

XVII. *An Account of some Observations and Experiments made in Siberia, extracted from the Preface to the Flora Sibirica, sive Historia Plantarum Sibiriae cum tabulis æri incisis. Auct. D. Gmelin. Chem & Hist. Nat. Prof. Petropoli 1747. 4to. Vol. I. by John Fothergill, M. D. Lic. Colleg. Med. Londin.*

Read Feb. 11. 1747-8. **B**Y Direction of the late Empress of *Russia*, several Members of the *Royal Academy of Sciences* at *Petersburg* undertook a Journey into *Siberia*, in order to inquire into the Natural History of that Country, and to make such Experiments and Observations, as might tend to give a just Idea of that almost unknown Region, and to the Improvement of Physics in general.

Dr. *John George Gmelin*, Professor of Chemy and Natural History at *Petersburg*, was sent at the Head of this Deputation, who, besides several of his Collegues, and some Students, had a Painter or two, a Miner, Huntsman, and proper Attendants in his Retinue.

He set out upon this Expedition in *August 1733*. and returned to *Petersburg* in *Feb. 1742*. after having spent nine whole Years in visiting almost every Part of *Siberia*.

The Fruits of this Undertaking are designed to be communicated to the Public; and one Volume  
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of the History of Plants has already appeared, under the Title of *Flora Sibirica, sive Historia Plantarum Sibiriae, Tom. I. continens Tabulas Æri incisas L. Auctore D. Joh. Geo. Gmelin. Chem. et Hist. Natur. Prof. Petropoli Typis Academiæ Regiæ Scientiarum 1747.* This is intended to be followed by several others, containing a not only a Description of the Plants, their *Locus natalis*, &c. but their Uses amongst the Inhabitants, so far as the Professor could get Information concerning them.

In a large Preface to this first Volume, the ingenious and indefatigable Author has given us a concise Account of *Sibiria* in general, its Rivers, Lakes, Mountains, Mines, the Nature of the Soil, Fertility, &c. with several judicious Experiments and Remarks on the Altitude of the Earth above the Level of the Sea; but especially on the Qualities of the Air in that Climate; an Abstract whereof, at first drawn up for private Entertainment, was thought not unworthy of more public Notice, and is therefore addressed to the *Royal Society*.

The Country, whose Natural History D. *Gmelin* has collected, is of vast Extent: It is bounded by a Chain of Mountains called the *Werchoturian* and *Vralian* on the West; by the Sea of *Kamtshatka* on the East; and comprehends all those Countries that lie betwixt the *Mare glaciale*, and the Borders of the *Kalmucks* and *Mongales*, to the very Confines of *China*.

The Rivers which water this Tract are numerous; some of them large, and even receiving Streams in their Course, which in other Countries would be  
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looked upon as Capitals themselves. The Space they measure is no less considerable. The *Jaik* is the first River of Note on the Western Side. It rises under the Latitude of 54, of Longitude 78, and runs into the *Caspian* in 47 of Latitude, and 74 of Longitude. The *Irtisch* rises in the Country of the *Kalmucks*, Lat.  $46\frac{1}{2}$ , Long. 103; and empties itself into the *Oby*, Lat. 61, Long. 86. The *Oby* rises under 52 Lat.  $103\frac{1}{2}$  Long.; and loses itself in the *Mare glaciale*, Lat. 67, Long. 86. after running a Course of near 800 Leagues, and receiving a great Number of Rivers of considerable Note. The *Jenisea* is not much less than the *Oby*. The *Selenga* takes its Rise under Lat. 48, Long. 114; runs into the Lake *Baical*, in  $51^{\circ} 20''$  Latitude, with many others equally considerable, which it would be tedious to mention.

The Water of these Rivers is for the most part fresh, clear, and salubrious; In some it is a little brackish, by the Mixture of Currents from salt Lakes and Springs, which abound in many Places: They contain Fish of various Kinds in great Plenty, and mostly of an excellent Flavour.

The Lake *Baical* may deserve some Mention to be made of it, being one of the greatest fresh-water Lakes yet discover'd: It extends, according to our Author, from the one hundred and first Degree of Longitude, to the one hundred and twenty-seventh, being upwards of 500 Leagues in Length, and is from twenty-five to eighty Leagues in Breadth. It is every-where deep and navigable; the Water is extremely clear; it abounds with great Plenty of  
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fine Fish: It receives a great Number of Rivers, but the *Angara* alone runs out of it; which joining the *Tungusca*, loses its Name; as this likewise does, when it runs into the *Jenisea*.

Salt Lakes are common in many Parts of *Siberia*; some contain a pure white Salt, well tasted, and fit for Use; which, in Summer, is chrySTALLISED by the Heat of the Sun alone, and forms a Crust on the Top of the Lake. In some, this grows so heavy as to break, and fall to the Bottom. Besides this kind of pure common Salt, which is fit for Use, there is another Sort of a bitter Taste, much resembling the *Sal mirabile*, found in several Lakes in this Country. Springs of salt Water are sometimes observed to rise in the midst of fresh Water: Our Author assures us, that he has seen several such; one especially he observed rising thro' a Stone, in the Bed of the River *Angara*.

Before we dismiss the salt Lakes, we may just mention, that on the Banks of the River *Kaptendei*, where it runs into the *Wilvius*, are a great Number of salt Springs, which afford excellent Salt; and that, about 30 Leagues above this Place, along the same *Kaptendei*, on the right Hand, is a Hill about 30 Fathom high, and 210 long, consisting intirely of *Sal Gem*.

There are some Lakes, which, our Author informs us, in the Memory of Man, contained only fresh Water, but are now very salt. One of this kind, about 40 Years ago, abounded with fresh Water Fish, but is now become salt, smelling strong of Sulphur, with a bitter Taste, and all the Fish are killed.

The Inhabitants assured our Author, that some fresh-water Lakes have been by degrees dry'd up, and that others have appeared, where formerly it was dry Ground; and that even some of these new-formed Lakes, which at first had no Fish in them, are now very plentifully stock'd. They have not recourse to subterranean Caverns or Passages, for a Solution of this *Phænomenon*; but assert, that Ducks, Sea-Mews, &c. that live upon Fish, carry the Eggs from one Lake to another.

In the Description which our Author gives us of the Course of Rivers, Situation of Lakes, &c. he takes notice of the Soil, its Barrenness, Fertility, &c. These are different, as it may be supposed, in the different Parts of such an extensive Climate under such Latitudes. About the Lake *Baical* is the most fruitful Tract, and thence is called the Granary of that Part of *Siberia*. They grow some little Corn about the Latitude of 61. They have made of late Trials still further; but the Success was not known.

In his Passage thro' *Siberia*, he tells us, that he could scarce think himself in *Asia*, till he got over the River *Jenisea*: Till then, he saw no Animals, but such as are common in *Europe*, at least may be seen in the Plains washed by the lower Part of the *Volga*: The Plants and Stones were of the same kind, and the Face of the Country in general, like other Parts of Northern *Europe*. But from the *Jenisea*, both to the East, North, and West, the Climate seemed to be wholly different, and as if it were enlivened with new Vigour. It is mountainous; but these Mountains are intermixed with rich delightful

delightful Valleys, and fruitful Plains. The Animal that affords the Musk, and the *Musimon* of the Ancients, were now to be met with. Many of the most common *European* Plants by degrees disappeared, and others became frequent, which are Strangers in *Europe*. The Purity, Clearness, and Salubrity of the Waters, the exquisite Taste of the Fish and Fowl, but more especially the different Genius and Way of Life of the Inhabitants, plainly proved they were got into another Climate. This Remark our Author submits to the Consideration of Geographers.

Amongst the Curiosities of *Siberia* the Professor mentions a Place remarkable for its excessive Coldness in the midst of Summer. It is in the Province of *Jacutski*, about the middle Way to *Ochotz* along the River *Junacan*; it is called by the *Russians* *springing Ice*, by the Natives the *icy Lake*. Three other such Places occur within the Circuit of eighty Leagues.

The Provinces beyond the Lake *Baical* are mountainous, with high and wide-extended Plains lying betwixt them, which in many Places are only cover'd with barren Sand; so that in some Places one may travel thro' such Deserts one, two, or three Days together, without finding Wood enough to make a Fire, or any other Water than that of salt Springs, which are very frequent; and being dried up by the Summer-Heats, leave a saline Crust, very much resembling *Natron*, being of an alkaline Nature, with a sulphureous Smell.

The Country that borders on the Rivers *Uruncan* and *Gasimur* is extremely rich and fruitful. The

Face of the Country is delightful, and its Produce to the Husbandman almost exceeding his Hopes: But what renders it still more surprising, is, that a Country, whose Soil yields to few in Fertility, and the Beauty of its Bloom, should yet cover immense Riches in its Bosom. Here are Mines of Gold and Silver, which have long been worked to Advantage: The Veins are rich, and lie shallow; yet communicate no poisonous *Effluvia* to the Vegetables that cover them: Nor do those distinguishing Marks of Sterility appear here, which in most other mining Countries are so observable.

The highest Part of *Siberia* is towards the Springs of the Rivers *Argun*, *Schilca*, &c. about the 49<sup>th</sup> Deg. of Lat. 130<sup>th</sup> Longit. This Part is destitute of Marble and Lime-Stone, which are almost everywhere to be met with in the lower Tracts both of *Siberia* and *Russia*: No Petrifications are to be found here, either of the testaceous or crustaceous Animals: And the Veins of Ore are always found near the Surface, never entering deep into the Earth. Besides the Mines of Gold and Silver above-mention'd, Copper and Iron are found in several Places; likewise the *Glacies Mariae* or *Muscovy Glass* is dug near the River *Mama*. Loadstones are also got in *Siberia*; and in several of the Rivers beautiful transparent Pebbles and Chrystals occur.

I shall only add, that there are some natural warm Baths in several Parts of *Siberia*, and some of them of a most agreeable Temperature; and proceed to the Account of our Author's Observations and Experiments on the Height of the Earth, &c.

*Pauda*

*Pauda* is allowed to be the highest of all that Ridge of Mountains called *Werkoturian*. Our Author endeavoured to take the Height of it by means of the Barometer.

On the 11th of *December* 1742, at our Author's Lodgings at the Foot of *Pauda*, the Mercury in the Barometer, in a cold Place, but within-doors, stood at  $26\frac{8.3}{100}$  *Paris* Measure. He then carried it up the Mountain as high as he could go, which was about one Third of the whole Height, where he hung up the Barometer on a Tree, from 9 to 11 in the Forenoon, making a good Fire pretty near it, lest the intense Cold, which sunk the Quicksilver in *De Lisle's* Thermometer to 201, should affect the Barometer, and lead him to ascribe that to Gravity, which was only owing to the Contraction of Cold.

Under these Circumstances the Quicksilver sunk to  $25\frac{3.2}{100}$ .

Hence, according to *M. Cassini's* Calculation, our Author's first Station will be 941 Feet higher than the Level of the Sea: The second on *Pauda* 1505 f. and the whole Height of this Mountain 4515, or 752 *Paris* Toises; which, added to 941 Feet, the Height of his Lodgings at the Foot of *Pauda*, makes 5456 Feet, or 909 Toises, the Height of *Pauda's* Top above the Sea; supposing the Level of the Sea to be 28 Inches, as the *Paris* Academicians have fixed it: Tho' this differs from Observations made on the Barometer at the Seacoast of *Kamschatka* at *Bolcheretz*; where, from Experiments made for above two Years, the mean Height of the Mercury was 27 Inches,  $6\frac{1}{2}$  Lines. And at *Ochotz*, during a Year's Observations, the mean



mean Height was found to be 27 Inches and about  $8\frac{1}{2}$  Lines.

Hence it would appear, that the Sea of *Kamtschatka* is higher, with respect to the Earth's Centre, than the Ocean and Mediterranean; and at *Bolcheretz* higher than at *Ochotski*.

The following List of barometrical Observations, made in various Parts of *Siberia*, will shew the different Heights of the different Tracts in it.

	Feet	Toises	Inches
The mean Height of the Barometer, from a Year and 10 Months Observations at <i>Ir-cuts</i> , was	—	—	26 $\frac{38}{100}$
Its Height above the Sea will then be	1355 or 226	—	—
At <i>Selengia</i> , 1 Month's Observations,	—	—	25 $\frac{95}{100}$
Its Height above the Sea	1779 or 296	—	—
At <i>Kiachta</i> , a Town on the Confines of <i>China</i> 12 Days Observations in <i>April</i> and <i>May</i> , mean Height	—	—	25 $\frac{35}{100}$
Its Height	2400 or 400*	—	—

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\* In the Copy before me appears to be a great Mistake, either of the Printer, or in the Manuscript; it being put down in Words at Length, *bis mille quadringentarum Orgyarum cum dimidia*; which is impossible; and the Number of Feet is not exact, according to other Calculations.

	Feet	Toifes	Inches
At <i>Nertschia</i> , from 20 Days } Observations in <i>June</i> ,	—	—	25, $\frac{99}{100}$
The Height above the Sea	1738 or 298	—	—
At the Silver-Mines at <i>Argun</i> } 9 Days in <i>July</i> ,	—	—	25, $\frac{6}{100}$
The Height above the Sea	2121 or 353 $\frac{1}{2}$	—	—

Our Author adds several judicious Reflections upon the Time and Manner of making these Observations, in order to determine any thing with Certainty; which he has endeavour'd to keep strictly to in these Experiments; and concludes, that the Plains in some Parts beyond the Lake *Baical*, are almost as high as the Tops of high Mountains in some other Countries; Mount *Massane*, according to the *French* Geometricians, being but about 408 Toifes high; which differs but little from the plain Country at *Kiachta*; which yet has considerable Mountains rising in its Neighbourhood.

From whence our Author concludes, that the Elevation of the Earth, in this Tract, above the Level of the Sea, is very great, compared with the West Part of *Siberia* and *Europe*. \*

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\* *M. De la Condamine*, in his Voyage thro' the inland Part of *South America*, makes *Quito* to be between 14 and 1500 Toifes above the Level of the Sea. Suppose  $\frac{1450}{1450}$   
 He tells us, that *Pichincha* is 750 higher — —  $\frac{750}{750}$   
 This makes in the Whole — - - —  $\frac{2200}{2200}$  Toif.  
 above the Level of the Sea.

*P. Martel*, Engineer, in his Account of the *Glacieres* in *Savoy*, printed at *London* 1742, tells us, that the Barometer at *Geneva*, by the Side of the *Rhone*, stood at 27  $\frac{2}{3}$  I. which is 656 Feet above the Level of the Sea according to *Schenzer*; and that the highest Point  
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The Air of *Siberia*, with respect to its Gravity, is, as in other Countries, the nearer the Sea the heavier; and the more remote, the lighter: So that at *Kiackta* scarce one Person in our Author's Retinue escaped without some Indisposition: They were seized after their Arrival, some with acute Fevers, others complain'd of extreme Lassitude and Dejection. It was in the Spring Season, the Weather moderate, their Manner of living regular, nor had they been much fatigu'd with their Journey; in short, they could attribute it to no other Cause than the Lightness of the Air.

In these Provinces, *viz.* beyond the Lake *Baical*, our Author tells us, that Intermittents are seldom heard of, and Ophthalmies are endemic: But that, in the fenny Tracts which lie near the *Oby* and *Jenisea*, intermitting Fevers are very frequent.

The Coldness of the Air of *Siberia* is of all others the most remarkable Quality. In some Places it snows frequently in *September*, and not seldom in *May*: In *Jacutsk*, if the Corn is not ready to cut in *August*, which often is the Case, the Snow sometimes prevents it, and buries the Harvest all together. At *Jacutsk* the Professor order'd a Hole to be dug in the Earth, in a high open Place, on the 18th of *June*; the Mold was 11 Inches deep; below that was Sand about  $2\frac{1}{2}$  Feet; it then began to feel hard, and in half a Foot more it was froze as hard as possible.

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of *Mont Blanc*, measured partly by the Barometer, and where inaccessible from the Snow that covers it, by trigonometrical Operations, is 12459 Feet, or somewhat more than 2076 Toises above the Level of the *Rhone*; which, added to the Height of this above the Sea, makes 13115 *French Feet*, or about two *English Miles* and two *Inchs*.

possible. In a lower Place, at no great Distance from this, he order'd another Hole to be dug: The Soil was 10 Inches; soft Sand 2 Feet 4 Inches; below this, all was congealed; so that the Earth is scarcely thaw'd even in Summer above four Feet deep.

Our Author inclines to the received Opinion, that the Eastern Climates under the same Latitude are colder than the Western; and thinks this is confirm'd by Experiments made in different Parts of *Siberia*.

The Mercury in *De Lisle's* Thermometer often sunk in Winter in very Southern Parts of this Country, as near *Selinga*, to near 226, which is equal to  $55\frac{1}{2}$  below 0 in *Fahrenheit's* Thermometer. But the Cold is often much more intense than this, as appears by the following Experiments, made at *Kirenginski*.

Feb. 10. 1738. at 8 in the Morning the Mercury stood at 240 Degrees in *De Lisle*; which is 72 below 0. in *Fahrenheit's*. On the 20th it sunk one Degree.

At the same Place in 1736.

Decemb. 11. at 3 in the Afternoon 254 in *Delisle*.  
Almost 90 below 0. in *Fahrenheit*.

Decemb. 20. 4 o' Clock *p. m.* 263 in *Delisle*.  
 $99\frac{4}{100}$  below 0. in *Fahrenheit*.

	D.	F.	
Novemb. 27. 12 at Noon	270	=	$107\frac{73}{100}$ below 0.
Jan. 9.	275	=	$113\frac{65}{100}$
1735 Jan. 5. 5 in the Morn.	260		
6	—		280 = 120
8	—		250 and rose by degrees
till 11 at Night, when it stood at 252.			

Such an Excess of Cold could scarcely have been supposed to exist, had not Experiments, made with the greatest Exactness, demonstrated the Reality of it.

During this extreme Frost at *Jenisea*, the Magpies and Sparrows dropp'd down as they flew, and to all Appearance dead; tho' they most recover'd when brought into a warm Room. This was quite new to the Inhabitants of that Country; tho' it frequently happens in *Germany* in much less intense Cold, when the Weather sets in at once very severe.

The Air, says our Author, was at that time extremely unpleasant; it seem'd as if itself was froze, being dark and hazy; and it was scarce possible even to bear the Cold in the Door-Way for three or four Minutes.

These Experiments, our Author assures us, were made with all possible Exactness, and agree with many others, made in different Parts of *Siberia* by his Direction; and from these we may conclude that the Cold in *Siberia* is more intense than it has yet been found to be in any other Part of the World.

It was not apprehended that a greater Degree of Cold existed any-where, than that artificial one produced by *Boerhaave*, by means of concentrated Spirit of Nitre, which sunk the Mercury 40 Degrees below 0. in *Fahrenheit's*; which was supposed to be the Point beyond which no Animal could bear it.

But the utmost Limits of Cold are yet unknown; or to what Degree an Animal can subsist in it, when inured to it by little and little. The History of Heat is alike imperfect. The celebrated Professor  
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above-mention'd was induced to think, that a Man could not bear, without the utmost Danger, a greater Heat than that which would raise the Mercury to 90 in *Fahrenheit's*; but an ingenious and accurate Correspondent of our Author's at *Astrachan* informs him, that it not only rises there to this Degree frequently, but even to 100, and he has seen it  $103\frac{1}{2}$ . Even in the Bagnio's in *Russia*, the Heat is often equal to 100: It sometimes makes the Quicksilver ascend to 108, 10, and to 116, as may be tried every Day; and yet People not only bear them with Impunity a few Minutes, but often stay half an Hour or an Hour.

One necessary Observation our Author makes, which is, that the Ball or Tube containing the Mercury ought to be as dry as possible on the Outside, during these or any other Trials with the Thermometer: For the adhering Moisture, by forming a cooler Atmosphere around it, has sometimes occasion'd a Difference of 10 Degrees.

These are some principal Facts given us by our Author in his Preface, relative to the Natural History of *Siberia* in general: What follows chiefly regards the Work it is prefixed to.

As a just Idea of this Part cannot be exhibited in a narrow Compass, the Curious in this Branch of Science must be referr'd to the Book itself.

I have only to acknowledge with Gratitude the Instruction and Entertainment I have received from this elaborate Work: It is a Tribute justly due to the learned and ingenious Author, in Return for the Pains he has taken, and the Fatigue he has endured in this inhospitable Region; and to intreat

your Indulgence, if I have flatter'd myself too much, in apprehending this Excerpt might afford you some Amusement.

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XVIII. Novum rei que medicæ utile *Electricitatis* inventum exponit *Joannes Henricus Winkler*, Professor *Lipsiensis*, et *Societatis Regalis Londinensis Sodalis*.

*Lipsiæ, die Martii 12, 1748.*

Read March 31. 1748.

**S**ubtiliter dividendi vim habet Electricitas. Quas vero solvit materias, earum partes secum abripit, et in loca transfert, in quibus scintillæ electricæ existunt. Res odoras in vitreis vasis bene naviterque conclusas et munitas ita discerpit, ut oriundæ exhalationes æque facile, ac vis magnetica, vitrum penetrent, et per atmosphæram cylindrorum et catenarum, quibuscum electricitas communicatur, instar fluminis dimanent. Quæ ex altera cylindri extremitate egreditur, materia electrica accedentem manum odore aromatico inficit. Non autem perstat odor communicatus in hac corporis parte, quam electricum flumen afflavit : sed, continuata adspiratione, odorifera materia universum corpus humanum pervadit. Non modo cutis et vestimenta fragrant, sed aer, quem pulmones reddunt, et saliva, et sudor hominis imbuti redolent aromata, quæ in vase obturato electricitate agitata sunt.

Inopinatæ huic virtuti fidem faciunt observationes et experimenta, quæ sensu animoque attento capta sunt.