



J. S. Bratt. 1810
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THE

NATURAL HISTORY

OF

NORWAY:

CONTAINING,

A particular and accurate Account of the Temperature of the Air, the different Soils, Waters, Vegetables, Metals, Minerals, Stones, Beasts, Birds, and Fishes; together with the Dispositions, Customs, and Manner of Living of the Inhabitants: Interspersed with Physiological Notes from eminent Writers, and Transactions of Academies.

In TWO PARTS.

Translated from the DANISH ORIGINAL of the

Right Revd. ERICH PONTOPPIDAN,
Bishop of BERGEN in NORWAY, and Member of the Royal Academy of Sciences at COPENHAGEN.

Illustrated with COPPER PLATES, and a General Map of NORWAY.

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The AUTHOR'S PREFACE.

THE chief deſign of this preface is, to lay before the reader my motives for attempting a Natural Hiſtory of Norway, together with the opportunities and encouragements which have concurred towards the accompliſhment of my deſign; as ſuch information may, in ſome reſpects, be neceſſary in the peruſal of the work.

My principal motive was, to promote the glory of the Creator, by a contemplation of his works. In the inſtructive book of nature are many leaves, which, hitherto, no mortal has thoroughly peruſed; though the preſent times are bleſt with the happy advantage of all the important diſcoveries made in natural philoſophy, ſince the commencement of this century, which are ſuperior in number and merit to thoſe of many preceding ages. Theſe have been chiefly promoted by the learned Societies now flouriſhing in almoſt every country in Europe, who have liberally encouraged, directed, and excited enquiries into nature, and by the periodical publications of obſervations, objections, and experiments, have communicated to the world ſuch important truths, as reſulted from them.

It is not my preſent purpoſe to enquire, how theſe diſcoveries have been applied to various ends by perſons of different opinions; I ſhall only obſerve, that devout men have taken occaſion from them to expreſs, in the fulneſs of their hearts, their faith and love to the great Creator, by applying their natural knowledge, to the ſupport and illuſtration of this greateſt of all truths, "There muſt be a God; and he muſt be almighty, omniſcient, and infinite in goodneſs; and though he

dwells

dwells in a light inacceſſible to any mortal eye, yet our faculties ſee and diſtinguiſh him clearly in his works". In this reſpect I have the moſt profound veneration for a Boyle, a Nieuventyt, a Fenelon, a Scheuchzer, a Derham, and the like great and excellent perſonages; who having been no leſs conſpicuous in the ſanctity of their lives, than in their mental abilities, will doubtleſs find a place among thoſe, or in preference to many of thoſe, to whom the prophet Daniel promiſes a more exalted degree of glory.

It is true, that the rational part of the heathen world were not unacquainted with the firſt principles of natural religion, and conſequently theſe are of themſelves inſufficient for the immediate and perfect converſion of ſinners, or the attainment of any degree of that ſalvation reſerved for the members of Chriſt's myſtical body, who live in a more ſhining-light, and have more abundant offers of grace. But it is equally true, as the Apoſtle affirms, *he that cometh to God, muſt firſt believe that he is, and that he is a rewarder of thoſe who diligently ſeek him.* A general belief in God, as the creator and preſerver, as the rewarder and avenger, muſt be preſuppoſed, before any faith in the Son of God, the Redeemer, can take place; conſequently the firſt is the baſis of the other articles, and though a miniſter of the Goſpel is not to be lightly carried away by the ſtream, or ought not to follow the crowd of mere philoſophic moraliſts, who purſue vain glory in ſcience, falſly ſo called, and in contradiction to the mind and example of St. Paul, *are almoſt aſhamed of the goſpel of Chriſt, which alone is and will continue to be the power of God unto ſalvation*; yet it becomes them as little to deviate on the other hand, into a diſregard and contempt of natural truths, and of the occaſion which they may draw from them, of promoting the glory of God, among many whoſe taſte and capacity reach no further than ſenſible objects: and not having been found faithful, even in theſe leſſer matters, are not therefore intruſted with greater. *If*, as our Saviour ſays, *we believe not what is ſaid to*

us of earthly things, how ſhall we believe when he ſpeaks to us of heavenly things?

I am therefore inclined to think, that neither I nor my brethren tranſgreſs the bounds of our miniſterial office, by inveſtigating and exhibiting natural truths concerning the works of God, which, like his word, are Jehova's. I am rather of opinion, that a ſupercilious neglect of ſuch truths, in this critical age, is one of the cauſes of that contempt, with which the Freethinkers, as they arrogantly ſtile themſelves, look on the miniſterial function.

If phyſical knowlege be not, like godlineſs, *profitable to all things*, yet it is ſo to many, and in a certain degree to moſt things. A civilian, in order to a juſt ſolution of a point in law, muſt previouſly have a competent intelligence of the fact; * and this is not always to be had from a formal depoſition, which is frequently contradicted by others of equal authority; but in many caſes, he may be conſiderably aſſiſted by a perfect inſight into the connexions of nature, which will teach him to reject impoſſibilities, which others would obtrude upon him for certainties, and not to attribute to any cauſe, however plauſibly alledged, what may much more reaſonably be ſuppoſed the effect of ſome other cauſe, though unknown.

The utility, I ſhould ſay the abſolute neceſſity of this ſcience to medicine, needs no tedious proof, the alliance between natural philoſophy and medicine being univerſally known, and the whole materia medica being properly res phyſica. This is ſufficiently confirmed by our eminent phyſicians, Wormius, Bartholin, and Borrichius, who were alſo conſummate naturaliſts. But my more immediate aim, is to repreſent the advantages of natural knowlege to thoſe who apply themſelves to theological ſtudies, with a view of directing others in the way to ſalvation. The firſt knowlege requiſite in them, is the knowlege of human nature; for grace and nature are the two great objects, which it is incumbent

* See an ingenious piece in the Hamburg magazine, under the title of Arguments on the uſefulneſs of natural philoſophy in the ſtudy of the law, Vol. IV. p. 27.

upon them to diſtinguiſh on all occaſions, when they undertake a cure of ſouls. In the next place, they muſt learn to know God from his other great works, which proclaim his being, and attributes, as well as from his wiſe and tender œconomy in the government of all his creatures. If they ſhould prove unacquainted with this branch of knowlege, then they are more ignorant than even the heathens, according to the teſtimony of St. Paul himſelf, which is accompliſhed by the writings of Pagans. How admirably among others *, Derham, and Nieuwentyt †, have applied natural philoſophy to an unanſwerable confirmation of revealed truths, is well known to thoſe who have peruſed their excellent works with attention, and have from ſuch peruſal, either acquired their firſt belief and love of God, or found thoſe religious habits greatly ſtrengthened and animated. Moreover, a religious man, whoſe profeſſion turns his attention to other ſecular ſciences, muſt confeſs, that the delight of natural enquiries is greatly heightened to him, by an advantage which at firſt he did not expect, by the confirmation of his belief, and thus he is encouraged to purſue his reſearches, by the repeated ſatisfaction with which they are attended. Not to mention the occaſion which a naturaliſt may take from his ſcience, to remind himſelf and others of their duty towards God and their neighbour, and this agreeably to the method of the prophets, and the example of the great prophet Jeſus himſelf, who referred thoſe who are intemperately ſollicitous about worldly things, to the fowls of the air, and the lillies of the field; the diſobedient to the oxen, and aſſes, which know their maſter; the ſlothful to the induſtrious pattern of the ant;

* Particularly in his phyſico theology, or a demonſtration of the being and attributes of God, from the works of creation, being the ſubſtance of ſixteen ſermons preached at the lectures founded by the honourable Robert Boyle.

† In that learned and devout work, the religious philoſopher, or a right uſe of the ſtudy of nature to the conviction of atheiſts and infidels. This conviction ſhould be an eſpecial incentive to further reſearches; as, without the leaſt hypocriſy, I can ſay of myſelf, that the γνωςὸν τȣ Θεȣ the knowlege of the eternal, inviſible Being, who is the ſcope and ſpirit of all the truths delivered by the prophets and apoſtles, and the ἔιναι ἀυτȣς ἀνα πολογήτȣς, by which others alſo may be gained, not only irreſiſtibly drew me into the ſtudy of natural hiſtory, but ſweetens all the labours with which it ſeems to be attended, and enlivens the converſation of perſons of the ſame taſte, Henkels Pyrilologie, or hiſtory of fire, Cap. v. p. 300.

and

and the negligent to the bird which knoweth its ſeaſon. Thus the works of God ſerve for a baſis and confirmation of natural theology, even as revealed truths are grounded in his word; and this hath induced ſome able men of our times to follow Derham's excellent plan, whoſe phyſics, and aſtro-theology were no ſooner publiſhed, than others adopted the ſyſtem; every one was ſtirred up to apply his particular knowlege to the diſcuſſion of ſome point of natural hiſtory, and exhibit ſuch an account of it, as ſhould tend moſt to ſpread the knowlege and glory of the Creator. Theſe endeavours by no means deſerve to be conſidered as unneceſſary or ſuperfluous, for all who are deſirous of a more intimate acquaintance with the works of God, as arguments of his exiſtence and attribues, have no time, or opportunity for that circumſtantial examination of every part, which hath been undertaken and executed by Fabricius, in his pyro- and hydro-theology; Alvard, in his bronto-theology; Zornius, in his pitano-theology; Rathleff, in his acrido-theology; Leſſer, in his litho- and teſtaceo-theology, &c.

I heartily join with the celebrated Linnæus * in wiſhing, that even thoſe gentlemen in the univerſities, who are not peculiarly deſtined to phyſic, or the like, but to the ſtudy and promulgation of the word of God, in ſome miniſterial office, were directed to apply ſuch a part of their academic years to phyſics, as may equal, if not exceed the time ſpent in metaphyſics, and logic, theſe laſt not being ſo indiſpenſably neceſſary and uſeful as the former, eſpecially to thoſe who are called to attend a country pariſh. Here their natural knowlege will not only furniſh them with many clear arguments, and edifying reflexions to themſelves and their

* Monſieur Linnæus commence par une harangue, que lui dicte la vivacité de ſon inclination, pour l' hiſtoire naturelle. Il s'attache à la felicité des peuples, dès qu'elle a été portée à un certain degré de perfection. Il s'addreſſe aux puiſſances, et les ſupplie d'introduire une ſcience auſſi utile dans les univerſités. On y enſeigne la logique, la metaphyſique et d'autres ſciences de theorie, dont l'utilité eſt extremement éloigneé du bien public, pendant qu'on ne devroit pas negliger l' hiſtoire naturelle, qui enrichit une nation, parce qu'elle lui fait connoitre ſes richeſſes. Il ſouhaiteroit ſurtout que les jeunes gens, qui ſe deſtinent à la vie eccléſiaſtique, puſſent ſe procurer une teinture de cette aimable ſcience. Elle leur adouciroit la ſolitude de la campagne, et elle leur feroit faire des découvertes, que les ſavans des villes ne ſont pas à même de faire, Biblioth. Raiſonnée, Tom. XXXVIII. p. 15.

hearers,

hearers, of which we have inſtances in many religious books of that kind; but it will beſides prove a liberal amuſement in their ſolitude; it will enable them, by much greater opportunities than the learned enjoy in towns, to make uſeful diſcoveries or improvements, from the products of nature, to the laſting benefit of their country, which it is their duty to promote. I ſhall mention only one thing, which here in Norway might be of the greateſt importance, I mean ſuch ſkill in metallurgy, as to know the ſpecies of ores and minerals, to make little experiments by fuſion, and thus to form a judgment of the intrinſic value of a mine, and how far it will anſwer the expence of opening. He who is poſſeſſed of ſuperior knowlege and penetration, may in this country, ever meet with many latent things, which might long ſince have occaſioned much thought and reflexion, had they been exhibited earlier to public view and examination.

This leads me to my other motive, for attempting a natural hiſtory of Norway, which carried me thro' it with infinite delight, though I wanted the materials, the time, and the opportunities requiſite for an eſſay of this kind. In the annual viſitations of my dioceſe, which lead me into every part of this province, and ſometimes form a journey of an hundred Norway miles, I have heard authentic accounts of natural things, and ſometimes have ſeen the originals themſelves, which being unknown to me, put me upon enquiring whether they were ſo to others, or whether they had a perfect knowlege of them? The latter being ſeldom the caſe, it was natural to wiſh the improvement of that knowlege, eſpecially as thoſe mountainous countries are diſtinguiſhed from others by containing many things, which are met with in the province of Dauphiné in France. I refer the reader to the ninth volume of the Memoires de l' academie royale des inſcriptions et belles lettres, where he will find the following paſſage; " Nature has beſtowed on every province ſome diſtinguiſhing advantage, and the curioſities of each country are proportioned to the number and nature of the alterations it has undergone. Con-

quently, in provinces full of mountains, rocks, grottos, ſubterraneous cavities, and minerals, the ſpeculative mind is entertained with many ſuch natural phenomena, as are not to be found in other parts.

This obſervation of M. Lancellot, is entirely applicable to Norway, and more eſpecially to that part where providence has been pleaſed to ſettle me, which, according to its name, almoſt wholly conſiſts of mountains, in which, few parts of Europe can be compared to it, and conſequently, according to the above obſervation, few contain more remarkable naturalia. Even Norwegians themſelves, who reſort hither from the other provinces, imagine themſelves in a foreign country, not only on account of the continual high mountains they meet with; but in reſpect of the different and very unwholſom air iſſuing from off the ſea and ſettling between the mountains, from whence it cannot eaſily be diſſipated.

But Norway, conſidered in general, in the ſingularia naturæ et providentiæ, ſurpaſſes moſt countries, and not only in its inanimate treaſures, ſuch as metals, minerals, and vegetables, but in the various kinds of beaſts, birds, and fiſhes; and particularly of the laſt, ſcarce any parts of the univerſe afford ſuch a diverſity and abundance. But theſe ſuperior advantages are not eſtimated as ſuch by the inhabitants, who daily enjoy, and therefore are too apt to diſregard them. Foreigners ſeldom viſit us, unleſs they are ſeamen and merchants; and theſe have little elſe in view, than the lucre of their profeſſions. Northward of us the people are too unpoliſhed to encourage a traveller to take the tour of the country, which hath been the means of clearing up the natural hiſtory of other countries.

On this very account it ſeems the more expedient, that ſuch of our Daniſh nobility, and of our literary youth, who travel at a very great expence to viſit foreign countries, ſhould be firſt obliged to take, at leaſt, a half year's tour through this kingdom, which is ſo cloſely united with Denmark. If the travels of

theſe young gentlemen are ſaid to be undertaken upon worthy motives, I hope their principal object is to qualify themſelves the better for the ſervice of their king and country, in thoſe public employments which at their return they ſollicit, and to which they have ſome claim. Now if this be their object, it is more neceſſary for them to viſit Norway and Sweden, than all the other countries of Europe. An acquaintance with the latter (Sweden) both in reſpect to its ſtrength and its weakneſs, is unqueſtionably more neceſſary to our young ſtateſmen, than to be able to decide which merits the preference, the Rheniſh, Italian, French, or Spaniſh wines. As to the neceſſity of an accurate knowlege of Norway, I believe it muſt be immediately manifeſt, if not to others, at leaſt, to a Norwegian, when he ſees a perſon filling ſome eminent poſt either in the ſtate, or in the law, with irreproachable integrity, who is totally ignorant of the particular circumſtances and properties of Norway, and wherein they totally differ from thoſe of Denmark. Thus the public, contrary to his intentions, may ſuffer great detriment, or many things be neglected, which would be happily executed, if his public ſpirited views were directed by his own diſcernment, which would enable him without ſeeing thro' the eyes of other men, throughly to ſift and examine the grounds and conſequences of a matter, which now becomes doubly difficult, it being not only foreign to him, but very remote perhaps from the purpoſe, to which he is meditating to apply it.

In this reſpect, I flatter myſelf, this firſt eſſay towards a natural hiſtory of Norway, will have its uſe with ſome, who never had an opportunity of perſonally viſiting a country, with which, by virtue of their office, they are in a greater or leſs degree, perpetually concerned.

This work, moreover, with all its imperfections, may ſerve to enrich natural hiſtory in general with ſome particulars, of which, conſummate naturaliſts were heretofore the only competent judges. I am very far from deſiring to relate, or eſtabliſh marvel-

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lous things, merely to excite the admiration of the reader. On the contrary, I have endeavoured to rectify the erroneous idea which many, even among the learned, have, for want of better information, formed of ſeveral, in themſelves very wonderful natural phænomena, here in Norway; ſuch as a bottomleſs ſea-abyſs growing in the Moſkoe-ſtrom, penetrating quite thro' the globe; of ducks growing on trees; of a water on Sundmoer, which in a ſhort time turns wood into ſtone; and many other ſuch things, which, ſome who have had no opportunity of enquiring further, or others who were not diſpoſed to it, have received as undoubted facts. The reader will meet with many ſtrange, ſingular, and unexpected things here, but all of them ſtrictly true; ſome of them not diſcovered before, others confirmed; and, to the beſt of my ability, in ſome meaſure accounted for, and illuſtrated.

Perhaps, Norwegians by birth, to whom the nature of their country is better known, may, from their own particular experience in divers parts, produce ſomething more complete and extenſive. If they ſhould be animated thereto by this work of mine, I ſhall account it among the accidental advantages which may reſult from it; and in this caſe, let no one imagine that a difference of opinion, decently delivered, will give me any offence, or trouble; the diſcovery of truth, is in this and every other reſpect, my chief end; and I live in an age, which not content with mere hypotheſes, unſupported by proofs, requires that every fact or poſition, which is advanced as real, be at leaſt demonſtrated poſſible, and conſonant to the nature of the things in queſtion.

Phyſics, having never been my chief ſtudy*, I am far from the arrogance of ſuppoſing, that I have always hit upon the true original cauſe, and laid open the connexion of every ſubject; and I am much farther from the preſumptuous conceit, that I have, in

* Si mihi homini vehementer occupato ſtomachum moveritis, triduo me juriſconſultum profitebor. Cicero in Orat. pro Muræna, cap. XXVIII.

every particular, developed the abſtruſe meaſures, and diſcovered the ſecret deſigns of the infinite Creator, whoſe ways are paſt finding out. I hold with Bartholin. "Officio ſuo ſatisfecit phyſicus, ubi rationes adduxit probabiles." It is not in one reſpect only that our Saviour's words hold good; *the wind bloweth where it liſteth, and thou hearеſt the ſound thereof, but thou knoweſt not from whence it cometh nor whither it goeth.* And the wiſe man does not exaggerate when he ſays, *we ſcarce perceive what lies upon the earth, or feel what is betwixt our hands.* However, our almighty and all-wiſe Creator cannot be diſpleaſed at an inveſtigation of his works, with a pious and reſpectful docility, nor at the praiſes we give to his holy name for ſo much as falls within the extent of our faculties; reſting aſſured, that what is beyond our reach in this ſtate of probation, will be explained to us in that new heaven and new earth which we look for according to his promiſe.

I ſhall now, purſuant to my promiſe, give ſome account of the ſources from whence I have drawn what is here offered to the public. Theſe are partly writings relating to Norway, partly my own certain experience, as far as it extended, and partly the obſervations of ſome intelligent perſons, communicated to me at my deſire.

In the firſt claſs are our noted hiſtorians and chorographers, eſpecially Peter Nicholas Undalin, formerly ſuperintendant over the diſtrict of Liſter, miniſter of Undal, in the dioceſe of Chriſtianſand, and a canon of the chapter of Stavenger, who, beſides his tranſlation of Snorre Sturleſen's annals, from the old Norwegian tongue into modern Daniſh, wrote a poſthumous work, publiſhed at Copenhagen, in quarto, in the year 1632, intitled, A True Deſcription of Norway and the adjacent Iſlands. Of this piece Dr. Chriſtopher Steinkuhl, in 1685, publiſhed a German tranſlation with additions. It gives a tolerable account of the extent of every province in general, its ſubdiviſion, and the names of the diſtricts and pariſhes; with ſome particulars on the nature and

qualities of the ſoil; but theſe are but few in number, it not having been his deſign to treat expreſsly of them. Mr. Jonas Ramus, heretofore paſtor to the community of Norderhong in Rongerige, in the dioceſe of Aggerhuus, goes further. This writer, beſides many other theological and hiſtorical compoſitions, has deſerved highly of his country for his Deſcription of Norway, publiſhed in quarto, at Copenhagen 1715. It is a chorographical improvement upon Undalinus's work, but having the ſame point in view with that author, he confines himſelf within the ſame limits, yet is fuller on the nature and products of the country, adding, particularly at the cloſe, from page 240 to 274, an appendix, enumerating the ſeveral beaſts, inſects, birds, fiſhes, herbs and trees. This conſiſts indeed of little more than the bare names of them, but was of uſe however to me, as it opened a large field for further enquiry. Arendt Berendſen's Fertility of Denmark and Norway, printed in quarto at Copenhagen, in 1656, is a book which exhibits a clear account of the different fertility of the reſpective provinces, and ſeveral particulars concerning the products of the country; but this again proceeds no farther than giving the names of things *. In ſome certain points, I have been moſt indebted to Mr. Lucas Debes's Feroa Reſerata, or Deſcription of the Ferro Iſlands, publiſhed at Copenhagen, in octavo, 1673. This gentleman, who was formerly ſuperintendent of Ferro, was, for the times he lived in, and the opportunities he had, a good naturaliſt, and, as the iſlands he deſcribes, lying parallel to the weſtern coaſts of Norway, have ſome analogy with them, eſpecially on account of the ſea-fiſh and water-fowls, his obſervations were of greater aſſiſtance to me than any other work. I have likewiſe gleaned ſome good materials from diſtinct treatiſes on ſingle ſubjects, ſuch as Wormius's Tractatus de mure Norvegico, Dethardingii Diſſ. de vermibus in Norvegia qui novi viſi, Gartner's Hor-

* The Norrigra Illuſtrata of Jens Lauridſen Wolf, hardly deſerves to be ranked among the chorographies of the country, it containing little of any importance but what is hiſtorical.

ticulturas Norvegica, Lochſtor's Diſſ. de Medicamentis Norvegiæ ſufficientibus, Daſſe's Deſcription of Nordland, &c.

The loſs of the manuſcript hiſtory of the beaſts of Norway, by the above-mentioned Mr. Peter Nicholas Undal, is exceedingly to be lamented; it happened in this manner. The author had tranſmitted his work to his intimate friend Dr. Worm, that before it was committed to the preſs, it might undergo the reviſal of that conſummate naturaliſt †. With him it remained till his death, when it fell into the hands of Dr. Thomas Bartholin, who carried it to his ſeat at Hageſted in Silland, where, together with many other valuable books and manuſcripts, it was unfortunately burnt. Undal, page 83 of his Chorography, mentions another book, called Speculum Regale, to which he appeals for what is ſaid concerning a hazle ſtick being petrified in Birkedal moraſs, in Sundmoer, from whence I conclude, this book muſt have turned upon natural hiſtory; but as probably it was likewiſe a manuſcript, it was a great pity that the public was not benefited by it, before it was loſt, as is unqueſtionably the caſe. But a greater calamity to the literary world, was the conflagration which happened 1734, in the city of Chriſtianſand, which deſtroyed that invaluable aſſortment of collections for a natural hiſtory of Norway, in which Mr. Jens Spidberg, an eccleſiaſtic of great eminence there, had with indefatigable application ſpent many years. He was a man conſummately accompliſhed for ſo great an undertaking, as appears from the other monuments extant of his genius, which diſplay a ſingular penetration and judgment, with an infinite compaſs of learning, eſpecially in phyſics and mathematics. I ſhall here quote a paſſage from a letter, with which he favoured me, dated Dec. 10, 1750, concerning his deſign, which he relinquiſhed after the unfortunate loſs of his manuſcripts and library. I ſhould not have troubled the reader

† This, however, from the following mention made of it, by the ſaid Mr. Worm, does not appear to have been a comprehenſive or finiſhed work: Petri Undalini fragmenta hiſtoriæ animalium Norv. MSS. quæ penes me ſunt. Tr. de Mure Norveg. page 3.

with this extract, but it contains some things relative to my present purpose.

" It is to be lamented that hitherto no person has ventured to undertake a natural history of Norway; for I am persuaded that no country in the universe affords more curiosities and wonders, out of the three kingdoms, of nature, than this; and consequently, there is not a subject more fit for the pen of a naturalist. Had M. Maupertius gone as far as to Wardehuus, or to the north-cape, and there made his dispositions for taking the figure of the earth, his calculations would have been attended with less difficulty, and more certitude than at Tornea. Had M. de Mairan taken care to procure from Norway, some accurate observations on the Aurora Borealis, his valuable Traité Physique de l'Aurore Boreale, had been much more complete and decisive; for the north light takes its rise from Norway, and particularly from the diocese of Drontheim. Considerable additions might have been made to Redi, Swammerdam, and even to M. Reaumur's Memoires des insectes, had they had the advantage of a communicative, and observing correspondent in Norway, where are several tribes unknown either in Italy, Holland, or France. Linnæus, by his observations in Sweden, has enriched botany more than Tournefort, by all the remarks he made in France, or in his travels to the Levant. I need only mention the article of metallurgy, in which Norway surpasses all other countries, producing all kinds of minerals and metals, from gold, to sulphur and lead. In like manner I pass over the numberless beasts, birds, and fishes peculiar to Norway; the rivers, hot springs, meteors, and the several alterations of the air, &c. but alas! all these things, such is the incogitancy and ignorance of the people, are still almost unknown; at least, I have not yet heard of any one equal to the task, who has attempted to place them in a proper light. Peter Nicholas Undal, to whom we owe a translation of Snorre Sturleseus, and a civil history of Norway, had, it seems, also composed a natural history, but it being sent to Copenhagen for approbation, was suppressed,

or

or at leaſt not publiſhed; though a phyſical treatiſe written 130 years ago, would little ſuite the taſte of theſe more enlightened times. The great Wormius in his Muſæum, and Tho. Bartholin in his acta medica, and hiſtorica anatom. rariora, have, I know, introduced ſome of the curioſities of Norway, but their accounts are defective. Jonas Ramus was diſtinguiſhed by a knowlege of the hiſtory and antiquities of his country, but was not eminent as a naturaliſt. About five or ſix years ago, Count Reuſs, who was then governor here, ordered all the litterati in theſe parts to ſend in an account of every particular in their reſpective countries which might contribute to the melioration of the ſoil, or the improvement of agriculture. Some ſuch memorials were delivered in; but of what uſe they were, or whether any meaſures were taken in conſequence of them, I have not heard. It may be preſumed that the like orders were iſſued in the other dioceſes. Mathematics, and natural philoſophy have always been my favourite ſtudies, and in my late library I was poſſeſſed of moſt and the beſt phyſical writings publiſhed in Italy, France, Germany, and England. It was Scheuchzer's Natural Hiſtory of Switzerland, that firſt induced me to undertake a work of the ſame kind on Norway; and I had an opportunity of perſonally making the beſt collections and obſervations for that purpoſe, being ordered by baron Lowendahl, who commanded in chief in Norway during the laſt war, to draw a map of the country, and frontiers betwixt Norway and Sweden; a copy of which, I am informed, is in the Collegium Curioſum at Copenhagen. This undertaking gave me an opportunity of travelling thro' the dioceſe of Chriſtianſand, and of obſerving all the rivers, lakes, mountains, and every thing relative to natural hiſtory; but afterwards, whilſt I was employing my leiſure in augmenting and digeſting my collections, in order for publication, that deplorable fire which happened in Chriſtianſand 1734, deprived me, beſides 6000 volumes in all languages and ſcience, of all my collections and manuſcripts, ſo that my whole ſtock was reduced to what I had treaſured up in my memory,

mory, and I have ſince acquired by ſubſequent obſervations. I had before publiſhed two little pieces, one in Holland, de cauſa et origine ventorum, the other at Hall in Saxony, of the North-light. I can ſtill amuſe myſelf, with the entertainment I receive in my leiſure hours, from books of Mathematics, and natural philoſopy." So far M. Spidberg.

It is therefore a melancholy conſideration, that ſo few having made any advances towards a natural hiſtory of Norway, their collections ſhould be thus deſtroyed; which, from ſeveral cauſes, has been the fate of many excellent writings among us. Concerning the neglect of natural hiſtory, or the great ſcarcity of ſuch writings in the northern countries, the learned Muller, in his Iſagoge ad Hiſt. Cherſoneſ. Ambricæ, cap. XI. p. 10. thus expreſſes himſelf: "Hiſtoriæ chorographicæ cognata eſt naturalis, quæ licet infinita rerum ἀξιοθαυμάστων varietate in regionibus hiſce luxuriet, et curioſorum calamos atque ingenia provocet, pauci tamen hactenus partem illius aliquam illuſtrandam ſibi ſumpſerunt." This likewiſe is the complaint of Dr. Henry Lochſtor, whoſe death in the maturity of life, and in the midſt of many uſeful deſigns, was a public loſs; in his diſſertation De Medicamentis Norvegiæ ſufficientibus, p. 20, he ſays, "Monendum duxi, haud deeſſe Norvegiæ fontes medicatos, deeſſe autem, qui horum vires et principia inquirant ſolertes naturalium rerum ſtudioſos." If we conſider the natural cauſe of this, it will not appear matter of complaint, tho' the effect is ſo in a great degree. In a country ſo healthy as Norway, a few phyſicians will ſuffice, and conſequently, there are few who devote themſelves to phyſical reſearches.

From theſe ſeveral circumſtances it will be eaſy to conclude, that I had not a multiplicity of ſources from whence to draw many choice materials. The diſcoveries which I have been able myſelf to make, either by my own experience, or enquiries, or experiments, have furniſhed my principal aids. My annual viſitations, as has been intimated before, gave me the beſt opportu-

nities, and great encouragement. Almoſt every inn in this extenſive dioceſe, gratified my curioſity, and yet this is not the only province known to me from my own experience. The dioceſe of Drontheim is the only one I have never been in, the others I have travelled through, and in ſeveral places in that of Aggerhuus made ſome ſtay, and always took care to find out a perſon, who was able to ſatisfy me in any queſtions concerning the nature and circumſtances of the country. But the dioceſe of Bergen, as will be eaſily imagined, is the country of which I have had the moſt perfect knowlege, both from experience and information. Theſe circuits uſually take up two or three months, and leaving me more vacant time than I could wiſh, I uſually, according to the proverb, make a virtue of neceſſity, by ſpending part of the time in converſation with the guides and drivers, appointed at different ſtations to attend upon me with carriages. Their anſwers to my ſeveral queſtions, I afterwards examine with the miniſters of the pariſhes, or ſome other perſon well acquainted with the country, and whatever I hear confirmed by ſeveral teſtimonies, or not controverted, or doubted of, I enter among my miſcellaneous obſervations, and, at my return home, compare them with the deſcriptions of ſuch countries, eſpecially the mountainous, or which are in any other reſpect analogous to Norway. Theſe annual tours I have alſo improved towards making a ſmall collection of naturalia of Norway, ſuch as ſtones, ores, foſſils, ſea-trees, corals, ſnails, muſcles, uncommon birds, fiſhes, and the like; of the moſt remarkable of which, for the gratification of the reader, I have cauſed prints to be annexed.

Laſtly, on the ſubject of the Norway-birds, and more particularly the fiſh, I have had recourſe to the obſervations of men whoſe dwellings and employments give them opportunities of examining more minutely things, which do but ſeldom fall under general obſervation. As to fiſh and marine-animals, a greater variety, and ſtranger tribes are ſeen hereabouts, and off Nordland, than in any part of Europe; but a ſuperſtition which prevails among

among the lower claſs of people, deprives us of moſt of theſe, for, when they happen to catch a fiſh of a ſtrange, ſingular figure, conſequently the greater ſubject of curioſity, they are ſure immediately to throw it over-board; to thoſe of the monſtrous ſpecies the peaſants give the general appellation of trold, devil, or trold-fiſh, devil-fiſh, and are weak enough to imagine, that unleſs it be immediately ſet at liberty, their fiſhing will be unſucceſsful, and ſomething or other amiſs will certainly befall them.

I have now, delivered what I principally intended in this preface, I ſhall only repeat the before-mentioned declaration, that I do not ſend this eſſay abroad as a maſter-piece, and ſhall rejoice to ſee it improved by more intereſting articles, and more refined obſervations; and to ſee a complete ſuperſtructure raiſed on this foundation, by perſons of more leiſure and opportunity.

However, I own myſelf entirely in the ſentiments of a very eminent writer on the like occaſion, who, in his firſt eſſay of a natural hiſtory of Hungary, aſſerts the claim of an original writer to the indulgence of the public, in the following words; "Res omnino remotas è ſua, ut ita dicam, barbarie primus exemi; propterea veniam mereri videor mihi, ſi nec omnia eruerim, nec omnia correctè .... ſentio ineſſe multa quæ corrigi, deeſſe quæ valeant ſuppleri *". Had I not judged this work to ſtand in need, or to admit of any amendment, I ſhould not ſo frequently have called it an eſſay in this preface; but it is, indeed, the firſt eſſay on this ſubject, and of courſe encumbered with difficulties too great for the application and talents of one man; and on this ground, I hope that every candid judge, who knows how little leiſure my indiſpenſible functions leave me, will not require more, or a more perfect work of this kind from one, who may appear to have performed more than could be expected, who has denied himſelf many hours of natural repoſe, if not ſuffered

* Aloyſius Comes Marſilli in Danub. Panon. Myſic. Tom. 1. Præfat.

by his aſſiduity in other reſpects *, but this I ſhall never regret, if, in any meaſure, I can contribute to promote the glory of God, and the public welfare.

Bergen, May 1. 1751.

* Qui multa agit, ſæpe fortunæ poteſtatem ſui facit, quam tutiſſimum eſt rarò experiri. Seneca de Tranquillit. Anim. Cap. XIII.

THE

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THE NATURAL HISTORY OF *NORWAY*.

PART I.

CHAPTER I.

Of the Air and its Phenomena.

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SECT. I.

The climate, and various atmoſphere of *Norway*.

THE air, together with the light, warmth, humidity, and other properties thereof, varies much more in Norway than in moſt European countries. This may well be concluded, without perſonal experience, from the vaſt extent of the country, of 300 Norway-miles * from cape Lindeſnaes ſouth,

* The common miles of Norway are computed to be about one fourth larger than a German mile, at which rate they are near equal to five or ſix meaſured Engliſh miles.

to the north cape on the borders of Ruſſia. Thus M. Ramus, ſo juſtly celebrated for his hiſtory of the civil tranſactions and antiquities of his country, in the Chorographical deſcription of Norway, computes its length from Lindeſnaes in the dioceſe of Chriſtianſand, which lies in 58, or, more preciſely, in 57 degrees, 47 minutes latitude, to the north cape at the extremity of Finmark, at 71 degrees and half, to be in a direct line, or through the air, 202 miles and a half, but he finds that the circuit acroſs the mountains and vallies, or by water, from one cape to the other, increaſes it to above 300 miles, and its breadth from the frontiers of Sweden weſtward, to cape Statt near Sundmoer, in 21 degrees of longitude from the Canaries, is 65 miles, but from thence, the country becomes gradually narrower towards the north. I have no particular knowlege of that part of Norway called Finmark, which lies in the frigid zone, or near the polar circle. It is the country of Norway, properly ſo called, at the extremity of the temperate zone, that is here to be chiefly treated of, and it is the air of this country, which I affirm to vary conſiderably in reſpect of the degrees of heat and cold, light and darkneſs.

SECT. II.

Day-light and length of the day.

In this and moſt other points, I ſhall chiefly regulate my obſervations by the horizon of Bergen, not only as it happens to be the place of my reſidence, but as its latitude, being 61 degrees 15 minutes, with reſpect to north and ſouth, lies nearly in the middle of Norway * properly ſo called. The longeſt day at Bergen conſiſts of 19 hours, the ſun riſing at half an hour paſt two, and ſetting at half an hour after nine; and the ſhorteſt is only ſix, the Sun not riſing before nine, and ſetting at three.

The gradations of the increaſe and decreaſe of day-light, are clearly exhibited in the following table.

* At Bergen in Norway, Geſle in Sweden, Nyſtad in Finland, and Wyburg in Carelia; as being at parallel diſtances from the equator, the days and nights are of the ſame length. But at Bergen it is noon at the very ſame inſtant, as at Utrecht in Holland, Marſeilles in France, and Conſtantine in Africa.

The

The rising and setting of the Sun in the horizon of Bergen, in the 61st degree of latitude, according to Pontanus.

January.			February.			March.			April.		
	Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets
1	8 ½	3 ½	4	7 ½	4 ½	2	6 ½	5 ½	5	4 ½	7 ½
11	8 ½	3 ½	10	7 ¾	4 ¾	6	6 ¼	5 ¾	11	4 ¼	7 ¼
20	8 ¼	3 ¾	14	7	5	11	6	6	16	4 ¼	7 ¾
25	8	4	19	6 ¾	5 ¼	16	5 ¾	6 ¼	21	4	8
30	7 ¾	4 ¼				21	5 ½	6 ½	26	3 ¾	8 ¼
						26	5 ¼	6 ¾			
						31	5	7			

May.			June.			July.			August.		
	Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets
1	3 ½	8 ½	2	2 ½	9 ¼	4	2 ¾	9 ¼	4	4 ¼	7 ¾
7	3 ¼	8 ¾	7	2 ¼	9 ½	9	3	9	6	4 ½	7 ½
12	3	9	13	2 ¼	9 ½	14	3 ¼	8 ¾	14	4 ¾	7 ¼
22	2 ½	9 ¼	18	2 ¼	9 ½	19	3 ¼	8 ½	19	5	7
28	2 ¼	9 ½	23	2 ¼	9 ½	24	3 ½	8 ¼	25	5 ¼	6 ¾
						29	4	8	31	5 ½	6 ½

September.			October.			November.			December.		
	Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets
4	5 ¾	6 ¼	4	6 ¾	5 ¼	5	8 ¼	3 ¼	6	9 ¼	2 ¾
14	6	6	9	7	5	11	8 ¾	3 ½	12	9 ¼	2 ½
19	6 ¼	5 ¾	14	7 ¼	4 ¾	17	8 ¾	3 ¾	17	9 ¼	2 ¼
24	6 ¼	5 ¼	20	7 ½	4 ½	28	9	3	22	9	3
			25	7 ¾	4 ¾						
			31	8	4						

A particular herein observable, is, that as in the beginning of the year the day-light increases with remarkable celerity, so it decreases at the approach of winter in a like proportion. In the middle of February, I have been able to read without difficulty at six in the morning, which at the same hour in October was not possible; the cause of this, being manifestly the inclination of the earth towards the poles, needs no further explanation.

Clearness of the summer nights.

In the summer nights the horizon, when unclouded, is so clear and luminous, that at midnight one may read, write, and do every kind of work as in the day; this I have often experienced, even when age had brought me to the use of spectacles. Christian V. during his stay at Drontheim, in June, 1685, used to sup at midnight, without the use of lights. In the district of Tromsen, which is properly the extremity of Norway, towards the islands of Finmark, the sun is continually in view in the midst of summer, and is observed to circulate day and night round the north pole, contracting its orbit, and then gradually enlarging it, till at length

it

it leaves the horizon, ſo that in the depth of winter it is inviſible for ſome weeks *, and all the light perceived at noon is a faint glimmering of about an hour and half's continuance, which, as the ſun never appears above the horizon, chiefly proceeds from the reflection of the rays on the higheſt mountains, the ſummits of which are ſeen more clearly than other objects. However, this glimmering is not the only light with which the inhabitants of theſe northern provinces are provided for their fiſheries, and other employments, in the open air. The wiſe and bountiful creator hath afforded them all poſſible aſſiſtance, for theſe and other purpoſes. Beſides the moon-ſhine, which by reflection from the mountains, is exceedingly bright in the valleys and creeks, theſe northern people, as well as the peaſants, and fiſhermen in the dioceſe of Bergen, when their day-light is contracted to ſix hours, find conſiderable relief from the north-light called Aurora borealis; it often affording them all the light neceſſary to their ordinary labors, eſpecially as it is now both here and elſewhere more frequent and extenſive than formerly.

SECT. III.

The *Aurora borealis*, and ſea-light in the night.

This light in the air †, which here, and in Sweden, is known by the name of Værlios, Lyſnar, Lyſanigar, and Lottetſkien, is elſewhere generally called the north-light, as uſually iſſuing from the north, and its appearance moſtly known to the northern people, although the real cauſe of it be here, no leſs than in other parts, a very dark problem, and involved in many uncertainties. I ſhall the leſs preſume to advance any thing as certain and deciſive on this head, ſince counſellor Ramus, a native of Norway, and a celebrated mathematician, hath not ventured to

* Even in theſe provinces, where, I have already obſerved the ſhorteſt day to conſiſt of ſix hours, there are alſo ſome few parts ſo incloſed within the ſteep mountains, that for ſeveral months they cannot ſee the ſun's diſk, though its beams are viſible to them. As I paſſed in my viſitation through the iſland of Laerdahl, the maſter of the houſe where I lodged, aſſured me, that he, and his next neighbour, were bleſſed with the ſun's appearance, not more than four months of the whole year, namely, from the middle of April, to the middle of Auguſt, yet others, at the diſtance of but a quarter of a mile, where the valley widens, could ſee it as uſual. This muſt be the condition of ſome of the inhabitants of the Alps, eſpecially about Monte Cenis, which ſeparates Savoy from Piedmont, where, in ſome valleys, though the ſun does not appear during the whole winter, yet the inhabitants enjoy the neceſſary day-light.

† In England, and eſpecially in the north parts, where the north light is alſo well known, it is by reaſon of its deſultory motion, called Morrice-dancers, Merry dancers, and ſtreamers.

account for it, and nothing of this kind is found even in the Acta Societatis Hafnienſis, T. I. N°. IX. and T. III. N°. VI. where it might moſt naturally be expected, as theſe pieces contain hiſtorical and phyſical accounts of this very light, with ſeveral plates, repreſenting the obſervations made in many parts of Europe, on the various figures of the northern lights. In the year 1741, the ſon of Capt. Heitman, another great naturaliſt of Norway, publiſhed a poſthumous piece of his father's, on the heat of the ſun, &c. and likewiſe on the north-light. His ſyſtem of the means and manner by which the ſun influences our earth, and the other planets, at ſuch an immenſe diſtance, through the æthereal expanſe, is certainly very ingenious, but I am cautious of ſubſcribing to it, as it oppoſes the doctrines of Newton, Wolfius, Reinbeck, and other eminent mathematicians; yet his thoughts on the north-light, as he was both a perſon of great erudition and experience in philoſophy, deſerve to be here inſerted along with other conjectures, eſpecially as he there treats of another phænomenon analogous to it, namely, a ſea-light, or a luminous appearance in the water, called by the Norwegians, Moor-Ild. His ſentiments on both theſe ſubjects are as follows: " Thus it is obſerved in the frigid zone, that the force which gives motion to the high winds, is there at its utmoſt height; inſomuch, that ſometimes the lower region of the air, which is filled with nitrous vapours, is whirled round, and then is formed that light in the air called the Aurora borealis, or north-light: yet this is a light void of heat, and of the ſame nature with that light which the people of Norway call Moor-Ild, and takes its riſe nearly from the ſame cauſe as the Moor-Ild, the latter proceeding from an agitation of the ſalt-water in a dark night, which hath been every year obſerved by the herring-fiſhermen, when towing their nets along in a calm; for the ſea appears in a kind of flame, as far as the nets reach, whereas before the motion of the nets, not the leaſt glimpſe of light was diſcernible. In freſh-water lakes, there is no ſuch flame apparent; it being formed by the ſaline particles, which upon a motion of the ſea begin to ſparkle, and cauſe an effulgence *. The ſame has been likewiſe obſerved in

* This ſparkling fire in the ſea, ſhall be treated of more at large in chap. 3. ſect. 8. when we come to treat of the ſea, to which it properly relates.

navigation: for as in a dark, calm night, the courſe of a fiſh is perceivable by a long and increaſing track of light upon the water, ſo the water, behind a ſhip under ſail, appears luminous to a conſiderable diſtance.

It is not at all times, however, that this igneous effulgence is to be ſeen in the ſea; but it frequently happens at an approaching alteration of the weather, and on the change of the winds to ſouth-weſt, when the ſaline particles of the ſea are thrown into a kind of fermentation. In like manner, the northern-lights do not always appear, but only at particular ſeaſons, when the ſaline corpuſcles of the air are agitated by a natural fermentation. But the proper rationale of this fermentation, and aſcent of the ſaline particles of the ſea and air, is beſt known to naturaliſts, whoſe reſearches turn on things of this nature. However, it is a general obſervation among expert northern navigators, and the fiſhermen who live along the coaſt of Norway, that when the north-light moſtly appears to the weſtward, it is a prognoſtic of a ſouth-weſt wind; which confirms the opinion of the naturaliſts, that ſome regions of the air, as well as of the ſea, abound in ſaline corpuſcles more than others, and theſe, at certain times, create a ferment, and diffuſe a light through the air. Although this moſt frequently preſages the above-mentioned change of weather, yet, there is often a conſiderable interval, before the change actually takes place. It is however certain, that the cold regions of the air contribute greatly to the change and boiſterouſneſs of the weather; particularly when the north-light has a copper-tinge, a violent ſtorm, at weſt and north-weſt, may be certainly expected, though the weather may for a week after continue favorable to navigators, before the ſtorm comes on. Of this I have ſeen many inſtances.

In this fermentation of the air the cold is abated, and if it extends ſo far as to rarify the air of the atmoſphere, this is called mild weather: And when, by the elevation of the inferior air, it is the more compreſſed againſt that region, which is ſaturated with nitrous exhalations, ſo that the wind in the inferior air ſets the lower part of the cold region in ſome motion, this cauſes thoſe corruſcations in the air, which are called the north-light. In thoſe years, when the winter is unuſually ſevere, theſe nor-

thern lights are ſeldom or ever ſeen; the air being too far oppreſſed and condenſed by the intenſneſs of the cold, to force itſelf upwards againſt the nitrous region, and communicate to it that motion which produces the north-light, before the lower air again expands itſelf by freſh fermentations."

Thus far M. Heitman, whoſe obſervations in ſome meaſure confirm the general opinion of its being a kind of fulgur brutum, or lightning without thunder; conſiſting, as lightning generally does, of inflamed ſulphureous particles, but burning with much leſs vehemence. Dr. Nicholas Boerner, in his Phyſics, chap. xi. p. 284. is expreſsly of this opinion, viz. " that the north-light is nothing but ſaline, ſulphureous vapours, kindled in the upper air, by a change it undergoes in autumn, ſpring, and at other times, when the ſun has not power ſufficient to rarify and diſperſe theſe ſulphureous particles." Or, to make uſe of the words of the celebrated Wolfius, " it is a ſubſtance as yet immature for lightning; of which he treats in a particular diſſertation; or, an imperfect tempeſt, as he calls it in ſect. 335, of his rational Reflections on the works of nature." This opinion may be further corroborated by the following circumſtance: Some perſons of credit, who live in this country, have aſſured me, that theſe Fulgura ſpuria, are not always without a crack or ſound, for in a glaring north-light, and calm weather, a diſtinct ſound has been heard, with an exploſion in the air, like the ſudden breaking of the ice. Another opinion concerning the north-light, is, that it is no more than a mere refraction, or reflection of a flame iſſuing from certain vulcanoes, which, in favour of this conjecture, are ſuppoſed to lie beyond Greenland, near the north-pole. But this poſition is too weak to build any thing on, or to be generally admitted. There are many, however, who conſider the northern lights only as a mere reflection, or reverberation, tho' not from the flame of any vulcanoes, but from the ſun itſelf, when far below our horizon it meets with ſome evaporating clouds, at ſuch a height as to be within the contact of the ſun's beams in their aſcent.

This is the opinion, for which Dr. Ventſky of Prentſlau declares in his third publication of Miſcellaneous Obſervations, drawn from the celebrated M. Euler's enquiry into the north-light,

light, which is to be found in the ſecond part of the Hiſtoire de l' Academie. This hypotheſis requires the following concurrence of cauſes; firſt, there muſt be vapours in the upper regions of the air; next, ſome clouds of that ſort, and theſe at a vaſt height, and in the north; and they muſt not only emit vapours, but be illuminated and irradiated by the ſun, when it is inviſible to us; and of conſequence, the ſun muſt be viſible to us at ſuch time, if we ſtood as far above the horizon as the ſaid clouds. And laſtly, there muſt be a north-wind in the ſame upper region of the air to ſet it in motion, and to give a diſpoſition to the figures, which ſo ſuddenly change their appearance. It is poſſible, that the experience of poſterity may ſuggeſt ſomething more probable.

The author's opinion concerning the north-light.

If I may be allowed, or expected, to add any opinion of my own on this problematical ſubject; it may perhaps be not more improbable than what hath been already alleged, if we admit, that the original cauſe of the north-light lies in the electricity of the etherial air; and, conſequently, that it has exiſted at all times, and in all places, tho' not viſible to us, without a concurrence of ſuch concurrent circumſtances and junctures, as I ſhall here exhibit. It is not above twenty years, ſince the electrical experiments have become generally known, and as they have excited the attention of all lovers of natural knowlege, they have likewiſe filled them with hopes, that this diſcovery would open a way to the ſolution of many more myſteries in nature. I flatter myſelf with the ſame expectation; but the firſt experiment of any importance, which has occurred to me, relates to this very point of deducing the north-light from the electrical, feeble, and ſubtile fire of the air, which by means of the more rapid circumvolution of the globe on its poles, or axis, excites a more vehement concuſſion, or agitation, in the air of the northern climates, and thus diſplays the electricity of the ethereal air moſt conſpicuouſly in thoſe parts. I was firſt led into theſe reflections ſometime ſince by a converſation with a friend of mine, a very ingenious naturaliſt, who ſhewed me a remarkable paſſage in the Bibliotheque Britannique, Tom. XXI. P. II. pag. 336. where, among other extracts from the Engliſh Philoſophical Tranſactions, is part of a piece of M. Deſaguliers, intitled, A Diſſerta-

tion concerning electricity. The ſcope of his demonſtrations is ſomething different, viz. to ſhew the true cauſe of the aſcent of rain-water, and the power by which it remains floating in the air, which is at all times much lighter than water. But as the inveſtigation of one truth often proves introductory to another, ſo in this paſſage the writer ſeems to direct us to a clearer inſight into the origin and nature of the north-light. I ſhall therefore inſert ſo much of that paſſage here, as relates to our purpoſe. In order to apprehend his meaning, we muſt recollect with the learned writer, that Mr. Du Fay's obſervation, " that there are two ſorts of electricity," is proved by obſervations and experiments; and that the electrical bodies of a vitreous electricity mutually repel one another, whilſt they attract thoſe of a reſinous electricity; alſo that thoſe of a reſinous electricity repel one another, and attract thoſe of a vitreous electricity.

" I ſuppoſe, ſays Dr. Deſaguliers, particles of pure air to be electric bodies always in a ſtate of electricity, and that vitreous electricity.

1ſt, Becauſe particles of air repel one another without touching, as has been deduced from experiments and obſervations.

2dly, Becauſe when the air is dry, the glaſs-tube rubb'd (or only warmed) throws out its effluvia, which the air drives back to the tube; from whence they dart out anew, and ſo move backwards and forwards with a vibratory motion, which continues their electricity.

3dly, Becauſe the feather made electric by the tube, and darted from it, keeps its electricity a long time in dry air; whereas when the air is moiſt, the moiſt particles, which are non-electrics, floating in the air, and being attracted by the feather, adhere to it, and ſoon make it loſe its electricity; which alſo happens even to the tube in a little time.

From this conſideration it will be eaſy to account for a famous experiment of the late Mr. Haukſbee, which is this:

Having pump'd out all the air from a glaſs-globe, he caus'd it to turn on its axis very ſwiftly by means of a rope with a wheel and pulley; then rubbing the glaſs with his hand during its motion, there appear'd a great deal of light of a purple colour within the globe, without any light or attraction obſerv'd on the outſide of the glaſs, which is obſerv'd when the air has not been pump'd

out. Then turning the cock ſo as to re-admit the air gently into the globe during its motion, the light was broken and interrupted, diminiſhing gradually, till at laſt it appeared only on the outſide of the glaſs, where it was accompanied with attraction. Does it not appear that the external air, by its electricity, at firſt drives back the electric effluvia of the glaſs, which go then to the inſide of the globe, where there is the leaſt reſiſtance? For we obſerve that as the air comes in, it repels the electric effluvia, that go inwards no longer when all the air is come in. If the fact be ſo, as the experiment ſhews, is not my conjecture proved, viz. that the air is electrical?

In the reverend and learned Dr. Hales's Vegetable Statics, ſeveral of his experiments ſhew, that air is abſorbed, and loſes its elaſticity by the mixture of ſulphureous vapours, ſo that four quarts of air in a glaſs-veſſel will, by the mixture of thoſe effluvia, be reduced to three. Will not this phænomenon be explained by the different electricity of ſulphur and air? The effluvia of ſulphur, being electric, repel one another: and the particles of air, being alſo electric, do likewiſe repel each other. But the air being an electric of a vitreous electricity, and ſulphur of a reſinous electricity, the particles of air attract thoſe of ſulphur, and the Moleculæ compounded of them, becoming non-electric, loſe their repulſive force."

The judicious reader may, of himſelf, apply this paſſage to the north-light; and perhaps, by a mature diſcuſſion of it, ſtrike out clearer ideas of that phænomenon, than I can develop, who only undertake to ſet down a few things, which have occurred to me.

The terreſtrial globe, together with its atmoſphere, may be conſidered as the glaſs-globe of the electrical machine. Upon the air being exhauſted, and the globe whirled about with velocity, there appears within it a purple flame, and this is the colour of the north-light; now this flame muſt be the æther igneus. Upon the re-admiſſion of the circumambient air, eſpecially if thick and damp, the acid or æthereal fire within is expelled, and hovers for ſome time on the upper ſurface of the glaſs, till, mingling with the air, it is diſſipated, and extinguiſhed. Now this ſeems to intimate to us, that the north-light obſerved towards the pole or axis of our earth, does not only owe its origin to the æther, but is the very æther itſelf; which, being aggregated, gives way to the

the impreſſion of the humid air, and mounts and floats above the clouds, whoſe motion likewiſe renders it variable. Whilſt the air is dry, whether by the froſts of winter, or the heats of ſummer, no north-light is to be ſeen. But upon the weather's beginning to break, either by a thaw after a ſharp froſt, or by rains after heat, and when theſe are preceded by damp exhalations, the north-light breaks forth, as a certain prognoſtic of the change. For theſe exhalations have then nearly the ſame effect in the atmoſphere, as the aforementioned intruſion of the air into the glaſs-globe; propelling upwards the lighter æthereal air, when for a time it appears like the purple coloured fluid iſſuing from the glaſs-globe, till it is diſſipated, or mixed again with the ambient air. It is further obſervable, that the air near the poles is far more denſe, and compreſſes more vehemently, as being repelled with leſs violence, than that in the middle of the globe, where the centrifugal power operates with a more direct and immediate force *.

Should this hypotheſis, as indeed I know of no better, be approved by ſuperior naturaliſts, it will afford a very ready ſolution of a difficulty, which clogs all other ſyſtems; namely, It is well known among thoſe people of the north, who have the beſt opportunities of obſerving theſe lights in the air, that the general region of them is not due north, but rather in the north-weſt quarter of the ſky. Is it aſked how this comes to paſs? it may be anſwered, that as the ignorant imagine the ſun daily to run from eaſt to weſt, the more intelligent know, that, on the contrary, the earth daily revolves from weſt to eaſt; thereby on one ſide a rarefaction may be cauſed in the air, and on the other a condenſation. It is likewiſe obſervable and conſonant to this, that from ſun-ſet to a little paſt midnight, the Aurora borealis is ſtrongeſt, and to the beſt of my knowlege not towards the morning. Let others who have more ſagacity, inveſtigate this matter farther.

I muſt aſk the reader's pardon for dwelling ſo long on this particular, though I am not without apology, ſince it appertains

* In locis polaribus vis centrifuga nihil de gravitate aeris tollit, cum in eam ſub Æquatore directione perpendiculari agat. Quamobrem pondus atmoſpheræ ſupra æquatorem debebit apparere minimum, prope polos maximum; quemadmodumobſervationes baroscopicæ quoque evincunt. Petr. van Muſchenbroek, Elementa Phyſicæ, Sect. 1116.

to the phenomena of Norway, and of the north in general, and theſe are more immediately my ſubject, than natural philoſophy in general; which, however, I flatter myſelf, may, in ſome reſpects derive ſome benefit from this work.

I cannot forbear adding, that the northern peaſant, tho' he does not arrogantly pretend to inform us, what the Aurora borealis is, yet he is not ſo ſtupid as to imagine it to be ſome tremendous portent of wars, the deaths of princes, and other direful events, which has been the interpretation of thoſe lights, even till modern times, when they have been ſeen in France, Spain, and Italy, and been made uſe of to circulate a general terror and anxiety, very ſeldom as the omen of any happy event. Yet a ſignal inſtance of the latter happened even in Norway, and no longer ago than the middle of the laſt century; which, among other things ſhews, the north-light formerly not to have been ſo very uſual even here, or not ſo well known. But one extraordinary circumſtance is, that the perſon who interpreted this light as an omen, was a profeſſor of phyſics and mathematics, who, in the middle of the laſt century, was firmly perſuaded of having ſeen an apparition, which probably was no other than the north-light; and this apparition revealed to him the important and happy revolution, which, within three years after happened in this kingdom, when the government was changed into an independent hereditary monarchy *.

* The authority to which I can appeal for this, is in J. H. Feuſtking's Gynæceum Hæret. Fanat. p. m. 658. in theſe words: "A few years ſince died here in Kemberg, in his 92d year, our learned and experienced phyſician Ambroſe Rhodes, who, whilſt profeſſor of natural philoſophy and mathematics, at Chriſtiana in Norway, predicted from the appearances which were obſerved at Eger in Norway on the 1ſt of Auguſt, 1657, that Frederic III. who was then on the throne of Denmark, would be inveſted with an unlimited ſovereignty, and that the kingdom before elective, would be thus made hereditary. An account of his thoughts and inferences from this phænomenon, he drew up in writing at the preſſing requeſt of Jens Bilkens, chancellor of the kingdom. I muſt own that ſome particulars in it are very aſtoniſhing, and appear ſo even to the celebrated C. S. Schurtzfleiſch, who in his Latin letters (which are very well worth reading) mentions it in the following manner. "Memorabile eſt in vicino oppido Kembergenſi, medici et mathematici non inglorii judicium de oſtento quodam in Norvegia viſo, unde præſagivit Regi Daniæ Friderico III. plenam et hæreditariam poteſtatem, quod eventus An. 1660, approbavit."

SECT.

SECT. IV.

From the light, which is the firſt object of perception in the air, I proceed to its heat and cold. The degrees of theſe, as already obſerved, are very various; and this not only from the annual viciſſitudes of the ſeaſons, but in the very ſame ſeaſon, and on the ſame day, the variableneſs is greater than ſtrangers can well conceive to be poſſible. I ſhall the rather enlarge on this remarkable phænomenon, as it is a manifeſt argument of the power and wiſdom of the Creator, and his tender care of his creatures *. On the eaſt-ſide of Norway, or from the frontiers of Sweden to Filefield, that is in moſt of the provinces, the winter's cold generally ſets in about the middle of October, laſting till the middle of April, or, according to the computation of the peaſants, from Calixtus's day to that of Tiburtus, when the air is here as cold as at the extremity of the temperate zone. The waters are frozen to a thick ice, and the mountains and valleys covered with ſnow. I ſhall hereafter produce ſome inſtances of the extreme intenſeneſs of the cold. However, this is of ſuch importance to the welfare of the country, that, in a mild winter, the peaſants, who live among the mountains, are conſiderable ſufferers; for, without this ſevere froſt and ſnow, they can neither convey the timber they have felled, to the river, nor carry their corn, butter, firs, and other commodities, in their ſledges, to market-towns, and after the ſale of them, carry back the neceſſaries they are there ſupplied with. I muſt here mention a wonderful inſtance of the divine œconomy, which I ſhould heſitate to commit to writing, did not thouſands of witneſſes confirm it: when the

The winter mild in the weſtern parts, and the froſt ſeldom ſevere or laſting.

* According to the common opinion, and even the poſition of Ptolemy's Geogr. cap. viii. countries equally diſtant from, or equally near to, the line, ſhould have equal cold and heat. But that this is not the caſe is proved by Profeſſor Kaeſtner in his Explanation of Dr. Halley's method of calculating heat, Hamburg Magazine, tom. iii. p. 426; but none of the inſtances adduced by him are ſo clear as what might have been brought from the natural ſtate of Norway, had he been acquainted with it. The true cauſe of the want of heat, in the northern countries, is the vicinity of that part of the globe to the pole; the ſolar rays there falling more obliquely and, conſequently, not acting with ſuch force as near the line, where they fall in more perpendicular directions. The other cauſe, moſt current among the ignorant, namely, the greater diſtance of the ſun, can occaſion no great difference, if we conſider the vaſt diſtance of the ſun from the earth, conſiſting of ſo many millions of miles; for this being conſidered two hundred miles, more or leſs, cannot be ſuppoſed to affect us, at leaſt not in any degree; eſpecially as we know, that the ſun is fartheſt from the earth in the heighth of ſummer, and neareſt it about Chriſtmas; but it then deſcends ſo very low, that, from the obliquity of its rays, it gives little or no heat.

winter rages with such severity in the east parts of Norway, that all the fresh-waters are frozen, the lakes and bays are open on the west-side, though lying in a direct line with the eastern parts; the air is misty and cloudy, and the frosts seldom are known to last a fortnight or three weeks. In the center of Germany, which is two hundred leagues nearer the line, the winters are, generally, more severe, and the frosts sharper than in the diocese of Bergen, where the inhabitants often wonder to read in the public papers, of frost and snow in Poland and Germany, at a time when no such weather is felt here. The harbours of Amsterdam, Hamburg, Copenhagen, and Lübeck, are frozen ten times oftener than ours; for, with us, it is generally known not to happen above two or three times in a whole century; and, which is yet more extraordinary, when the harbour of Bergen is frozen, the Seine, at Paris, may be concluded to be in the same condition. Thus our winter at Bergen is so very moderate, that the seas are always open to the fishermen and mariners; and it is seldom that the bays and creeks are froze over, except those that reach far up the country towards Filefield, where they meet with keen and dry north-east winds, blowing from the land *. In the other parts, towards the western coast, it is but seldom, as has been before noticed, that any hard winters, or lasting frosts, are heard of, though travellers, who perhaps come from, or beyond, Filefield, about 20 miles eastward, say, they have had severe winters there for some time past.

SECT. V.

The wise and bountiful design of providence in this.

This amazing difference is, according to the wise design of the creator, requisite for the well-being of the country; for, as I have already observed, the eastern parts require a hard winter for their subsistence, and a mild winter, and open weather is no less necessary to the western parts, where the inhabitants chiefly main-

* As far as the 80th, or 82d degree, the north-sea continues open and navigable both winter and summer, except in the creeks, and along the shore, in Finmark, Iceland, and Greenland, from whence the large masses of ice being detached, are seen to float in the sea. In winters of extraordinary severity, when the Baltic is frozen up, the swans, which otherwise are not to be classed among the birds of this country, transmigrate hither, to procure themselves water, which they are there deprived of; and I have been credibly informed, that the few swans, which are still to be seen at Syndfiord, and other places within my diocese, were refugees from Denmark, in the years 1708 and 1740.

tain themſelves by their ſea-fiſheries. It is expedient for them, that the ſea ſhould be open during the whole winter; for from the middle of January, the herrings, skates, cods, &c. are chaſed by the whales towards the coaſt, when the peaſants ſally out in multitudes from the creeks, into the ſea, and thus get a great part of their ſubſiſtance for the whole year; and ſeveral thouſands of the northern peaſants of both ſexes, during January and February, paſs the whole day upon the open ſea, and only towards the approach of night betake themſelves to their huts, in the neighbouring iſlands. This mildneſs of the winter is likewiſe neceſſary for curing and ſalting the fiſh, which in froſty weather would be ſpoiled and uſeleſs: for if the fiſh ſhould freeze as ſoon as taken out of the water, the ſalt could not penetrate into them, being obſtructed by the ice; and if carried home and kept till a thaw comes on, they ſoon become flaccid and putrified at the bone, and conſequently unfit for uſe; a ſufficient evidence of the abſolute neceſſity, and great benefit of a mild winter, to the weſtern parts of Norway.

Winter-fiſhery.

SECT. VI.

If it be farther asked, how is it poſſible that nature can regulate herſelf by the neceſſities of the inhabitants, and give them froſts and thaws at the ſame time, under the ſame climate; I anſwer, that it is no miracle, but purely the reſult of the primary natural diſpoſition of things. It is a general rule, that Norway, from its ſituation on the globe, muſt have ſevere winters; but the exception from this rule lies here; the weſtern ſide of Norway lying neareſt to the great ocean, its air muſt be ſenſibly milder, the intenſe froſt being warded off by the conſtant intermixture of warm exhalations, vapours, and miſts from the ſea, which in the lower region of the air, inſenſibly diſſolve the almoſt imperceptible ſharp particles of ice that proceed from the north pole, or congeal in the cold upper regions of the air, but are melted as ſoon as they fall in with the warm vapours of the ſea. That theſe exhalations abate the natural rigour of the weather, cannot be doubted; but whether they ariſe from warm ſprings at the bottom of the ſea, continually boiling by means of the centrial fire; or if this be denied, whether this ebullition be the effect of leſſer ſubterraneous

The natural cauſe thereof.

vulcanoes reſembling the mountainous ones on the ſurface of the earth, it would not be pertinent here to determine.

Woodward's Theory of the earth, p. 39, and 52.

Without entering into a prolix examination of theſe things, I ſhall only quote Woodward's opinion on this head, " There is a nearly uniform and conſtant heat diſſeminated throughout the body of the earth, and eſpecially the interior parts of it; the bottoms of the deeper mines being very ſultry, and the ſtones and ores there very ſenſibly hot, even in winter and the colder ſeaſons; and 'tis this heat which evaporates and elevates the water of the abyſs, buoying it up indifferently on every ſide, and towards all parts of the globe." And, page 151, he adds, " That the water reſident in the abyſs, is, in all parts of it, endued with a conſiderable quantity of heat; and more eſpecially in thoſe parts where theſe extraordinary aggregations of his fire happen. So likewiſe is the water which is thus forced out of it, inſomuch that when thrown forth and mixed with the waters of wells, of ſprings, of rivers, and of the ſea, it renders them very ſenſibly hot." Thus far Woodward.

It is ſufficient that experience ſhews the countries remote from the ſea, tho' neareſt to the line, to be ſubject to the hardeſt winters; and that among thoſe countries which are actually encompaſſed by the ſea, none have leſs of the winter, that is of the froſt, ice, and ſnow thereof, than thoſe which lie open to the great ſea, or the main ocean, the mild and warm effects of its exhalations being moſtly felt in winter, when they are moſt copious, having a large range in the atmoſphere, which at that ſeaſon is leſs crowded by the ſolar rays. It is almoſt inconceivable, tho' certainly true, that the winter of the year 1708, ſo remarkable for its deſtructive ſeverity, was not remarkably different at Bergen from the other common winters. And ſo likewiſe Ireland, Scotland, and the Orkneys, all ſituated towards the weſtern ocean, felt little of the extraordinary rigor of that winter; of which more particular accounts may be read in the Engliſh philoſophical

* To remove all doubts, which thoſe who are not experimentally acquainted with this ſingular providence may entertain of it, I ſhall confirm it by the following paſſage from Derham's phyſico-theology, B. 4, C. 2. Of which defence againſt the moſt ſevere cold, (namely the warm exhalations from the ſea,) we have lately had a convincing proof in 1708, when England, Germany, France and Denmark, and even the more ſouthern parts of Italy, Switzerland, and other countries, ſuffered ſeverely; whereas

loſophical tranſactions * N° 324. In relation to this truth, a certain French geographer muſt be allowed to be in ſome meaſure right, though the aſſertion ſeems very ſingular and unheard of, " L'air eſt fort doux en Norvegue, de ſorte que la mer n'y gele point, et la neige y eſt fort peu de tems." i. e. In Norway the air is very temperate, ſo that the ſea is never frozen, nor does the ſnow lie long upon the ground.

Les Etats, Empires et Princip. du Monde, par Sieur D. T. V. v. p. 777.

SECT. VII.

The aforeſaid writer probably had his account from ſome Norwegian, who was acquainted only with the weſt ſide of the country; for the deſcription by no means agrees with moſt of the provinces, and eſpecially all the eaſtern parts near Filefield. The intenſeneſs of the winter is there extreme, particularly in the levels on the mountains; which are far more expoſed to the ſeverity of the air than the valleys, and reach towards the upper region of the atmoſphere which is much colder than the lower, as the reflexion of the ſun is there leſs powerful, and the air more rarified. The uſual degree of the cold, eſpecially in January and February, may be ſufficiently conceived from hence, that the largeſt rivers, with their roaring cataracts, are arreſted in their courſe by the froſt, and the very ſpittle is no ſooner out of the mouth, than it is congealed, and rolls along the ground like hail. A farther inſtance of the extreme cold, not unworthy notice, eſpecially as it raiſes aſtoniſhment in foreigners, is, that no ſooner has a horſe dropped his excrements on the ice, than the balls of horſe-dung move and leap on the ground: The cauſe of this is the ſudden change from heat to cold, which occaſions a violent conflict, when the ſharp and denſe air penetrates forcibly into the lighter, and expels it *. It

The cold moſt ſevere in the eaſtern parts.

whereas Ireland and Scotland felt very little of it, more than in other winters. But it ſeems this is what ordinarily befal thoſe northern parts, particularly the iſlands of Orkney, of which the learned Dr. Wallis gives the following account, " there the winters are generally more ſubject to rain than ſnow; nor doth the froſt and ſnow continue there ſo long as in other parts of Scotland; but the wind in the mean time will often blow very boiſterouſly, and it rains ſometimes, not by drops, but by ſpouts of water, as if whole clouds fell down at once, &c." Likewiſe M. Lucas Debes, in his deſcription of the Ferro iſlands, affirms, " that the winters there are not very cold, though they lie in the 62d degree of latitude; the froſts ſeldom laſting longer than a month, and are withal ſo moderate, that no ice is ever ſeen in an open bay, nor are the ſheep and oxen ever brought under cover.

* Of the ſmall and piercing darts of ice, as they are called, which are particularly ſhot forth by the north, and north-eaſt winds, the very learned Jens Spidberg, deaf

on

It is neceſſary to uſe great caution in providing againſt ſuch weather, in which an unexperienced or unguarded traveller may be deprived of his noſe and ears; it is particularly expedient to cover the face, and for this the moſt approved method is to fix a piece of gauſe under the hat; which both retains the warm effluvia iſſuing from the body, and keeps off the piercing air better than would be imagined; allowing at the ſame time ſight enough, to guide the horſe. Some now and then rub their faces with a handful of ſnow, as enabling it, better than by warmth, to bear the cold; but in long journeys over the higheſt mountains, where the air is much keener, and the winter quite inſupportable, no precautions would avail, without the convenience of the mountain-Stoves, as they are called, which are kept at the public charge for the repoſe and warmth of travellers. Of the neceſſity of theſe, and the impracticableneſs of the mountainous and deſart parts in the winter-months, the Swedes afford a melancholy inſtance; and as the like is ſcarce to be found in the hiſtory of any age,

Several thouſand Swedes periſh in the froſt.

I ſhall here give a ſhort account of it. In February 1715, ſeven thouſand, ſome ſay nine thouſand Swediſh ſoldiers, together with their officers, periſhed in a moſt deplorable manner on the mountain of Ruden, or Tydal, which ſeparates Jempteland in Sweden, from the Dioceſe of Drontheim, without any other enemy than the extreme cold; which ſurpriſed them on the ridge of that mountain, where nobody could come to their aſſiſtance. The affair happened in this manner:

In the autumn of the preceding year, this corps, which then conſiſted of ten thouſand men, had penetrated into the country, and appeared to have a deſign upon Drontheim; thereby to clear a paſſage for the main army, which was at that time under the command of the king in perſon, and had made an irruption near Frederickſhall, and to facilitate its farther progreſs into

of Chriſtianſand, bears the following teſtimony, "It cannot be denied, that the air towards the north is in winter-time full of innumerable particles of ſnow and ice, which are frequently ſo large and ſenſible, that when the wind blows freſh, they dart into the face, and give it a pain like the ſmart of a ſwitch; and they are not only felt, but when the cold is very intenſe, and the ſun ſhines clear, theſe particles may be viſibly diſcerned, glittering like ſo many little Stars." And this accounts, why the north wind is of a more penetrating coldneſs than any other, that in its paſſage, it ſweeps along the ſnowy mountains of the north, and thus becomes impregnated, as it were, and loaded with theſe particles, or lamellæ niveæ et glaciales, which among us occaſion ſuch a ſharp cold. Supplem. II. Actor. Vratiſl. Art. 4. p. 71.

Nor-

Norway, but the gallant Daniſh general Budde, who, in the laſt invaſion of the Swedes, had done his country great ſervice, made ſuch good diſpoſitions againſt the enemy, that they laid aſide their deſign of attempting Drontheim, and cantoned themſelves among the peaſants, till the beginning of the year 1719; when, though late, they received an account by expreſs of the unexpected death of the king before Frederickſhall. Soon after, advice coming that Count Sponeck was in full march towards them, they had orders to make the moſt precipitate retreat over thoſe deſart and loſty mountains; but juſt as they had reached the frontiers of their own country, they were overtaken by a ſtorm, accompanied with an extreme cold, and much ſnow, which ſo bewildered them, that the greateſt part of them periſhed. A company of two hundred Norwegian ſledge-men, under major Emahus, which followed them cloſe to obſerve their retreat, found the enemy dead upon the mountains; ſome ſitting, ſome lying, and ſome in a poſture of prayer, all frozen to death. How great their diſtreſs muſt have been, may be judged from their cutting their muſkets to pieces, in order to burn what little fuel they could raiſe from them. The generals Labarre and Zoega were among the dead, but the generals Adlerfeld and Horn barely eſcaped with their lives; and of the whole body only two thouſand five hundred, or, according to others, no more than five hundred, ſurvived this dreadful cataſtrophe *.

SECT. VIII.

From this accidental digreſſion I now return to the cold in Norway, which led me into it, and ſhall ſhew, according to my deſign, that the wiſe and provident Creator has not left the inhabitants of theſe cold climates without a greater variety of preſervatives againſt the weather, and more means of keeping themſelves warm, than other countries afford. 1. The country abounds in large foreſts, affording them plenty of fuel, and timber for building ſtrong houſes: 2. The wool of the ſheep, and the furs and

Prefervatives againſt the cold.

* Whoever conſiders this great loſs, which was inflicted by the hand of God, and the many other defeats, particularly at Moſs, Frederickſhall, Ringerige, Crogſtoven, Iid, and elſewhere, cannot but wonder that Mr. Nordberg, an hiſtorian of great merit in other reſpects, ſhould in the ſecond part of his life of Charles XII. affirm, that the war was carried on with equal advantage, or rather on the Swediſh ſide with conſiderable ſuperiority. "Par là les forces de Charles XII. furent aſſez egales à celles de ſon ennemi. Il fit trois campagnes en Norvegue avec un avantage aſſez egal et même avec ſuperiorité." An aſſertion without the leaſt truth. But the circumſtances of this laſt war were never rightly underſtood by foreigners.

ſkins of wild beaſts, furniſh them with warm linings for their clothes, and good bed-covering: 3. The innumerable flights of wild fowls ſupply them with down and feathers: 4. The mountains themſelves ſerve them for fences, and retreats; their ſummits, indeed, are unhabitable, on account of the cold and barrenneſs; but the ſhelving ſides, or interſtices, eſpecially where the expoſure does not face the north or eaſt, enjoy weather that is at leaſt ſupportable. But above all it is to be obſerved, that even the cold air occaſions warmth in the bodies of men; its compreſſive force rendering the body more firm and compact, and fortifying it againſt external injuries: and thus the natural warmth is by the cloſeneſs of the pores repelled towards the inner vital parts, and more particularly concentrated in the ſtomach; ſo that the northern people are known to digeſt ſmoked fleſh, dried fiſh, and other food hard of digeſtion, better than any other nations*. In ſhort, in this as in every other reſpect, the œconomy of the Almighty towards his creatures is full of wiſdom, goodneſs, and harmony. I can even venture to affirm, that were the Norwegians tempted by any thing to change countries with the Italians, the winter's cold would not be the motive to the exchange: for this is the leaſt of their complaints; and, for my own part, I cannot ſay that the cold here has ever been more painful to me than in other parts.

SECT. IX.

Great heat in ſummer, and its cauſes,

After this account of the cold in Norway, it is proper to ſpeak of the heat. Here I apprehend many would interrupt me with a queſtion, whether it is ever actually warm in Norway? I anſwer from experience in the affirmative: for in the beſt ſummer-months it is not only warm, but ſometimes to ſuch a degree, that according to the vulgar phraſe, *it may make a raven gape*; and perſons, who have been born and educated in hot climates, might fancy themſelves ſuddenly tranſported home. Particularly in this preſent year 1750, on the laſt day of July and firſt of Auguſt, the

* That the particles of the atmoſphere are more condenſed near the poles, and conſequently preſs more forcibly on bodies, than in the expanded and rarified air of hot climates, inſomuchthat 1010 pounds of copper at Drontheim, weigh only 1000lb. at Rouen, is demonſtrated and explained by J. Rohault, Traité de Phyſique, Tom. II. P. III. C. III. § 9. where he alſo ſhews, that the mercury riſes higher in Denmark and Sweden, than in France and Italy.

heat was ſo exceſſive, that M. Haar, miniſter of Waas, and formerly chaplain in the Eaſt Indies, declared he hardly ever felt it hotter in that country; tho' I am inclined, partly, to impute this, to the much ſtronger impreſſion made on the mind by preſent ſenſations, than by the recollection of any paſt *.

The cauſe of theſe violent heats (which however are but of ſhort duration) may be partly derived from the valleys incloſed within high mountains, where the rays being compreſſed and confined, the reverberation of them from all ſides muſt occaſion ſuch heats, as were the ſummer of any conſiderable length, would bring grapes, and other fruits and vegetables, to the like exquiſite perfection as in other countries. The ſecond, and which is the chief cauſe, is, that in the midſt of ſummer, the ſun's abſence below the horizon, is ſo ſhort that there is no night, at leaſt no total darkneſs; conſequently neither the atmoſphere nor the mountains have time to cool, but often retain part of the heat of the preceding day; and if the general opinion of naturaliſts, that a mineral ſoil emits ſulphureous and hot effluvia, be true, this may come in for a third cauſe of the heat, the country being almoſt every where full of mines.

There cannot be a more deciſive proof of the ſummer's heat in Norway, than that ſeveral vegetables, and particularly barley, grows up and ripen within ſix weeks or two months; which, beſides the great profit, is of very conſiderable advantage to the peaſant, as it enables him to begin threſhing when he will, which he is often under a neceſſity of doing very early. It is ſaid, that the ſame happens in Sweden within a much ſhorter ſpace, namely, 36 days; but this I mention only on the authority of the celebrated Olaus Magnus, who has the following paſſage concerning it, "Quoad Aquilonares hoc certum eſt, in pleriſque agris Weſtrogothorum, parte objecta meridionali plagæ, hordeum ſpatio 36 dierum a ſemine projecto maturum colligi; hoc eſt, a fine Junii ad medium Auguſti, aliquando celeriùs" †. It is certain that, where nature has but a ſhort time to work, ſhe accelerates her opera- Early harveſt.

* It appears, that in the countries lying far north, the great length of the days often renders it warmer than with us. Wolffius's Phyſic. Part. II. Chap. VIII. p. m. 180.

† On my viſitation in the year 1750, I ſaw at Indwigen, in Nordfiord, barley ripe and mowed on the 29th of July. Of the vegetables of the country I ſhall hereafter ſpeak more at large.

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tions, and acts with greater energy. In our northern gardens, it is indeed seldom that the winter fruits can attain to their proper maturity; but those of the summer keep pace with those of Denmark, where strawberries, cherries, and the like, are ripe so early as the first of July. Counsellor Carbiner has more than once had ripe figs, in his garden at Bergen; and in Christiana, M. Wilster, an apothecary, has several years brought grapes to a degree very little short of perfect maturity.

SECT. X.

False notions of foreigners concerning the air in Norway.

From these instances, I presume, foreigners will have the candor to admit, that however natural and lasting the cold may be in Norway, yet the impartial Sovereign of nature has not so far neglected us, but that we may pass our days agreeably; especially, if it be considered, that what the climate of Norway denies, it abundantly compensates in other advantages; of which I shall hereafter have occasion to adduce several proofs, partly in praise of the Creator, and partly for the information of foreigners, and the confutation of that very false idea, which, even in my own country, men entertain of the rigorous and unpleasant climate of Norway; which is seldom mentioned but with a commiseration, of which it is not a pressing object. But no conceit is more absurd than that of Simon Patrick, a native of England, and in other respects a writer of great learning and worth; who represents a Norwegian as one who had never seen a rose (which is a very common flower in Norway) and was afraid to touch it, imagining it to be fire *. Who would have thought, that an European could be such a stranger to Norway, and an Englishman too, who ought to know it better from the equality of its situation with the North of Scotland, this being nearly in the same degree of latitude with the bishopric of Bergen; not to mention the frequent

* This passage occurs in a piece of his, in which he instructs and cautions a friend against lukewarmness and apostasy from the Christian religion. His words are to the following import: "The poor Norwegian, as history informs us (I ask what history?) was afraid at the first sight of a rose to touch it, being apprehensive of burning his fingers; he was astonished that trees, as he imagined, should produce flames and fiery flowers; he moved his hand towards it to warm himself, but could not be prevailed with to touch it; but as he was over-joyed to be delivered from such a gross mistake, being afterwards brought not only to touch but to smell this innocent flower, which at first appeared to him to be a fire, so it will be with us, &c." And just so would it have been with the worthy author, had it been his fate to have come to Norway, and there to have seen the roses growing every where.

voyages

voyages of the Engliſh to Norway, ſome of whom are very well pleaſed to ſettle there; or the conſtant voyages of Norwegians to England, who, if the trade would turn to any account, might furniſh the Engliſh abundantly with roſe-water.

SECT. XI.

Quality of the air in reſpect to health and ſickneſs.

If the air of Norway be conſidered in reſpect to health and ſickneſs, particularly as to the natives, it will appear to be pure and ſalubrious from many inſtances of perſons of a very advanced age, eſpecially among the peaſants. Mr. Jonas Ramus, in his Chorographical Deſcription of Norway, is of opinion that a more healthy air in ſummer is hardly to be met with any where than in Norway; though I muſt confeſs, that this varies according to the ſituation of places. The moſt pure and kindly air, I judge to be, in the middle of the country, eſpecially about the mountains, where the inhabitants have hardly an idea of ſickneſs, unleſs it be hereditary, or contracted by intemperance. It is reported, though I will not warrant the truth of it, that in the vale of Guldbrand, which is regularly viſited by very ſalubrious gales, eſpecially in the pariſh of Læſſoe, there are perſons of ſuch an extreme age, that from a laſſitude of longer life, they get themſelves removed elſewhere in order to die the ſooner; that farther in the province of Valders, and in other parts, meal may be kept many years without being worm-eaten, or any other damage; which amounts to a demonſtration of the purity, wholſomneſs, and dryneſs of the air. But on the ſea-coaſts, and here in Bergen, I account the air to be leſs healthy from the abundance of humid and ſaline vapours from the ſea, eſpecially in winter, when the miſts and rain are more frequent than clear froſt; yet with the aſthmatic, this moiſt air agrees better than a finer or drier, which may be more piercing; a proof of this I had in an intimate acquaintance of mine, who found his breaſt and lungs conſiderably eaſed after his arrival from Denmark, which I attribute to the air here, as more humid than that of Copenhagen, tho' the latter in winter is not without frequent fogs and rains *.

* This may poſſibly be the cauſe that a very dry air hurts conſumptive perſons, by too ſtrong a tenſion of their weak lungs, and by detaching and carrying off too

Generally ſpeaking, experience, the beſt inſtructor, ſhews the air in moſt places of Norway to be pure and ſalubrious, and even more ſo than in many other countries, as perſons of regular lives, all circumſtances duly conſidered, arrive in theſe parts to the utmoſt extent of the age of man. I ſhall produce many memorable inſtances of this hereafter, when I ſhall particularly treat of the inhabitants of the country; and the ſame is evident from the yearly bills of births and burials, which, by his majeſty's order, I tranſmit to Copenhagen. I ſhall here only mention, that next to their plain and ſimple food, the Norwegians owe their permanent health and longevity more to their air, than to medicinal arts and precautions; for medicine is very little underſtood here; the little we know of it is learnt from foreigners; and whilſt the lawyers are never at a loſs for clients, practitioners in phyſic meet with very few patients.

It is only in the chief towns that phyſicians are commonly to be found, and there they are eſtabliſhed with a public ſalary, as Provincial phyſicians, and in general have but very little employment; even in this populous city of Bergen, among thirty thouſand ſouls, (ſome indeed carry the number higher, but I believe they are miſtaken) there is but one, or at the moſt two phyſicians, and theſe are found ſufficient; whereas in a German city of the ſame extent, ſuch as Lubeck, or Roſtock, ten or more may find an ample ſupport. Norway, indeed, cannot be ſaid to be entirely exempt from peſtilential diſtempers, for the Black-death, known all over Europe by its terrible ravages, from the years 1348 to 50, was felt here as in other parts, and to the great diminution of the number of the inhabitants. I likewiſe find accounts of great numbers of people of all ranks, ſwept away in the years 1618, 1630, and 1654. But the piercing colds of winter, and the ſtorms ſeem to be a divine diſpoſition for purifying the air, and ſtopping the progreſs of an epidemical diſeaſe. The like good effect is produced by thunder and lightning, which diſſipate the ſulphureous and nitrous particles in the air. It is a general notion, that ſtorms and tempeſts are more violent here than elſe-

much of the inward moiſture. The moſt robuſt perſons ſuffer ſometimes by this extreme ſiccity of the air. The people of the eaſtern coaſt of the Red-ſea are ſometimes obliged to ſprinkle water up the air to moiſten it, and when they breath, hold a wet cloth to their mouths. Hamburg Magazine, B. 11. page 38.

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where, but in this I am inclined to think the ſound impoſes on our judgment, the noiſe and eccho of winds and thunder being much louder among the loſty mountains than in the plain country. This difference I have found, that ſometimes, tho' ſeldom, thunder is heard at Bergen in the winter, doubtleſs becauſe that ſeaſon of the year is, as hath been already ſhewn, attended with very little pure cold, but rather with a raw air, and of courſe with more rain than ſnow and hail.

SECT. XII.

As to the humidity of the air, rains being ſo unuſually frequent at Bergen, and for ſome miles round, as to be proverbial among the Dutch; I apprehend the cauſe may be derived not only from the high mountains, there being in other parts of this dioceſe much higher mountains, with much leſs rain, but rather from the many narrow valleys and creeks in the neighbourhood, which become ſoon filled with their own evaporations as well as thoſe from the ſea, and theſe are not ſoon diſpelled by the wind or ſunſhine, except in the heat of ſummer, when the ſun has ſufficient power to draw them up into the open air above the ſummits of the mountains, there to be ſeparated and diſpelled by the wind. Whereas, on the contrary, in other ſeaſons of the year, when the power of the ſolar rays is weakened, the vapours cannot riſe to any conſiderable height above the horizon *. Hence we ſee them hover like rain-clouds, and reſt not only on the tops of the mountains, but often hang about their ſides, inſomuch, that the top may be clear, and the middle of the declivity be covered with theſe rain-clouds: and when travellers or peaſants happen to be ſurprized among them, which is a common caſe, their ſight is ſo obſtructed, as not to ſee their way; they breath with difficulty, grow wet and cold, and un-

Rains and damps on the weſt-ſide.

See a view of Bergen, fig. 1.

* If the old opinion, of the ſun's exhaling the vapours upwards, ſhould not prevail againſt the new, which holds, that ſmall veſicles of air are impelled upwards, and being lighter than the lower air, float in it. Wolff's Phyſic. Cap. v. Sect. 247. Yet my conjecture on the rain at Bergen ſtill keeps its ground; for the eminent naturaliſt juſt cited, allows that the winter-vapours are heavier, and as ſuch ſink lower into the atmoſphere, or cannot aſcend ſo high, the teguments of their ſmall veſicles being then condenſed, ſo that the effect produced is the ſame. His words are, Sect. 254, "The vapours being rarified in the heat of ſummer, they then riſe to a great height in the air:" Again, "the groſſer vapours, having a thick tegument and a ſmall cavity, are heavier, and remain in the lower region of the air, this being of a more denſe nature than the upper; thus in winter, the vapours being condenſed by the cold during that ſeaſon, remain in the lower parts of the atmoſphere.

leſs

leſs they ſpeedily reach the open air their health is endangered. Theſe rain-clouds are like ſpunges ſwelled with water, and on any preſſure, or when driven againſt the mountains, diſcharge their waters in heavy rains, and cauſe that conſtant humidity *. On this account, indeed, Bergen is not ſo pleaſant to live in as ſeveral other places in Norway are; and the women, who ſeldom have the uſe of coaches, are in all weathers obliged to wear a woollen or ſilken black veil over their heads, whilſt the men ſecure themſelves from the rain by rain-hats, made like umbrellas.

SECT. XIII.

The wiſe diſpoſition of Providence in this.

As one of my chief views in this work is, according to my ſhallow knowledge and inſight into the harmony of things, to ſhew that all the works of God are full of loving kindneſs, I muſt here obſerve that the moiſt and rainy weather, which prevails all over the weſtern coaſt of Norway, but chiefly about Bergen, is excellently adapted to the neceſſities of the country, and in ſeveral reſpects contributes to its welfare. Firſt, it is of great benefit to the countryman in his corn and hay-harveſt, for the thin ſurface of earth on the high rocky mountains, which line the weſtern coaſt, requires a great deal of moiſture, otherwiſe it would not yield even graſs, and much leſs would it produce corn; it would literally anſwer to the parable of the ſeed, *which fell on a rock and withered away, becauſe it lacked*

* Edward Dapper, in his voyage to Africa, page 56—58, thus accounts for the heavy rains in Ethiopia, which cauſe the famous inundations of the Nile, "the ſunbeams, ſays he, exhale the vapours; afterwards the middle air, which is cold, and adheres to the cold ſummits of the mountains, diſſipates the clouds which the north-wind has aggregated, or diſcharges them in rain." What this writer attributes ſolely to the north-wind, profeſſor Kraft, on better grounds, judges to be an effect of that attraction which is moſt diſcernible on high mountains, but in ſome meaſure affects the whole globe, which revolving like a wheel, has an attractive power: His words are theſe, "I have often obſerved in fair weather the high mountains to be covered with a thick cloud, as ſoon as there is the leaſt hazineſs in the air, and from hence it is that in mountainous countries, the rains are both more frequent and more violent, than in a champain country." The ſingle cauſe of this, is, the attraction of the mountains, for the attractive power of large mountains, may in ſome meaſure be proportionate to the attractive power of the earth; therefore when neither of theſe attractions are impeded in their operations, and the proportion is adjuſted, the direction in which a particle floating in the air moves towards the mountain may be determined. This is proved from the ingenious obſervation made by Meſſ. Bouger and de la Condamine, on a mountain called Chimboraço, in Peru, when their plummet was by the mountain drawn aſide from its perpendicular direction. The ſprings found on the tops of mountains are produced by this attraction; and as many particles of matter as are ſeen in connection, ſo many inſtances are there of this attractive power. Reflections on the Newtonian and Carteſian Syſtems, by profeſſor Kraft, in Actis Soc. Hafnienſ. Tom. III. p. 284. ſq.

moiſture. Thus theſe deficiencies, in reſpect to vegetation, are ſupplied by the rain which continually moiſtens the little earth we have. Indeed, in moſt places, the rain would not be ſufficient without the maſſes of ſnow on the tops of the mountains, or when theſe are wanting, the many pieces of ſtanding-water on their ridges, which ſometimes by ſubterraneous oofings, ſometimes by gentle ſtreams, thoroughly water the earth, and afford a conſtant refreſhment to the parched ſides of the mountains. Whereas, in the vale of Guldbrand, and other parts where the rains are not ſo frequent, and the mountains not ſo ſteep or thick ſet as here, the water is conveyed into the fields by trenches, and thrown upon the cultivated ground with ſhovels, as is practiſed in Perſia, and other hot countries. A ſecond benefit of this wet and rainy weather, eſpecially when calm withal, and chiefly in ſpring, is, that it gives fiſhermen the advantage of larger draughts; for in clear and open weather the herrings, ſkates, &c. which are every year taken here, and in Nordland, to the amount of many tuns of gold, are generally ſhy of venturing near the ſhore, and into the bays, but in rainy or hazy weather, the fiſhermen meet with numberleſs ſhoals of them.

SECT. XIV.

In the preceding articles, I have ſhewn the diverſities of the northern air, in reſpect to cold and heat, froſt and thaws, both in thoſe provinces which are equidiſtant from the line, and in the eaſt and weſt parts of the country, and it is the ſame in reſpect to fogs and rains. Filefield uſually makes a very remarkable difference betwixt us and our neareſt eaſtern neighbours, in the province of Valder, inſomuch that when it is foul weather with them, with us it is fair, and ſo vice verſa. The courſe of the air, when impelled againſt the higheſt mountains, is checked, for it ſeldom aſcends to paſs over them. Of this I was an eye-witneſs in my return from Chriſtiania in 1749, when travelling on the 24th of June over the higheſt part of thoſe mountains, I obſerved thick rain-clouds hanging over Valders, which we had left, and where it had been rainy for ſeveral days; upon the hill we had a little ſleet, but in the valley of Laerdale, where we arrived at our deſcent from the mountain, the weather was warm

Diverſity of weather in parts contiguous to each other.

warm and dry, and had been ſo for a conſiderable time before. But this caſe is common to Norway, with other mountainous countries, which I ſhall here take occaſion to illuſtrate by ſome parallel inſtances: We are informed *, that whilſt the ſummer ſeaſon laſts, from cape Comarin to the coaſt of Coromandel, it is winter during that time, from Diu to the aforeſaid cape. In like manner, on one ſide of the mountain called Gates, or Ballagates, the fields are cloathed in their verdure, and the country appears in all the gaiety and luxuriancy of ſummer; whilſt, on the other, it is covered with fogs and rain. Something ſimilar to this is alſo obſerved from Ormus to Cape Roſalgate, where the ſhips may harbour and enjoy the moſt delightful weather imaginable, whereas beyond the cape they meet with hard gales, rain, &c. A further account of theſe remarkable particulars the reader may meet with in Paul van Caarden's voyage to the Eaſt Indies.

SECT. XV.

Deep ſnows on the mountains; their advantages and detriment.

From the conſideration of the rain, I am naturally led to ſpeak of the ſnow, eſpecially as both are the ſame in ſubſtance, differing only in texture and figure, which depend on the warmth or coldneſs of the air, as I myſelf experienced in coming down a mountain, where, till about half way, we had ſnow, but a little lower the flakes of ſnow were melted into drops of rain. Now in Bergen theſe ſnows ſeldom lie long; for it muſt be a very extraordinary winter, when the ſledges are uſed a fortnight ſucceſſively; whereas in the other northern provinces the ſnows are very thick and laſting, and lie long; and on the ſummits of the mountains, or in the cavities far north, which are inacceſſible to the ſun-beams, the ſnow lies throughout the whole year; and the contraſt betwixt the lively verdure of the fields and the gliſtering whiteneſs of the mountains is not diſagreeable. The upper region of the air, (where the atmoſphere being thinner than near the earth, the ſun-beams are leſs intercepted and reverberated) is always extremely cold, even in the warmeſt countries. This is the caſe in Switzerland and Italy, and even in Perſia, according to Taver-

* Concerning this I refer the reader to the northern voyages with Mr. Robert Boyle's Inſtructions for travelling with advantage, where we find the above obſervations on the difference of the air in hot countries at a ſmall diſtance from each other.

nier; and in Ethiopia, according to Ludolph and others, the tops of the mountains, as here in Norway, are covered with ſnow both in winter and ſummer. In ſome places far north the undermoſt lays of ſnows, by long lying, turn to a bluiſh ice, called in our language, Jiſbrede, which ſometimes ſlides down to a conſiderable diſtance over the lower grounds, to the no ſmall detriment of the peaſants. In Juſtedale, which lies high among the mountains, one of theſe Jiſbredes, detached from an ice-mountain, deſtroyed ſome farm-houſes and lands, and further damage is yet to be apprehended *.

However, both here, and in other parts, eſpecially in the eaſtern, the ſnow is highly beneficial to the peaſants, partly in forming a paſſable road in the winter, without which all traffic and intercourſe with the champaign country would be cut off; yet here they are often obliged to put on their Truviers † (a kind of ſnow-ſhoes, broad and round, made of withies, for keeping the feet from ſinking in the ſnow) and ſometimes they muſt even be put on the horſe's hoofs. Another contrivance for travelling on the ſnow are ſkies, or long and thin pieces of board, and ſo ſmooth, that with them the peaſants wade through the ſnow with all the expedition of ſhips under full ſail. In war time a corps of 4 or 600 of theſe ſkie-men are very ſerviceable as light troops, for reconnoitring, procuring intelligence, or for any ſudden enterprize; no place being inacceſſible to them, and they being always ſure of coming upon the enemy by ſurprize. The ſnow alſo improves the fertility of the ſoil, and is ſuppoſed in ſpring, to anſwer the ends of manuring; it likewiſe ſerves for a fence and ſhelter againſt ſevere colds and winds. When the ſnow is not off the ground early enough in the ſpring, for the huſbandmen to begin the work of that ſeaſon, they ſpread over the ſnow a kind of rich black mould, which, in a few hours, entirely diſſolves it. But, on the other hand, the peaſants are often ſufferers by the ſnow, which, when it falls in great quantities, and lies

* Nix jacet et jactam nec ſol pluviæq; reſolvunt.
Indurat Boreas perpetuamq; facit. OVID.

† Some entertaining accounts of theſe Truviers, or ſnow-ſhoes, which in other parts are alſo called Rackets, are to be ſeen in Hennepin, Tom. II. cap. 27. and in the ſeveral hiſtories of the countries and nations of America.

long

long on the ground, deſtroys thouſands of young trees: likewiſe when it falls late in the ſpring, and after the trees begin to put out their leaves, which, however, happens very rarely, ſome trees, and eſpecially the alders, wither and die; a prognoſtic of which is the leaves turning to a browniſh hue. It has been known, and particularly in the year 1742, many people were eye-witneſſes of it, that a ſpecies of black maggots fell along with the ſnow, whereby extreme damage was done to the grain and paſture. But among the miſchiefs occaſioned by ſnow, the greateſt are the Snee-ſkreed, or Snee-ſond, that is, when a maſs of ſnow, falling from a precipice, overwhelms both men and cattle, overſets boats in the lakes *, and, which is but too often the caſe, demoliſhes cottages and houſes, inſomuch that even whole villages are born down, cruſhed, and totally deſtroyed; but this laſt calamity is rather an effect of the incredible violence of the wind, driving on the maſſes of ſnow, when they begin to give way, than of thoſe maſſes themſelves, houſes having been ſeen to fall ſome ſeconds before the ſnow had reached them. Theſe ſnow-falls are of two kinds; the firſt, when in froſty weather the light ſnow is ſuddenly ſet in motion, and in its progreſs ſcattered over all the country, which the peaſants call Meel-ſond, and is not attended with ſuch damages as the other, which is known by the name of Kremſond; theſe happen, when by the miſts and rains in ſpring, the ſnow, which by moiſture is conſolidated, falls in a maſs, which, tho' ſlower in its deſcent, leaves ſtronger impreſſions on the ſides of the mountains, bearing down every thing in its way, even the ſtrongeſt new buildings.

Snow-falls.

A whole pariſh loſt in the ſnow.

By a ſnow-fall of the firſt kind, a whole pariſh, ſituate between Quindherret and Hardanger, a century or two ago (for the preciſe time is not certainly known) was wholly covered, and ſo re-

* Theſe accidents it ſeems are not unknown in Switzerland: "Souvent il tombe du haut des montagnes des maſſes de neige prodigieuſes, que les allemans appellent Lawinen et les Romains Avelanches, qui tombant avec impetuoſité, font un bruit auſſi grand que celui du tonnere. Non ſeulement elles enveloppent gens et betes, mais elles entrainent et emportent des arbres et des maiſons entieres. Le poete Claudien qui vivoit au iv ſiecle, nous apprend qu'on connoiſſoit deja ces choſes de ſon tems:

——— multos hauſere profundæ
Vaſta mole nives, cumque ipſis ſæpe juvencis
Naufraga candenti merguntur plauſtra Barathro;
Interdum ſubitam glacie labente ruinam
Mons dedit, &c. Delices de la Suiſſe, Tom. 1. p. 27.

manis

mains to this day; the ſnow which had thus fallen from the adjacent mountains, not diſſolving the year after, was further gradually increaſed, and hardened by lying, the ſituation being high, and hemmed in among the mountains. Many lives were loſt in this diſaſter, of which no memorial would remain, were not the truth of the ſtory, which was at firſt much doubted, ſtill confirmed by ſeveral utenſils, as ſciſſars, knives, baſons, &c. brought to light by a rivulet which runs under the ſnow; an inconteſtable evidence that this ſpot was formerly clear of ſnow, and inhabited. Such diſaſters, God be praiſed, are ſeldom heard of; and the perpetual ſnows which always cover the ſummits of the higheſt mountains, may, notwithſtanding, be juſtly ſaid to be rather neceſſary and advantageous, than abſolutely detrimental; and thus may be reckoned among the bleſſings of providence. Experience ſilences all cavils on this head, the ſnow being known, by age, to become ſo firm and indurated, that a horſe's ſhoe makes no impreſſion on it; and as it yields very gradually to the ſun, it is thus ſparingly diſpenſed for the daily benefit of the inhabitants beneath, except in a damp ſoutherly wind, which penetrating the ſnow, the mountains pour down whole torrents. Theſe accumulated ſnows thus become conſtant ſprings for promoting vegetation in the champaign grounds, and when theſe ſprings are too early exhauſted, the graſs and corn inevitably ſuffer, and are ſometimes withered for want of moiſture. Another convenience of theſe currents, and likewiſe of their impetuous deſcent, is, that they drive great numbers of little mills, every farm-houſe * having its own mill. A third advantage of them redounds to the oxen, cows, ſheep, and goats, which in ſummer are turned out upon the mountains for paſture, where they are ſo extremely tormented with the heat, with gnats and muſketoes, that they run about regardleſs of danger, and in this frenzy many have loſt their lives, falling down the precipices; this lays the peaſants under a neceſſity, where no ſnow is near, of building ſheltering places for the cattle; but if any ſnow-hill be in ſight, the cattle move towards

* In the eaſtern provinces, which are leſs mountainous, the people not only labour under a great ſcarcity of water, but in ſeveral parts, the mills are at a great diſtance; but this evil might be remedied, if hanging wheels were uſed inſtead of fixed ones; there are but few places where a ſufficient water might not be found for thoſe, which require ſo much leſs than the others now in uſe.

it, knowing they ſhall there be relieved by the coolneſs, which it communicates to the air. A further remarkable inſtance of divine goodneſs in this caſe is, that juſt as far as the ſnow melts, and runs from the mountains, the very beſt graſs is obſerved to grow, and in the greateſt plenty; its warm covering, ſo far from being an obſtruction, both forwarding and improving it. Such are the effects of infinite power, wiſdom, and goodneſs, even where at firſt ſight they are leaſt expected.

SECT. XVI.

Regular and irregular winds.

It will not be improper to ſubjoin ſome account of what I have collected in my annual circuits, by my own experience and that of others, relating to the winds in Norway. The winds which moſt prevail here at Bergen, and all along the weſtern coaſt, are the ſouth, ſouth-weſt, and ſouth-eaſt, which laſt is uſually called the Land-South. And in moſt winters, when on the other ſide of the mountain called Filefield, the north, the eaſt, and north-eaſt winds uſually bring on and continue the hard froſts, they ſeldom laſt a fortnight on the north of the mountains called Nordenfield, towards the ſea. Here we generally enjoy a ſoutherly wind, which together with the warm vapours, are, as I have already obſerved, ſubſervient to the provident end of the Creator, in keeping open the ſea for the fiſhermen, and warding off the ſeverity of the winter, of which we have leſs than they who live in the middle of Germany; altho', in exchange, we have rain and foul weather, which is not ſo pleaſant as a clear froſt. It is ſeldom that the wind here is directly weſt, it is generally ſouth-weſt, or ſouth-eaſt, which fills the creeks with the ſea-vapours in abundance, which afterwards, floating among the mountains, become rain-clouds. A north, north-weſt, and eſpecially a north-eaſt wind, are little known here; but when they blow, they verify the words of Solomon, *the north-wind driveth away rain.*

The eaſt winds, which frequently come from the ſhore, and drive the watry clouds out of the creeks, are beſides very temperate, and ſo are accounted the moſt ſalubrious winds, and are the more welcome to us, as uſually cauſing dry weather, but on the contrary, ſouthward, beyond the mountains, they commonly bring rain. The inhabitants of the large province of Nordland, who,

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in not leſs than two hundred barks, viſit Bergen every year, at the fair and the aſſizes, and moſt of whom have upwards of an hundred leagues to ſail, are often favoured with the north and ſouth winds, like regular trade-winds, though not ſo infallibly to be depended on. The wind which is, with the greateſt certainty, expected towards harveſt, is the north-eaſt, called Hambakke, which name it derives from the melting of the ſnow at that time from the ſummits of the mountains; but there is alſo here, in ſummer time, and in a clear ſky, another kind of a daily trade-wind along the coaſt, and in the creeks, known by the general appellation of Soelgangs-Veyr, the weather of the ſun's courſe; and in Northland, Soelfar-Vind (the wind of the ſun's courſe) the wind then following the ſun. Nic. Hartſoeker attributes this alternative to the ſun, which in the morning heats the coaſt, and conſequently rarifies the air, but on its declenſion in the evening, the air cools, and conſequently recovers its gravity, and being thereby become heavier than the ſea-air, its own weight carries it thither, and occaſions a kind of ebb and flood in the air, the fluid parts whereof undergo the ſame agitation as water *. A little before noon in the ſummer time, comes on a weſt, ſouth-weſt or north-weſt breeze, and holds till towards midnight; it is called Hafgul, (ſea-cooler) as coming from the ſea, and indeed it tempers the heat, which otherwiſe in the creeks and narrow valleys, would be inſupportable. Oppoſite to this is the Landgul (land-cooler) or eaſterly breeze, which beginning at midnight, or two hours after, continues till within two hours of noon, when it uſually ceaſes; towards harveſt the land-cooler begins to get the aſcendant, and the ſea-cooler to relax, and then the former is called the Korn-moen, i. e. Corn-mother, bringing a ſenſible warmth along with it.

Conject. Phyſ. L. II. Diſc. II. p. 65.

Beſides theſe regular winds, the coaſt is ſubject to Field-flagers (mountain ſqualls) or guſts from the land, by which, without the

Sudden ſtorms.

* To theſe viciſſitudes of the ſummer winds, which are in ſome degree regular, is applicable what Ariſtotle's diſciples write of the Eteſiæ, which were known in Greece, "Quod ad Eteſias attinet, cauſam harum ajunt eſſe reſolutionem nivium in hyberboreis ſuppolaris regionis montibus, quæ uti à ſolis radiis verberatæ atque in exhalationes reſolutæ, interdiu ventorum ſuppeditabant materiam, ita noctu dicta nivium reſolutione cum ſole quibuſdam quaſi induciis conſtitutis, ventos partiter ſilere cogebant." Athan. Kircherus in mundo ſubterr. P. I. L. IV. Sect. II. cap. III. p. 196. Likewiſe Dr. Arbuthnot in his Treatiſe of the Effects of the Air upon the Human Body: "The winds, when ſtrong, correſpond to each other; but, when they relax, they differ, as this proceeds from local cauſes. It is alſo clear that the Alpine ſnows influence the weather in England, as well as that at Zurich."

utmoſt

utmoſt precaution a veſſel is ſuddenly loſt in the ſecurity of fine and calm weather; for theſe blaſts iſſuing in a narrow and violent current from the clefts of the mountains, or from the vallies, behind a cape, or from the points of the high mountains, and being violently impelled againſt an oppoſite mountain, this reverberation cauſes a kind of hurricane in the air, which, for a time, may deprive the unwary of his ſight *.

Hurricanes and whirlwinds.

But the real hurricanes, or whirlwinds, which ariſe, though ſeldom on the open ſea, are known to be extremely dangerous to ſhips, by their ſudden and rapid vortex, which throws the ſea at a ſmall diſtance into ſuch an agitation, that the water in drops flies up into the air like ſmoke. The common people, from an old ſuperſtition, call them Ganſkud, conceiting that a necromancer, of Fin-lapland, has then ſent out his Ganfly, as they call it, to do miſchief; but the true cauſe of the hurricane, is the ſudden exploſion of a wind confined and agitated in a thick cloud, which being impetuouſly diſcharged upon the water, the ſurface is ſeparated, and riſes up into the air like duſt or ſmoke, and hence, amongſt us, this hurricane is very properly called Roeg-flage, i. e. ſmoke-ſquall.

I ſhall take this occaſion to mention another wonderful phenomenon of the air, which likewiſe proceeds from denſe, and violently agitated clouds, not as any thing new and unknown in the warm climates, but as being, however, ſomewhat rare, and by experience very well known in the north. I mean the water-

Water-ſpout.

ſpout, or Trompe de mer, of which a credible perſon, who ſpent his younger years at ſea, gave me the following account; that on the wide ſea, betwixt Shetland and Norway, he and his crew, to their great aſtoniſhment, obſerved, in clear weather, and an eaſy breeze, a cloud gradually deſcending towards the water, and in the ſhape of a funnel, or rather a ſpiral ſnail-ſhell, attracting from the ſurface of the ſea a column of water of a conſiderable diameter; and this ſuction continued all the time they were in ſight. Some hours after came on a very violent rain, which, unqueſtion-

* Whether it be poſſible that a man and horſe may be carried forward by ſuch a whirlwind, and driven back by another ſtronger wind meeting him, without any damage to either man or horſe, muſt reſt upon the authority of a very credible writer, Mr. Lucas Debes, in his Deſcription of the Iſland Faro, p. 97.

ably consisted of the water, which that spiral cloud had a little before exhaled from the sea *.

Filled with astonishment at the many and stupendous works of the Almighty (especially in the air and its phænomena) I close this subject with his own words in the xxxviiith chapter of Job, verse 24, &c. *By what way is the light parted which scattereth the east wind upon the earth? Who hath divided a water-course for the overflowing of waters, or a way for the lightening of thunder? To cause it to rain on the earth where no man is, on the wilderness, wherein is no man? To satisfy the desolate and waste ground, and to cause the bud of the tender herb to spring forth? Hath the rain a father? or who hath begotten the drops of the dew? out of whose womb came the ice? and the hoary frost of heaven, who hath gendered it?* Conclusion.

CHAPTER II.

Of the soils and mountains of Norway.

SECT. I. *Of the soil of Norway in general.* SECT. II. *Several kinds of soil, as mould, clay, sand, turf, mud, &c.* SECT. III. *Two kinds of mountains.* SECT. IV. *Extensive chains of vast mountains, as Koelen, Seveberg, Dofre, and Filefield.* SECT. V. *Many lesser mountains in all the provinces.* SECT. VI. *Deep and long cavities, like secret passages, in some mountains, with conjectures on the origin of them.* SECT. VII. *Effect of the deluge in dissolving and softening substances, which are at present of the hardest kind, but appear manifestly to have been soft heretofore.* SECT. VIII. *The origin of mountains, rocks, and smaller stones, deduced from the foregoing argument.* SECT. IX. *Detriment of so many rocks and mountains to Norway.* SECT. X. *Advantages of them, according to the wise and bountiful design of the Creator.*

SECT. I.

THE diversity which I have shewn in respect to the air, light, heat, cold, rains, and winds of Norway, is no less observable in the various soils of the earth, in the mould, sand, Of the earth and soil of Norway in general.

* Mr. Lucas Debes, p. 12, of his Description of Ferro, says, that such a cloud, amongst the Greeks, called Typhon, and among the northern people Oes, for it absorbs the water, making a deep vortex in the sea, drew up some lasts of herrings, and afterward dropt them on Kolter, a mountain about twelve hundred feet in height, page 14. He imagines that it is these Oeses which in Norway attract stones, flesh, mice, and, what is more remarkable, lambs, and afterwards throw them down again; of which a further account will be given in its place.







