# Translator's Corner

**J. Durban Odhner, Editor**

It is with much pleasure that we present here the final installment of text from the first English translation of the little work *On Common Salt*, by Emanuel Swedenborg. It has been the work of Michael David and myself, and will in due course appear as a book published by the Swedenborg Scientific Association.

To the latter end, still some work is to be done on the bibliography and authors index assiduously prepared by Alfred Acton, with its references to contemporary authors on the subject. The whole work is, in fact, a body of information gathered from all sources available to Assessor of Mines Swedenborg.

It seems worthwhile to present here the Alfred Acton preface which he tediously composed in Latin, and which I have translated for future reference.

### Editor's Preface

This little work *On Salt* now appears in print for the first time, following the plan laid down by Mr. Carl Hj. Asplundh, first treasurer of the Swedenborg Scientific Association, to transcribe and publish all unedited scientific and philosophical manuscripts of Swedenborg. According to this plan, which may be seen in *The New Philosophy* for the year 1901, pp. 85-87, Mr. Asplundh notes that more than 2500 pp. of such unedited mss. exist, and that to publish them by the phototype process, which would be the best, cannot be done due to the expense. He therefore proposes another method of getting them out, namely, put a Stockholm transcriber to work transcribing them, then print the copies so made.

This plan being approved, in the meeting of the society of 1901, three members, Frank Sewall, Carl Hj. Asplundh and Alfred Acton were chosen to promote it and bring it to completion.

The transcription of the mss. was arranged immediately the same year by those elected. The work itself was in the hands of Rev. Joseph E. Boyeson, Stockholm, and took from the fall of 1901 until August, 1902, in which month Mr. Alfred H. Stroh, who was sent to Stockholm by the SSA for the sake of this project, carried the work further and promoted it with great diligence. Under his most praiseworthy care, all the following Swedenborg mss. were copied:

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| Codex 36. | Excerpts from Aristotle, Plato, etc. |
| Codex 37. | Index of Philsophical Miscellanea |
| Codex 81. | On the Magnet |
| Codex 82. | On Sulphur and Pyrite |
| Codex 83. | On Common Salt |
| Codex 84. | On the Secretion of Silver and Copper, etc. |
| Codex 85. | On Vitriol |
| Codex 86. | Geometric & Algebraic data (except for parts already published in photolithograph form) |
| Codex 88. | Philosophic, Anatomic & Travel notes (with some exceptions) |
| Codex 99. | Description of Swedish Iron Furnaces |

These copies (comprising more than 2500 pp. of Swedenborg ms.) were almost all very carefully compared by Mr. Stroh with the originals, who also made most exact notes of whatever errors he found.

In the fall of the year 1902, when the time had come to publish these mss., it was felt that the present work *On Salt*, which had been copied first and was the only one ready, should be the first printed, and the undersigned was made editor of that work. The job of publishing this little work, which for many reasons took a long time, has now happily reached its completion.

Before they were copied, the contents of this work were unfamiliar to the editor, especially as to whether the words were those of the author, or whether they were quoted from the literature. But a short perusal of the text soon revealed that it contained much quotation; and examined more carefully and, as far as possible, compared with the books of many of the authors, it proved to contain many quoted passages which did not at first

seem to be quotations. I have taken pains to annotate all such quotations in the Appendix.

Three organizations, the Academy of the New Church, the General Convention of the New Jerusalem, and the Rotch Trustees, have generously covered the expense of copying the manuscripts and of printing this work *On Salt*. For that purpose, they contributed the funds to the organization printing the work, namely the Swedenborg Scientific Association.

Dr. R.L. Tafel in his *Documents concerning Swedenborg*, Vol. II, p. 906, says that this work *On Salt* was written in the year 1722. He based this opinion on a Prospectus printed the same year announcing the great work *On the Genuine Treatment of Metals* to be printed the next year, 1723, which was to be arranged in 19 parts, of which Part 15 was to treat of "Methods of obtaining Saltpeter" and Part 16 of "Methods of obtaining Common Salt." Dr. Tafel reckoned that the 16th Part of the proposed work was the same as this work *On Salt*, which had therefore been written in 1722.

But from the work itself it clearly appears that it had not been written, and certainly not completed, prior to 1728. For at the end of Chapter 18 (our p. 41) the author mentions a man by the name of Ekhardt "who took leave of the living in the year 1728." Moreover he quotes from books that were not published until 1723, 1724 and 1727 (see the Index of Authors in the Appendix under the entries *Anonymous*, *Boerhaave*, *Bruchmannus*). But that the author had written the work *On Salt* no later than 1728 or 1729 would seem to be indicated by the fact that we could find no quotations from any books published after the year 1727.

But there is no doubt that either the first draft or some quotations had been written before 1724. For in a letter to Erik Benzelius dated May 24th, 1724, the author says: "Kindness of brother Antonius Schwab I am sending you my *collected notes* on *Sulphur*, *vitriol*, *alum*, *common salt*, and *glass* and *acids*—although not properly arranged, but only as I have them for my own use. So I beg you to send them back to me together with the previous collections on *Copper* not later than July" (*Geological Notes & Letters I*, p. 314).

Further, the author wrote in a letter to Andreas Celsius, Secretary of the Society of Literature & the Sciences, Uppsala, on Nov. 27th, 1729:

"For the last ten years, I have been collecting material that will be enlightening on the subject of *Metallics and the Mineral Kingdom*. In a few

weeks I propose to arrange the collected notes and *excerpts* in order, and then they will be printed outside the country. But before I send them abroad, I am honored to invite you to collect whatever of them may be worth including in the *Acta*. It will, as you can see from the sample, be quite a large volume, which I will be honored to send you in the winter" (ibid., p. 321).

From these letters it appears probable that Swedenborg had begun his "collected notes" *On Common Salt* before 1724 (perhaps in the year 1719, i.e. ten years back from the year 1729), with the purpose of inserting them in the proposed book *On the Genuine Treatment of Metals*, which was to be published in 1723. From the letters it further appears that these collections had not been completed in 1724. From these and other indications I have mentioned above, there is little doubt that these same collected notes were among those he wrote about in 1729, saying that he hoped to complete them soon. I consider it beyond doubt that these collected notes were the basis for the present work *On Salt*: for that this work, as we have it here, is a finished work, furnished with an index and addressed to the reader, the work itself declares.

After publishing the prospectus mentioned above announcing the large work *On the Genuine Treatment of Metals*, the author seems to have changed his plan, at least in regard to the title of the work. For his *Philosophical & Mineralogical Works* which he published in 1734, treating in Tome II of Iron, and in Tome III of Copper, are doubtlessly the fulfillment in part of the promise made in the prospectus. If we consider that in these Works, the later chapters of the tomes on Iron and Copper, just like this work *On Salt*, consist mostly of quotations from the literature; and if we also recall that in these tomes the author states that he will publish continuations on Vitriol, Silver, etc., then the conclusion does not seem improbable that this work *On Salt* provides the continuation to the *Philosophical & Mineralogical Works* published by the author himself.

Bryn Athyn, Pa. Alfred Acton
Oct. 1910

Although the Alfred Acton Latin edition of 1910, based largely on the Boyeson/Stroh reading, has been very helpful, we have gone back to the manuscript, finding 136 misread words (16 of which are listed in Acton's errata) and making several revisions indicated by the author, such as the insertion of Acton's Chapter 60 at the end of Chapter 45, also noted by Acton. So we have the corrected, second Latin edition on diskettes, virtually ready for printing.

## § 48

## THE SHAPES OF COMMON SALT

9. The crystals differ quite a bit, and the difference arises from the differing crystallization process. It is said that crystals become brighter from a slow crystallization, but more cloudy, and also small and malformed, from a sudden one.

As was said, from a slow exhalation of the water, one gets larger and more elegant crystals, which for the most part have a four-sided pyramidal shape.

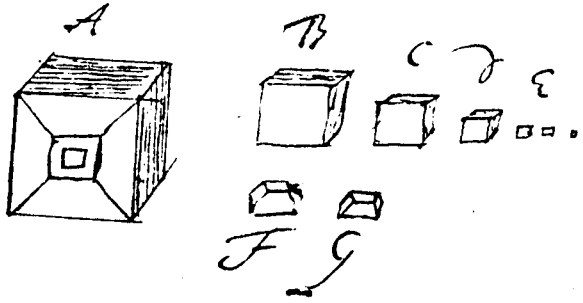
*Sea salt* and *spring salt* are of about the same shape, except that crystals of sea salt are a little bigger and have a stronger, more penetrating and more bitter taste. Spring salt outwardly looks like alum, and the main shape of spring salt is a cubical parallelopiped, and it cleaves in a cubical shape, especially the transparent crystalline kind.

It is also fitting to note that rock salt keeps its square shape both in smaller and in larger grains. When the eye is armed with a microscope, even the most accurate one, it can uncover in these saline particles none other than a cubical shape, square and the same on every side. Mr. Leeuwenhoek observing. This also appears when rock salt is divided, which, as far as the eye can see, usually happens in layers that are very small and similar to each other.

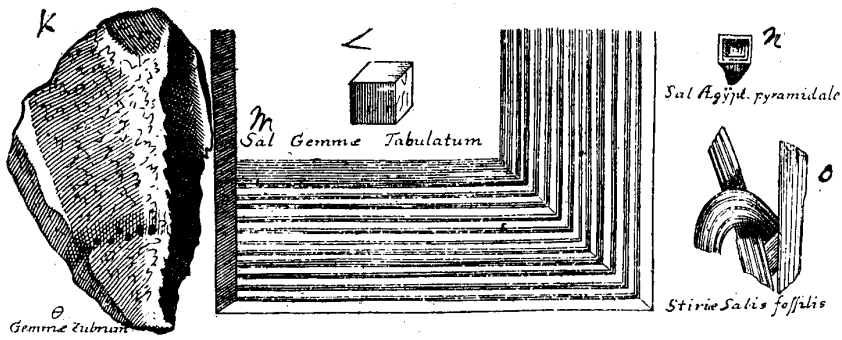
Pyramid-shaped salts, which are obtained by boiling, are often also hollow, but sometimes the lower cube is small and solid. Salts of this

shape, namely pyramidal, end in an apex, whose slope seems to be 45 degrees. The slopes usually also end in planes or smaller areas.

As for other treatments of the shape of salty particles, they are according to the drawing here, that is, according to A, B, C, D, E, F and G, which are crystals either from sea water or from rock salt or from salt water from springs, according to Mr. Lister, an Englishman. See *Acta Lips.* for the year 1684, page 92.




Elsewhere, the shape of red rock salt is represented as (K), and cubical salt (L), and layered rock salt (M), icicles of mined salt (O), and Egyptian Pyramidal salt (N), these according to Valentinus. We can also see that hollow pyramidal salt, having nothing but walls on top of each other in layers, sloping pyramidally and converging to an apex in one direction and a larger or smaller plane in the other. This may be observed in the purified salt of Holland.



If common salt is put in a fire and melted, it goes off as smoke, and if the smoke is collected and put in water, it crystallizes into cubes just as before.

As for Glauber's salt, the saline mass from which that salt is extracted drinks in the water in which it would otherwise be dissolved, for from a two pound mass one gets three pounds of salt, whose crystals are wide and rhomboidal.

Mr. Leeuwenhoek examined the sweat dripping from a human face, both when wine had been drunk previously, and when no wine had been drunk. In the faces of the latter, he saw through his microscope cubical and pyramidal salty shapes in great abundance, each of these being longish in shape; besides these, many irregular shapes were seen.

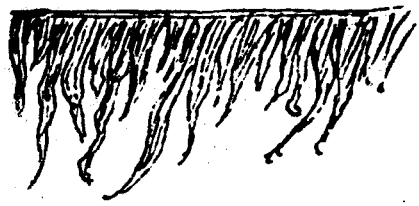
Likewise in human urine and kidney stones, about which one may read his works.

If liquefied oil of tartar is poured into spirit of sea salt even to saturation, then the sea salt seems to be regenerated. If this pure liquid is filtered and thickened by gentle fire until a skin forms and then exposed to cold, the true crystals of sea salt are reborn, according to Mr. Boerhaave.

If other kinds of salts are also mixed with common salt, such as alkaline salt, niter, vitriol, alum or lime, and after evaporation are placed in the cold to crystallize, they crystallize together, that is, they come together into crystals. But the crystals come out cloudy and not exactly cubical in shape, but unequal. From this it may be seen that salts of various kinds can be conjoined and crystallized together.

If distillation be done with two parts [of oil of vitriol] and one part common salt, and if the residue or deadhead is dissolved in hot water and the filtrate crystallized, Glauber's wonderful salt will be obtained, according to what was said before. The crystals that are formed in the water are flat, and where vitriol is contained, have six sides, two flat and rather wide surfaces and then two very narrow ones at the sides. This is from an anonymous Frenchman in *Nouveau Cours de Chymie*.

In the salt-mines in Eperjes a salt is dug which is called "flower of salt" or Saltz-blüthe. It has a whitish color, a taste like cooking salt anda hard yet crumbly consistency. It consists of thin but short filaments, and some longer ones, as if it were woven from many threads, and underneath are bending and pointed strips, as in the accompanying figure.



Such a flower is found in many parts of the mine, but especially in the deeper parts or caverns, notably in the mine called Schowar. Elsewhere it is said that this kind of salt is most pure, and is found along the sides of the old collapsed mines. Agricola speaks of flower of salt as being like powder—very fine, light and white. It grows out of walls consisting of brittle rock, that is, from the pores of the stone, first like frost emerging from the walls, but after some time growing into larger shapes as thick as the back of a knife. It can be divided into thinner strips. It cannot be bent easily with a finger without shattering like glass. It does not crackle on coals, nor give off much visible smoke. One drachm of the salt of this mine can dissolve in half an ounce of ordinary water, but not more than a scruple of this flower could dissolve in that much water. The flower mentioned here is not changed by heat or by humid air. Elsewhere it is also an indication either that impure salt follows, or that it will soon be gone. This was also observed in the mines at Eperjes. It originates from the evaporation of salt water that still remains in the ground, oozing through the pores in the harder, brittle rock. *Bresslauische Natur- und Medicin-Geschichte*, for February 1719, page 180.

## § 49

### THE WEIGHT OF SALTS

10. Mr. Wolf made an experiment. He added salt to fresh water, to the point of saturation, and left it at rest for some time, until the brine became

clear. He poured the clear part into a narrow necked glass jar. When the neck of the jar-full of salt water was inverted and poured into fresh water, then the fresh water below worked its way up through the salt water and the salt water went to the bottom, where the fresh water had been, without any mixing or confusion of the liquids. The same result ensued if there was fresh water in the upper part of a glass vessel and salt water in the lower part. From this it appears what a difference in weight there is between the salty liquid and the fresh.

When salt is dissolved in water, the weight of the water increases more than the volume.

In salt water a greater amount of salt is found than the difference in weight between pure water and salt water of the same volume, and it seems that salt contains water within itself. Mr. Ekhart observed and communicated to me that if two loths of salt are stirred into a vessel holding thirteen loths of fresh water, then the same water weighs fifteen loths. But if that water is poured out and replaced with fresh water to the same depth or volume as the salty water, then the fresh water of the same depth or volume weighs just about thirteen and a half loths; from which it follows that the volume does not increase to the same extent as the weight.

The [ratio of] the weight of water to the weight of salt, according to the experiments, is 1000 to 2125.

The weight of water to the weight of rock salt is 1000 to 2143.

The weight of water to the weight of spirit of salt is 1000 to 1130.

The weight of spirit of salt in summer was 5 gross, 49 grains, in winter 5 gross, 55 grains. Parisius is the observer.

Excessively boiled or weakened salt possesses less acid, and so is not only rather tasteless and unsuited for household use, but is lighter in weight than other salts. Whence the weight of one salt differs greatly from that of another.

Elsewhere it has been observed that a pound or thirty-two loths of water cannot contain more than eleven loths of salt (Hoffmann says six ounces), or as he puts it, a pound of pure water cannot dissolve more than six ounces of salt, which is not the case with other salts, except for Epsom salt. If more is put in, it is not dissolved, but lies whole and undissolved on the bottom.

**§ 50**

## SAL AMMONIAC FROM COMMON SALT, ETC.

Around the temple of Jupiter Ammon, armeniac[170] salt was at one time found and collected, which had hardened from the urine of camels in the Libyan sand, and was known to abound in common salt. Hence they make that salt artificially. They take thickened urine, which they have mixed with common salt and soot and, by means of sublimation, have combined in turn. So they obtain a sublimated salt known by the name armoniac[171] salt. *In another way*, it can also undoubtedly be made if spirit of urine and of common salt are mixed with salt itself and sublimated into that salt.

It can be made instantaneously from spirit of salt, urine and soot, combined by mixing and effervescence, after which the phlegms are evaporated until dry. What is left is ammoniac salt, which can be sublimated as desired.

Fresh human urine contains a lot of common salt, a great deal of which vaporizes by a process of fermentation and putrefaction, and the volatile part goes up in distillation before the water itself.

In the distillation of spirit of ordinary salt, whitish or yellowish flowers finally come up, sticking to the neck of the retort, which, when mixed with quicklime, give off a penetrating smell of urine.

Phosphorus is made from urine, and in urine there is a large proportion of common salt.

When the salty sea is agitated at night, especially when it is very dark, it casts an extraordinary light, especially when striking upon the rocks. And the saltier the water is, the clearer is the light that it scatters, especially in very hot and salty places. Mr. Snellen writes about this subject.

In the distillation of salt a very burning sulphur is obtained, together with spirit. When the salt is calcinated by fire, it shows a blue flame. Where salt springs are found, or where rock salt is formed, sulphur ormarcasite or pyrites are also found, and sometimes precious metals.

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[170] The author apparently uses variant spellings of this word intentionally.

[171] See previous footnote.

If one dissolves and solidifies salt ten or twelve times without filtering it, nothing at all will be obtained by distillation. This happens more with one salt than with another, faster in boiled spring salt than in sea salt. Also, in the distillation of common salt, a urinous or ammoniacal salt is found in the form of flowers in the neck of the retort, which reacts very sharply with acid of vitriol, niter and aqua fortis. The same thing is noticed when salt is being boiled at salt springs, where flowers are sublimated from the basins, and stick to the roof, as at Lüneburg. This is from Mr. Hierne.

But about these things, you may better consult *Sal Ammoniacum et Urinosum, etc.*, and *Phosphorus*.

## § 51

## COLDNESS IN COMMON SALT

About Glauber's Wonderful Salt, it was said above that in some time it can convert whatever liquids are present into ice, so I forbear to repeat the same words here.

Mr. Wolf reports an experiment on the cooling of water by common salt. He put a thermometer in fresh water and held it there until the enclosed liquid was no longer moving. Into the same water he put common salt, which dissolved in it by stirring. Before dissolution had finished, the alcohol enclosed in the thermometer began to drop, and after some time, reached an even lower degree. When it had come down and steadied at a certain point on the thermometer, he transferred the thermometer into water as cold as the previous water, with the result that the alcohol again went up to the original degree. He also observed that the coldness of salts all differ. Saltpeter has the greatest cooling ability, then armeniac salt, then common salt. The glass also was seen to be covered with some vapor on the outside.

From Boyle. His words are: We took a glass vessel open at the top, and put in it a mixture of snow and common salt. In the middle of this mixture we placed a cylindrical glass, with its lower end well sealed with plaster, but its upper end open, through which we filled it with ordinary water. With these things so placed together in the receptacle, and after some

pumping, the snow began to melt faster than we expected. Whether this was caused by the air being sucked out, or by the small quantity of snow, or some other reason, seemed uncertain. In any case, when most of the receptacle had been emptied, which took less than a quarter of an hour, we saw that the water near the bottom of the glass cylinder was freezing, and soon the ice began to increase, and a little climbed up to the surface of the surrounding liquid, in which nearly all of the snow and salt were dissolving. Finally, after we emptied the glass vessel it appeared that the thickness of ice was equal to that of the inner sides of the glass which it had filled—even though it was wide enough that I could stick my thumb into it. The upper surface of the ice was very concave. Afterwards, when the ice was held to the light, it appeared to be not without some bubbles, although some of the bystanders thought they were smaller than if the water had been frozen in the open air. We have tried a similar experiment at another time in a smaller vessel, with equal success.

Elsewhere an experiment for forming ice is reported, if you will believe it, in a hot place, in a room, on a table, although it was the month of May. If snow and common salt are put in a pot or other vessel and the snow is melted into water by continual stirring: if there is water under the vessel, between the table and the bottom of the vessel, it turns to ice and tightly binds the bottom of the vessel to the table.

In the North Sea it is observed in wintertime that the salinity goes to the bottom or deeper part of the sea, and that fresh water rises towards the surface, especially if the water is beginning to thicken into ice. Since this has been treated of above, it is here passed over.

## § 52

## THE REGENERATION OF SEA SALT

If liquefied oil of tartar is poured into spirit of sea salt to the point of saturation (but one must observe well the fact that that point of saturation is reached when the effervescence quiets down), then the liquid will be somewhat salty and a little acid, but not alkaline, that is, it will have the saltiness of sea salt. That it is true sea salt, this one can tell by its taste, its

solidification on the fire, its dissolving and crystallization; and if aqua fortis is mixed into this solution, it dissolves gold. If this pure, filtered liquid is thickened on a gentle fire until a skin forms, then exposed to cold, true crystals of sea salt are reborn. But when the point of saturation is not observed, it will be either acid or alkaline, according to which of the two it has mixed into it more or less. Mr. Boerhaave about this subject.

## § 53

### REPEATED DISSOLVING AND RE-BOILING OF SALT

If salt is calcinated, dissolved and recrystallized, and this repeatedly, each time some mucus-like mud separates and goes to the bottom in a noticeable quantity. This weakens the sharpness of the salt, and finally all its sharp taste is lost, and so it deteriorates into a tasteless earth, which water cannot penetrate, and the remaining water is likewise tasteless. Mr. Snellen.

When salt is frequently dissolved and solidified, all its sharpness and burning flavor vanishes. For if it is often and for a long time distilled, calcinated and liquefied by dissolving, finally no residue is left except plain water and a white, dead and tasteless earth, with all its sharpness completely dissolved and removed. Mr. Hierne.

When salt is frequently dissolved and evaporated, finally it resists crystallization, at least crystallization becomes difficult, and it turns into a kind of alkaline salt. After repeated dissolvings, the remaining water finally takes on some acidity.

It also follows from this that that kind of salt that is obtained by evaporation in the open, so that salt is left dry in the bottom, becomes somewhat weak and can easily be dissolved in water. Hence the nature and goodness of salt depends a lot on how it is boiled.

After evaporation often some oiliness remains, which is cast to the surface of the water.

The kind of salt that is crystallized first after dissolving and evaporation are finished, is the purest, nor does it react with oil of tartar or with any alkaline salt: but the salt that is crystallized last combines with oil of

tartar and precipitates thickly into a substance like cheese, and this thick substance is dissolved by acids, especially distilled vinegar, but not by water.

When salt dissolves in water, some small bubbles and fine particles of foam are cast out, but coldly. This fine material also deposits itself around the sides and at the bottom of the vessel, and forms bubbles.

## § 54

SOME THINGS THAT REACT [or REAGENTS] WITH COMMON SALT

If tincture of Moon[172] is poured into a solution of salt, it makes it turn white.

Also a solution of salt turns white like milk and turns into granules, if a solution of sugar of Saturn[173] is put in it.

It also changes the color of a solution of vitriol of Venus[174] the same way, but imperfectly, so that a quite dilute green color arises.

A solution of the slag of regulus of antimony[175] is turned opaline by a salt solution.

Also a solution of resin becomes coarser and thicker.

Syrup of violets turns a little green.

Common salt and quicklime water mixed become transparent and watery.

Tartar salt with a solution of Spanish salt turns a cloudy color. Some think that salt will be precipitated to the bottom in water by oil of tartar. At least the solution does turn slightly white.

If choice oil of vitriol is put on common salt, a hissing arises, and a quantity of bubbles and vapors.

Elsewhere, one finds common salt is precipitated neither by alkalis nor by acid.

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[172] See Chapter XLIV, footnote 161.

[173] See Chapter XLIV, footnote 162.

[174] See Chapter XLIV, footnote 163.

[175] See Chapter XLIV, footnote 164.

Common salt precipitates silver to the bottom, if put in its solution. Likewise if it is put in solutions of other metals. Some precipitation arises, so much that it takes away the sting of nitric acid and aqua fortis. It also changes the color of a solution [of vitriol] of Venus to a watery and weak green.

Common salt gives a solution made from the slag of regulus of antimony an opaline color.

If silver is dissolved with aqua fortis, and precipitated with common salt, a horny luna is obtained as a result, which is devoid of flavor, about which see more in the treatise On Silver.

Sublimated mercury from common salt calcinated with sulphur is turned black, then little by little, gray and white.

If there is some greasiness in the water, it unites and coagulates with it, so that oil or grease cannot be joined with water, except by common or alkaline salt. From the mixing of the grease and salt a soap is also made. When together, they foam considerably, so that when the salt solution goes off into foam on the fire, this seems to be the result of the presence of some grease.

## § 55

## THINGS THAT REACT DRY WITH COMMON SALT

Salt that is melted, mixed with a pressed out oil and abstracted by distillation, produces an oil more penetrating than petroleum, which comes out clear when repeatedly distilled, and then when extracted with tartar salt, degenerates into burning water.

If just a drop of water falls on molten salt, there is a big explosion, gravely dangerous to the worker, and often propelling molten salt to the walls, where it sticks like the sparks from a fire.

Salt thrown on a fire of coals revives the fire, and makes it flame up. As the crackling ceases, it joins with the inflammable substance of the coals, and part of it degenerates into a more volatile form, or produces white flowers. The rest alkalizes along with the coals.

Common salt fused with borax foams very little, whereas it foams a lot with others.

A redness is imparted to sulphur by mixing fire-melted salt with it: and it should be noted that from this mixture a crumb of gold is obtained—that if a little lime of Saturn is dissolved in this mixture, and if it is reduced by a small cup, they say this granule of gold is found. William Lithgou, an Englishman, reports on a gold-bearing salt at Trapani, a city in Sicily, thickened by the heat of the sun[176], which shines with a red color, or that of red corals.

Glauber teaches a way to extract gold from sea salt. A brass or copper vessel is filled with sea water, and some dissolved lead is poured into it which immediately precipitates into a white powder. The water in the vessel and the solution is stirred thoroughly, so that volatile gold sticks to the lead powder and sinks with it to the bottom. The powder is then sweetened with water and from it gold may be extracted with a fire. Silver can be used instead of lead.

If the yellow coloring of gold is sublimated with common salt, white and transparent arsenic is obtained from it.

## § 56

## EXPERIMENTS ON THE CORROSIVENESS OF SALT AND ITS OTHER ACTIONS

Common salt, especially rock salt, is much used in metal coating and helps in the dry solution of metals.

Also if salt is digested by other bodies, it usually also dissolves them in the end.

Likewise mercury can be purified with salt water or with salt itself, in that it better works its way into particles of gold and mercury, than those of other metals.

Powdered gold can be purified with salt.

In testing mining sites, a quantity of common salt is used, which is put on the upper side of a beam to a thickness of half an inch, or one inch. Also, with the use of common salt metals are separated from slag.

[176] Acton read *salis* for *solis*.

If common salt is added to lead or tin that has been melted in a crucible, and the mass is well stirred with an iron rod, these metals are reduced into a very fine powder like ashes. Also if common salt, without anything else added, is melted in a crucible, then when the acid spirit has been thrown off into the air, it alkalizes.

Salt that has been melted several times finally turns to a sulphurous mass when coal dust is added, as if some mineral of sulphur had been added. Hoffmann.

Salt also turns iron into steel, and does this if good iron beaten into the shape of a rod in live coals, to which a lot of common salt has been added is strongly heated and then pounded out on an anvil with a hammer, and the slag separated, the process being repeated several times.

Salt mixed into parts of all animals impedes them from putrefaction, so that they can be preserved for years: thus whole eggs in boxes can be kept from rotting if they are sprinkled with powdered sea salt.

About his wonderful salt Glauber reports that if meat is rubbed in it, it does not rot in the air. It is like an embalming compound for bodies that are stored in it, and it turns them to stone in the course of time. He has yet more things about his salt, but hides them as mysteries.

If salted meats and fish are cooked in salty water containing twice as much salt as is in the meat or fish, it seems to extract the salt from those living parts and render the meat sweet and free of salt. It happens differently if the water is fresh.

Common salt is excellent for purifying oils. For if the oils are somewhat dried up, thick, and deprived of their sweet smell by age, the salt not only makes them clearer, but can also give them a sweeter smell, if they are mixed in equal proportions in a mortar and poured through a filter in enough plain water. The process is the same if we wish to purify salt of amber, and make it whiter by separating it from its fiery oil, which must be taken away by sublimation with common salt that has first been well mixed with it. Hoffmann.

The large ships in which every year salt has been carried from one province to another for twenty or thirty years are not found to have rotted in the places where that salt had lain. Those parts of the ship appear sounder than the rest where some salty brine seems to have sat, or places that had been occupied by salty liquid. But where there is iron, such as

those thick nails by which the heavy beams and poles are joined, a lot of corrosion appears, and in twenty years the nails are almost half corroded, although these had been driven quite far into the sides of the ship. Thus it seems that salt keeps some parts in shape, but breaks down others. Scheldon.

## § 57

## OTHER OBSERVATIONS ABOUT SALT

Sea water is able to burn, for when it is sprinkled in flames, it does not extinguish them so much as stir them up, if of course it is somewhat salty. But on the other hand, nothing extinguishes fire more easily than dry salt.

Salt water nourishes plants, for cabbage, turnips, beets, seaweed, kohlrabi, and red cabbage are grown by irrigation with salt water, and because of this the Egyptians water cabbage with nitrous water, to make them much more sweet and tender. Baccius.

There are places in England and elsewhere, which are made fertile by sea water, and in the course of time, become very fruitful and fertile.

At the top of the mountains of the Canaries, it is said that the salt cannot dissolve by water; nor can the solvents work on metals in that high region as they do around the foot of the mountain.

Salt mixed and sublimated with yellow arsenic shows up white arsenic, or litharge.

Copper mixed with salt by melting is of a silver white color on the outside, but it tinges it rouge.

Copper contaminated with iron or calamine stone and melted with cooking salt, is said to precipitate pure from slag containing iron or calamine stone floating on top, according to Glauber.

If silver dust is mixed with common salt and rubbed with clean copper, and silver is deposited on the copper by that friction, with the salts dissolving the copper, it thus produces silver plated copper.

Water impregnated with common salt usually appears more transparent than fresh water, as the salt-boilers at the sea shore testify.

## § 58

### SPIRIT OF SALT, ITS CORROSIVENESS AND REACTIONS

If spirit of salt is freed of phlegm, either in a cup or by distilling until only a third of it is left, a sweet tasting spirit is obtained. But what rests at the bottom is even stronger and takes on a yellow color, and is denser than the prior liquid.

Silver precipitate made with spirit of salt or with common salt, when properly sweetened, not only becomes more dense, but also takes on a quite volatile nature in a fire, so that when put in a heated crucible, part of it goes off into the air, and part penetrates the pores of the crucible. This volatility immediately perishes if that lunar precipitate is melted with any grease or clinging ashes. Hoffmann.

Spirit of salt dissolves iron into a varying transparent rusty yellow, and in the course of time, deposits a coarse sediment, good for staining glass.

It dissolves copper, or rather its flakes, into liquefying and not a crystallizing form, avidly absorbing aerial humidity, and is a grassy color.

It reduces tin to a dry consistency. Thus, by means of a rather strong distilled vinegar gotten from common salt, lime of tin is dissolved and reduced into salt; but this does not succeed with the use of ordinary distilled vinegar, Glaser asserts. But it works well with flowers of tin prepared with niter by detonation.

Spirit of salt converts regulus of antimony, and very quickly its flowers, into a transparent crystalline form, that liquefies in the air and fire and is known as butter [of antimony] among chemists. But this is not to be expected from ordinary spirit, unless it has been well rectified.

Spirit of salt joined with mercury is said to turn with copper into a metallic gum, a salty substance, liquefying together on hot coals, inflammable, and liquefying in the air as well as in fire, having a blue color inclining toward green.

Which happens the same way with silver, except that it is a transparent color, like lemon amber.

Spirit of salt reduces flowers of arsenic and of orpiment into a similar butter.

In the common method of dissolving Mercury [with it], almost no work is done except during the day, and this when it is of a rather concentrated consistency, while digestion is going on. So at last the mercury is dissolved, and by sublimation both go up in white sublimate.

Zinc is completely dissolved in spirit of salt, and the solution becomes clear.

When acid of salt is combined with sulphur, it makes it transparent, like virgin sulphur. And by this method it is freed of all metallic and mineral parts still mixed in with the flowers themselves, and is collected pure.

Common salt or its spirit precipitates luna dissolved with nitric acid into a white powder, which when dissolved, dried and melted with fire becomes horny luna.

Spirit of salt in particular coheres so closely to limey earths, preferably to those that are dried out, and to quicklime itself while dissolving it, that it constitutes a new mixture.

It also dissolves clods and takes away their color.

It dissolves calamine stone, in such concentration that two thirds of it, removed by distillation, comes out tasteless. The thick oil that remains, avidly taking up humidity from the air, liquefies; thereby the solution does not precipitate but remains clear. The contrary happens with dissolved regulus of antimony.

Spirit of salt dissolves chalk both white and colored.

It dissolves pearls, the marrows of rocks, and various clays, and by this its acidity is dulled, [more] and less according the the differences of the things to be dissolved.

Stones themselves it dissolves somewhat, glassy as well as limey ones. From the former it rather extracts a part, and dissolves the latter more directly, although in general they also do not totally dissolve. About the above, read Glauber.

By itself it does not dissolve gold, but combined with spirit of wine, tinges it with whiteness. But spirit of salt can dissolve gold leaf. Elsewhere, aqua regia is prepared from nitric acid and common salt or ammoniac salt,

about which see *Niter* and *Acid*. Elsewhere, a drop of spirit of niter is said to turn 500 drops of spirit of salt into aqua regia.

Spirit of salt gives silver a kind of black color.

It does not absorb lead but rather calcinates it.

Crude mercury is not dissolved by spirit of salt, but mercury precipitated by itself, and very easily and quickly dissolves. Mercury dissolved in aqua fortis precipitates into white lime.

Spirit of salt does not further dissolve the chief [metals] that have been dissolved in aqua fortis and then precipitated with an alkali, with some exceptions.

It casts out of the solution almost everything that was dissolved by spirit of niter and aqua fortis, except those things that are dissolved by aqua regia.

Butter of antimony is precipitated with spirit of salt. If it is distilled, it becomes a solvent that separates silver from gold, precipitating the silver to the bottom.

Spirit of salt usually dissolves iron and steel. But if a crocus is obtained from iron with fire, it cannot be dissolved like the iron itself from which the crocus was prepared. It only makes a yellow or red tincture, while the solution of iron in spirit of salt turns green and will not dissolve hematite.

No acid will so quickly extract sulphur, of which iron contains much, as the acid of common salt. For whether a solution of mars made with spirit of salt is thickened, or ammoniac salt is used with iron filings on a closed fire, vitriol is obtained, of a yellow color, an astringent taste, and a pleasant odor, which will not undergo crystallization, but liquefy in the open air. Alcohol is best freed of phlegm if it is poured to overflowing; immediately the sulphurous substance of mars and a lesser portion of vitriol salt enter into it, and thus tincture of mars is prepared, the color of gold, of a fragrant odor and a mildly astringent taste. Hoffmann.

If iron shavings are dissolved with spirit of salt, and the solution is reduced to crystals, and the crystals are then sublimated, flowers are obtained by that sublimation.

Spirit of salt coagulates egg white, and turns it into a hard mass.

But spirit of salt agrees best with alcohol.

If spirit of salt is mixed with a volatile salt, a semi-volatile armeniac salt arises.

If spirit of salt is put into spirit of putrefied urine, it makes noise and bubbles, and the alcohol of a thermometer put into it rises.

From green flowers of bronze and an equal amount of salt, aqua fortis originates.

If spirit of salt is extremely saturated, when water is poured into it, it will grow hot, almost as oil of vitriol does.

Silica salt with spirit of salt turns a reddish yellow color.

Quicklime corroded with spirit of salt, when slag from regulus of antimony is added becomes a reddish chestnut color.

Spirit of salt from quicklime with syrup of violets becomes a light green color.

Brick dust dissolved with spirit of salt, with a solution of sulphur together with quicklime, turns a black color verging on green. Hierne.

Boyle says in his *Tentamina Physiologica* that a spirit can be prepared from sea salt that breaks through the structure of crude gold, but he thinks that this happened by chance, that perhaps the salt had been brought from the Island of Majorca.

When spirit of common salt is crystallized, it again deposits common salt which is somewhat like its original form.

A *Blue or Turquoise color* in glass, using salt. Rx: Put sea salt called crude and black—white will not do—in a furnace so that it calcinates and comes out white. Then grind it and it will give a white powder. In the jar you may have a film of crystal, stained with the color of sea water, and that color may be lovely and full, but every method of preparing the blue color depends on the quality of the sea water. Into this glass so stained the above-mentioned sea water is added, gradually, and well mixed, so that it turns into slag, and the sea water from clear and transparent becomes cloudy. For when the salt goes into glass, it takes away that transparency, and induces paleness, which gradually turns into a blue or turquoise color, so important in the art of glassmaking. For the rest, when the desired color results, the glass is to be worked immediately. For the salt is removed and goes off as vapor, and the glass becomes clear and deformed. If while it is being worked the color vanishes, add a little calcinated salt, as above, and the color will return. The glass worker should note that this salt, unless it is well calcinated, will always crackle; thus it is to be added at intervals, until the desired color results. Neri.

**§ 59**

## FROM MR. BRUCHMANN'S *MAGNALIA DEI IN [LOCIS] SUBTERRANEIS*

In *Catalonia* rock salt is found, especially near the cities of Cordona and Girona, where a lot of salt is chipped. *Insula Salina* is full of salt and alum. In *Bavaria* in Berchtesgaden there are the best salt mines. In *Poland* at Bochnia, and at Kolomyja near the river Pruth. In *Hungary* near Schower or Salzburg a quarter mile from Eperjes there are the best salt works, from which the best rock salt of a white, violet and yellow color can be had, and flowers of native salt. Each year more than 100,000 tons are produced. In the county of Marmara there are also salt mines of the best kind. In *Peking* all the ground consists of rock salt, from which enough vapor arises to cover bodies and faces.

In *New Spain* there are just about all kinds of salt, for neither sea salt, named Yztaxalli, with its flower and foam, river salt, lake salt, nor spring or well salt is lacking. Nor was nature more generous anywhere in making rock salt. I might add that yet another kind is cultivated from the earth in not a few places: it is prepared with waters lower down than the rest, and is formed into rather thick cakes, named by the name handed down to them, Yztayaholli. What shall I say about the salt called Indum, which is evidently the sugar of the ancients? or about those called Mucia, Alatro and Alaxater? all of which salts are artificially made, and familiar to this world. Moreover, salt is also generated from certain waters of salt springs erupting in many places, brought together into artificially made hollows, the best kind of salt being made when the moister components are consumed by the heat of the sun, but the remaining ones rather approach the nature of earth, held together by some portion of water.

But salt or niter that is collected and scraped off from the bed of a swamp, drying after the rains have ceased, in order to be separated from its earthy part, is softened, especially with water, and the remaining earth melted. The finer part flows with clear water through canals into urns, from which it is taken out and distributed into the hollows mentioned above, where by the strength of the sun, it hardens into salt.