S.	h. sup.	mil.	Couch. du S.
27) Samedi	11 41.44.1	6 51'	5. 8'	5.5.22	7. M. 07 à VII h.
28) Dimanche	11 41.56.8	6 53'	5 6	6 10	9 4 jusqu'à
29) Lundi	11 41.54.9	6 58'	5 5	7 7	10 15 1 Noy.
30) Mardi	11 41.49.2	6 56'	5 1	8 13	11 17 & 6 ros.
31) Mercredi	11 41.47.0	6 52'	5 2	9 26	0 S. 7 viront
1) Jeudi	11 41.46.0	6 59'	5 0	10 48	0 45 de 9 à 9
2) Vendredi	11 41.45.1	7 0	4 59	11 56	1 18 & demi.

**Prix des Denrées taxées par Messieurs de la Justice.**

Prix de la Viande.	Bœuf.	Pâche.	Veau & M.	Prix de Charbon.	Fayard.	Mûle.	Châtaigne.	Bœuf.
	10 l.	7 l.	9 l.	1. 2. —	1. 6. 6 l.	1. 7. —	1. 4. 6 l.	

**Prix des Denrées qui varient dans les différents marchés.**

Prix du	Froment.	Avoine.	Orge.	Vin de Cor.	Mûlière.	Regain.	Paille de Fr.	Seigle.
20 Samedi	de 10 à 16 fl.	de 10 à 12 fl.	18 fl.	7 à 7 fl. 6	5 à 5 fl. 6		22 à 28 fl.	
22 Mercredi	idem.	idem.	idem.	idem.	idem.		idem.	

Bois menu	Fayard rond	Chêne rond	Poirier.	Sapin.	Noyer.	Esprit. fay	Pap. la 125	Beurre
20 Samedi	77. à 24. fl.	16 fl.	56 à 59. 6	38 fl. 3 l.	40 à 41 fl.	15 à 26 fl.	4 fl. à 4 fl. 6 l.	16 l. à 17 l.
	refonda.	refonda.				chicot.	Onse.	
	61 à 66 fl.	51 fl.				16 à 18 fl.	10 l. à 12 l.	

**Journées des Ouvriers de campagne.**

Homme.	Femme.
Au plus haut — l.	Au plus haut — l.
Au plus bas — l.	Au plus bas — l.
En le nourrissant 13 & 18 sols.	En le nourrissant 15 & 21 sols.

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## Booklets of the Musée d'histoire des sciences

The museum collections described in short thematic booklets

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2. Once upon a time, there was electricity
3. Sun time
4. Seeing the infinitely small
5. Models of the universe
6. Observing the sky
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8. Jean-Daniel Colladon, Genevan scholar and industrialist
9. From foot to metre, from marc to kilo
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D'HISTOIRE  
DES SCIENCES  
GENÈVE**

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