

Appendix A English Text

In the name of God, the merciful, the compassionate, *The Discourse on the Reason Why Seawater Was Made Salty*, by Ṭābit b. Qurra. He said: it happened between us, may God honour us, to mention seawater, the reason why it was made salty, and what traces of knowledge there are in it, and two are the evidences that can be counted in it. Now, were it not for the fact that investigation, observation, and contemplation of knowledge and understanding of its causes is an important matter for the self, and a virtue among its virtues, and striving for knowledge of what has been hidden from us, there would be many things that we see, in which we would not see these signs of the subtle wisdom of God in clear matters that are not hidden from those who understand.

Regarding what the scholars have already deduced from this subject and sufficiently investigated, I mean on similar questions, despite everything that people have mentioned about it and despite its abundance and extent, we consider it to be of little value in terms of the wisdom of God in His creation, which cannot be enumerated or exhausted. The souls continue to constantly discover something about His affairs that they examine and gain knowledge of, and they continue to be amazed by what stands before them.

This is what prompted us to engage in the current discussion about why seawater is salty. However, what drives this inquiry is the desire to understand the wisdom of God, as evidenced by the abundance of its traces that one can find, no matter where one directs their gaze or strains the intellect. What man obtains from [the study of] the affairs of God is patience, and from his wisdom [he obtains] marvel, and this is a recognition of His glory and a praise to Him. The scope of this chapter is to introduce the knowledge of the reason why the seas were created. We will begin with this.

We say that it pertains to the wonderful wisdom of God to have created the four elements: Fire, Air, Water, and Earth. He made their strengths

balanced, equal, and resistant to each other by a well-devised measure, so that none of them could be predominant and overcome one of the others, changing its nature over the course of time until it is altered and nullified. If this were to happen, it would cancel the existence of people, animals, plants, and other things on Earth. Because God made all existence from the four elements and in them lies its permanence and endurance.

Moreover, God placed these elements where they are suitable for them. He made it so that the lighter elements are always on top of the heavier, and the more subtle are on top of the thicker, surrounding the latter like a sphere. He made the nature of fire, which is the lightest among them, the highest, and the nature of earth, which is the heaviest, the lowest underneath. He made the nature of air lower than the nature of fire. It would be necessary, based on this logic, that water is on top of the earth and between the latter and the air which surrounds it, before any examination.

It is one of the wonders of God's wisdom and the proofs of his power that, since it was more useful and good, in the case of this element alone among the others, he took care that the element of water would diverge from the natural course that applied to the others. Thus, water does not stay on top of the earth as the air surrounds the water and earth, and as the nature of fire surrounds the air, it is sent away from much of earth's surface and collected together. He made it into places of collection, courses, and deep places on its surface, which we call seas and rivers. He made earth's surface higher than all of those.

He also placed some of it inside the earth. We said that the most useful and good was for this element, I mean the element of water, to become impure and seep away on the surface of the earth. Since the earth was established as the dwelling of the animals and the support of the plants that are its ornament and its beauty and are securely established on it, it was necessary that water become unclean with whatever it becomes unclean of. These things and their identity are not known.

What God imposed on water was preferable than what would have occurred to its state according to the aforementioned ordering, meaning that all water would go to the seas that he made the deepest place on earth. If water was to be removed from the earth, dryness and thirst would spread, and the animals and plants that are on it would be greatly ruined if all water was collected in the seas.

God made sufficient water descend on the dry land in the streams of its valleys, in various places, and in rivers to wet the earth, preserve the plants, and quench the thirst of the animals so that they may live. Also, he placed some water in its interior, which evidently fulfils the benefits that we mentioned: the wetting of the earth even in those places from whose surface water is removed. He does not make it burst or cast light on it as he would do if he was doing it openly on its surface and he does not cancel in this what the intention that he decreed and we mentioned earlier, that is the resistance of the elements to each other. This action is also strengthened by the rains that he makes fall on the earth's surface, wetting and humidifying it.

Since it was the most beneficial and preferable, in the case of water, that it went to the seas and some of it returned repeatedly to the land in sufficient quantity to quench the thirst of the animals, plants, and population of the earth, and to humidify the latter, this other water returning to the earth had to be drinkable, sweet, pleasant, and suitable to the natures of the animals and plants.

This does not apply in the case of the sea, since the residence of the people, animals, and plants is on dry land. He made this water sweet and it was not necessary for seawater to be sweet. Had it been like that, all the water on the surface of the earth would spread corruption and damage to the air, were it not for what our Lord, the almighty, did with His subtle wisdom by preventing it. This will be understood thoroughly and completely in what follows.

About the fact that the water that is on the surface of the earth would spread corruption and damages to the air and to what is on the earth, and destruction to the animals and plants, this can be learned clearly from experience. If we find sweet water and it stays still for a long period of time, it putrefies, rots, and changes its odours to the point that it corrupts the air that surrounds it unless we cover it. This causes many grave illnesses, pestilence and plague. We already saw pestilence occur in certain regions caused by stagnating waters that corrupted the air to the point that it caused rapidly spreading death.

About this, among the astonishing things that we saw in certain regions, is that the smelly water. Some of it flowed to a streamlet nearby and in every village that the streamlet crossed along its course there was a great pestilence, while a place that was distant enough from its shores remained unaffected, if it remained at a distance. The gravity or triviality of the pestilence was proportionate to how close or distant the village was to the river. There are many similar cases, famous and well-known among the people, proving what we just told.

The stagnating waters that stay still for a long time are in small quantities and remain still for a brief period. We can imagine that if the waters of the seas and the rivers were to experience the utmost and greatest corruption over a long period, it would not remain anything on the earth were it not that God, in His subtle wisdom, regulated this ruling, preventing that corruption from occurring.

About the water of the rivers that traverse the earth, it was necessary that it be sweet, suitable to drink, and to sustain the flourishing of life. He prevented it from rotting by making it flow constantly, and He made their waters regenerate in their sources from whence they come. He made it fresh because He nullified its stay and did not affect it with the corruption that affects concealed water that does not flow. Moreover, He made it so that, if it flows long enough on the earth, it pours into the seas. About the seas, as it does not flow, but instead water descends into it, the ruling explained before does not apply. This way, all the reasons that lead to corruption are already reunited in it.

The first reason is that a lot of the water in it is from the water that is required, as we said before, to resist the other elements. If this corrupts, its corruption would be given to whatever air or other element is near or far from it. The second reason is that since it is necessary, as we said, that there is plenty of water according to its proper measure, it is also necessary that this quantity is collected in one place so that it does not cover or inundate all the earth. It would not be possible for these places to have a great depth, [[so water extends over it and is illuminated by light over its extension.

If there is much depth in a place, its purpose is to be hidden where there is a lot of water, this also results in one of the reasons that lead to a quick corruption of what is in similar places.]]¹

¹ The translation between double brackets is very tentative.

The third reason is that the water of the seas does not flow, and the length of its permanence in its places surpasses every imaginable measure of water stagnating or otherwise. These smaller cases do not make apparent the size of the damage and danger that would be in them were it not that God made this right by making this large mass salty which, as we will explain, is the taste that keeps corruption and the deterioration of the air and its change at bay and its removal, in favour of freshness when this is necessary, causes no harm. In fact, it is necessary that water is sweet only on dry land, as we explained earlier. This taste that was given to the sea, as we have mentioned, protects it from corruption and deterioration, also maintains the proper measure of the sea, which should not increase nor decrease, as we will explain in what follows. Nothing is more astonishing than the fact that He made this taste of seawater something that preserves both its state and measure as it is desirable, and with further ensuing benefits.

That the salty taste prevents corruption and putrefaction is something that all people know. For this reason, they obtain, if they fear that something may be corrupted, putrefied or change its odour, as in the case of meats and others, salinity by adding salt. Nothing more effective has been found.

This can be seen in the case of stagnating waters that may, perhaps, have developed pestilence or corruption. A lot of salt is thrown in it, so that its water becomes salty like seawater. [This practice] is done to cure the water and stop the corruption that it was spreading. This thing that people do as an expedient to protect things from corruption, was already decreed by God. It is most perfect what God did, in the case of the seas, as he placed in them the character of salinity, that stops fearsome corruption from spreading to the air and to what surrounds it, to the point that there is no remaining fraction of bodily health and wellbeing among what resides on seashores and elsewhere.

Moreover, if man considers all the tastes, he won't find one that is better for this purpose, for the properties that salty taste has together against corruption, and because it does not cause damage under another aspect: the part of odour that has in it separates from the odours of what it is mixed. There is no taste more suitable than that salty taste that is in the sea by that measure of salinity that is proper to it.

More precisely, of the philosophers who occupied themselves with the fundamentals of tastes in terms of enumerating them, some say there are eight tastes, some say there are seven tastes, and some others even less. If man detracts from them the taste of sweet water, since it does not prevent corruption but instead rots, as we said, when its stay still for a long time, stagnating and not flowing, he would find that the water of the sea must not gain that taste, that corruption was prevented in it, and change was distant from it. Furthermore, that water should not carry the odour of the taste with it, and should not change the taste of the air. Now, the fact is that the sour and spicy tastes give to the air odours emanating from them, damaging the animals and changing the air strongly. As for sweet and fatty, change and corruption gradually affect them.

Moreover, the sweet over the course of time becomes bitter or sour, as natural scientists explain. As for the fatty taste, over the course of time it gives off odours and begins to smell. These two tastes are not suitable to be the taste of seawater. So, three tastes remain: astringent and salty. The astringent can produce a lot of odour while dry, and, mixed with water, does not prevent corruption. It may have many harmful, unseemly and disgusting

odours, like the spirits that are said to be smelled at the sources of vitriol and yellow vitriol and other astringent things because there are strong humidity and harmful odours in those places.

It remains to be discussed if it would be more beneficial for seawater to be salty, bitter, or a taste assembled from them all. However, while bitterness protects from corruption, it has a downside: many animals avoid it. On the other hand, saltiness is pleasing and closer to the nature of most animals, which consume a lot of it. If seawater had been made bitter, none of the wonderful animals that live there would have been generated, and the creation would have been void and empty of the divine wisdom that is revealed in the creation of those animals and the benefits are derived who employ them.

About what God made in the small sea that is in the country of Palestine, that which they call Dead Sea: it proves what we have said. The salty taste is mixed with bitterness, and God made the lake's salinity so strong that no animal or plant can survive in it, according to Galen. He said: "Animals shy away from it, and all fish in the rivers that flow into it flee when it comes close to them. If someone tries to introduce fish into the lake, they will not multiply and instead will die quickly". This is what would happen to seawater if there was a trace of bitterness in it, or if its salinity exceeds its proper bounds. This proves that the most beneficial taste is the salty taste given to it in the proper measure, not more.

We will now discuss the possibility that seawater was salty in a lesser measure. It is clear that if the salinity were to diminish, its odours would deteriorate. Instead, its saltiness has already been set at the least measure possible, and the proof is that this measure of salinity does not fully achieve the goal of completely eliminating the odours of the sea and instead something of it remains, but in a measure that is not harmful. This proves that the measure of salinity in seawater is the desired one. If it increases, it harms marine animals, injuring and killing them. If it decreases, it damages the animals on dry land that are reached by its odours. It is clear to us that the most beneficial taste in seawater is that salty taste, and in the measure that is given to it, not less and not more.

Furthermore, if [seawater's] salinity were to be reduced, seawater would resemble the water in swamps, generating many worms, leeches, and other organisms found in stagnant water. It would become polluted, and bugs and mosquitoes would proliferate around it. This would be extremely harmful. This proves what we have said, that it is not best for seawater to be only salty, but that it is best for it to be salty by the measure that is given to it, and that the salinity should not be less or more than this. What we have mentioned proves that the best and most suitable for seawater is not only to be salty, but also to have the proper degree of salinity, neither less nor more. If it deviates from this, it causes harm to animals on land or in the sea.

We have already stated that one of the benefits of this taste is that it maintains seawater at a stable level, preventing it from increasing over time and overflowing and submerging its surroundings. This would be in contrast with the purpose for which it was created. Seawater does not decrease or increase, it maintains its quantity as it was made.

The evidence that the salinity of seawater is one of the factors that preserves its measure, as it was given to it, is that all the rivers flow into it constantly adding to its measure, while the heat and evaporation constantly diminishes its measure. Because its water is salty, it becomes denser, which works against its further evaporation and dissolution due to its increased

density. In fact, dense [liquids] evaporate and dissolve more difficultly than thin [liquids.]

As long as the sea receives the benefit of the fresh water that mixes into it from the rivers, it increases its quantity but this swiftly evaporates away due to its thinness and does not remain there for long. Eventually, the increased quantity of water is nullified, and the dense salty water returns to its original state, dissolving and evaporating with difficulty. Seawater remains in this condition, without having undergone significant changes, [although] it decreases until it is joined by another addition of fresh water.

If someone wants to verify this statement, they can take a certain measure of seawater or salty water that resembles it, mix an equal amount of fresh water or less and leave it in the Sun or elsewhere for a few days, and check on it every day. They will find that the weight of the fresh water that was added dissipates quickly. Afterwards, it stabilises and does not decrease further, except for a small diminution over a long period of time.

The evidence that seawater is dense is based on the weight of the objects that float on it and that do not float on fresh water, such as eggs or similar objects. Heavy ships float on seawater and do not sink, and are buoyed by it. Objects that cannot be buoyed by seawater, sink in fresh water. As we explained, ships and boats are safer in seawater than in fresh water.

There is another remarkable aspect of God's wisdom in making the taste of seawater salty among all tastes. This aspect is known to those who have received our account of the elements, because it relates to some of what we discussed at the beginning of our discourse. I do not see any harm in briefly mentioning it again to keep our discourse systematic and maintain its order.

We have already explained that it is necessary that the strength of the four elements is balanced in resisting each other. Given that, the element of water has a measure that is sufficient for resisting the remaining elements, it would not be acceptable for it to be more or less than that and exist together with the remaining elements.

It was also necessary that [water] traverses much of the surface of the earth, gracing it and come to be renewed in its reservoirs so that animals and plants have a place [to live]. As things stand, since plants and animals on dryland need water to live, rivers come from the water of the dryland, and it was necessary that their water was sweet. This was not necessary in the case of the sea, because the animals and plants which require sweet water are strictly located on dryland. As we explained, the seas, the rivers, and all which is wet would spread corruption, decay, and deterioration to the air and to all that is on the earth, was it not for what was done on them to make them suitable.

The water or rivers was made suitable by making it flow. In the case of the waters of the seas, it was not desirable that it flowed, and so it was more prone to corruption and deterioration because, as we said, several reasons for it were put together. This fact rendered necessary to preserve [seawater] from corruption. Now, only an overpowering taste would be able to preserve seawater, overwhelming any other by being stronger, not lacking in strength, and overwhelming and controlling the corrupting thing. This [taste] is what we have been talking about so far, in the terms required.

If the mass of water was slimy, it would have been necessary to divert it from the land, and dryness would have spread on it, while the sea would have increased its water, exceeding its proper measure, as if earth and water were specific to two distinct places. Water would have covered the earth

for days until all the water disappeared, with the rivers thinning them out, and the seas would have grown without a clear limit. God prevented these two things from happening through His knowledge by making the water of the sea evaporate and rise into the air through the heat of the air and Sun. This creates clouds, which return to the land bringing rain and snow. All this flows like in a cycle.

Here are the two things that are necessary in this chapter. They are [that if] wetness is removed from the land, as it thins out, and dryness triumphs over it, the rivers are emptied, and their water that benefits the land is no more. [The other is that] the water of the sea does not increase more than it is desirable, and it is necessary that the taste of seawater is a strong, prevailing one to prevent its corruption. It is also necessary, as we said, that a vapour rises from it, generating moisture on the land, moistening and humidifying it, thus preventing dryness and lack of water, and that this ascending vapour has already separated from that taste and got rid of it, becoming sweet and pleasant, so that it does not have a strong taste or smelly odours, as this is necessary for the water that comes from the clouds, the rain and the snow.

These two characteristics would not be present in seawater devoid any taste, except for the salinity that was made in it. This is because all the wet substances that have a foul taste, if they evaporate, will inevitably carry some of their taste and odours with them. This would result in a damaging taste and odour in the water and it would not be suitable for drinking. The only exception to this are wet substances that have a salty taste. The reason for this is that the salty component is removable from them, it is earthy, dense, and it seeks to move downwards, so that it does not evaporate with them or from them.

If one wants to test this, he can observe wet substances that evaporate due to fire. If he examines this, he will find that in what has evaporated there are tastes different from the taste of sweet water, except in the case of water that has this salinity. If the latter is evaporated, it becomes sweet water, like drinking water. This does not happen with any other taste, because sour substances, such as vinegar, and astringent substances, such as rose water, and fermented substances, such as wine and drinks, maintain their taste and are damaging if their tastes and odours are evaporated or exceed in intensity and strength, as those tastes, which are not salty, remain in them after the evaporation. They may also gain another taste and other odours, while the wet substances like seawater, if they are made to evaporate, they gain a taste of sweet water. This is something that can be proven by experiment and confirmed by measurement.

Moreover, it is not only through evaporation that the salty taste leaves seawater. Instead, it can also leave it through sand [filtering]. Thus, if the coasts are sandy, the water that is collected in it comes out as sweet water. Nothing is more wonderful than the fact that the taste that God chose for seawater has in itself the force to overwhelmingly prevent corruption and deterioration, for as long as it is needed, and where salty taste is not needed and there is a need to purify sweet water from it, it is separated as the water evaporates without odours or taste.

From this water come rain and snow on dryland, pure and without taste. Animals and plants have everything they need in terms of drinking water and moist soil, and perhaps it could be said that God could have made the taste of seawater another strong taste, other than salty, of those that become

attached to the wet substances and remain in them during the evaporation, [but] altering them or changing them so that no taste or odour remains in that water. There two fundamental answers to this.

One answer is that God does not do anything without sense, and creating a taste that does not have the two properties that were mentioned would be a deed without sense, since there is a taste that has those two properties is the salty taste, without going against natural order. The other answer is that if God had made it for water like we described, it would have been evidence of His power only, and not of His wisdom because he would have showcased His power, had he brought that to completion without wisdom in the arrangement. The fact that things are such that [seawater] is salty is one of the signs of both His wisdom and power.

Here ends the totality of what was presented to me and I understood of the subtle wisdom of God in making seawater salty for this purpose and for this compelling reasons that make it necessary. If there are further benefits, they are not the first and main principles. Rather, they descend from what we said. [Here] the book by Tābit on seawater ends.