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Description of the Celestial Globe belonging to Major-General Sir John Malcolm, G.C.B., K.L.S., &c. &c., deposited in the Museum of the Royal Asiatic Society of Great Britain and Ireland. By DR. BERNHARD DORN, For. M.R.A.S.

Read February 21, 1829.

AMONGST those sciences which, after a long interval of ignorance and barbarity, were revived by the Mahomedan Arabs, astronomy ranks very high; and it cannot be denied, that had not the Arabs applied themselves to it with great assiduity and zeal, and encouraged all that served to promote its dissemination and advancement, after it had remained almost totally forgotten from the time of Ptolemy, the application to its study would, perhaps, never have extended over so large a portion of the globe as it has done. Although the pagan inhabitants of Arabia, before the time of Islamism, were in the habit of observing the stars, many of which they knew, and denominated by names taken from pastoral life, and several of which they even worshipped as visible gods, yet of a scientific knowledge of astronomy among them no traces can be discovered. The revival, therefore, of this celestial science, was principally attributable to their Mahomedan successors, who introduced its study into Arabia, at a time when the countries around them were immersed in the most deplorable state of mental darkness, which could only be dissipated by slow degrees.

We know that, in the middle of the thirteenth century, astronomy was so little attended to in the Greek empire, that Chionides of Constantinople, being desirous of becoming acquainted with the celestial sphere, was compelled to travel into Persia to gratify his desire. The Persians, according to his statement, were at that time so jealous of their acquirements in astronomy, (in consequence of a prophecy current amongst them, that the Christians would overthrow their empire by means derived from a knowledge of it), that it was strictly forbidden to initiate any stranger into its mysteries; and the Greek sage, notwithstanding the strong recommendations he had

brought with him from the Greek emperor himself, experienced much difficulty in attaining the object of his journey. Georgius Chrysococces, a Greek physician of the middle of the fourteenth century, who was greatly attached to astronomy, and to whom we shall frequently have occasion to refer in the course of this essay, had derived his knowledge of this science from the works of Chionides, of whose travels into Persia he gives the following account :

Ἐ'λεγε τοῖνον ἐκεῖνος (Μανυῆλ) ὅτι Χιονιάδης τις ἐν Κονσταντινῆπόλει τραφεῖς καὶ πάντων ἐν καταλήψει τῶν μαθημάτων γενόμενος εἰς ἔρωτα πεσὼν καὶ ἑτέρας μαθήσεως διαλέκτου δι' ἧς σοφίαν πορίσαιο καὶ ἰατρικὴν ἀκριβῶς ἐξασκήσειεν, ἐπειδὴ παρὰ τίνων ἤκασεν ὡς εἰ μὴ εἰς Περσίδα ἀφίκοιτο τῷ ποταμένῳ εὐ τεύξεται, πάντων καταφρονήσας ἢ τάχως εἶχε τῆς ὁδοῦ εἶχετο · εἰς Τραπεζῆντα δὲ ὡς ἐν παρόδῳ ἐλθὼν καὶ τῷ μεγάλῳ Κομνηνῷ ὁμιλήσας χρόνον πόλλον (σύχρον), εἶτα καὶ τὰ τῷ πράγματος κοινοῦσάμενος μεγιστῆς ἡξιώη κηδεμονίας, πολλὰ γάρ παρ' ἐκείνῳ λαβὼν ἀναλώματα εἰς Περσίδα ἀφίκετο ἐν ὀλίγῳ δὲ τὰ Περσῶν παιδευθεὶς καὶ τῷ τῶν βασιλεῖ ὁμιλήσας, προμηθείας τε παρ' ἐκείνῳ τετυχηκὼς, ἐπειδὴ τὰ τῆς Ἀστρονομίας μανθάνειν ἐβόλετο μὲν, ἔκ ἔιχα δὲ τὸν διδάξοντα. Νόμος γὰρ ἐν Περσίδι πάντα μὲν τὰ μαθήματα τοῖς βελομένοις ἐξεῖναι μανθάνειν, ἀστρονομίαν δὲ μόνοις τοῖς Περσαῖς. Ὁ δὲ τὴν αἰτίαν ἐξετάσας καὶ μαθὼν δόξαν εἶναι τινα παλαιὴν ἐπικρατήσασαν παρ' αὐτοῖς ὡς φθαρῆσθαι τὴν ἐκείνων βασιλείαν ὑπὸ Ῥωμαίων τῇ τέχνῃ τῆς Ἀστρονομίας Χρωμένων, παρ' ἐκείνων πρότερον ταυτῆς λαβόντες τὰς ἀφορμὰς, διηπορεῖτο πῶς ἂν τῷ τοῖσδε μετάχοι καλῶ. Ὅμως πολλὰ μοχθήσας καὶ πολλὰ δαλεῦσας τῷ βασιλεῖ τῶν Περσῶν μόλις τῷ ποταμένῳ τετόχηκε. Προστάγματι γὰρ βασιλικῷ τοῖς διδασκάλοις συναγαγὼν ἐν ὀλίγῳ μέγας ἐν Περσίδι Χιονιάδης ἐφαίνετο, καὶ τιμῆς ἡξίετο βασιλικῆς, χρήματα δὲ πολλὰ συλλεξάμενος καὶ πολλοὺς ὑπηκόους κτησάμενος εἰς τὴν Τραπεζῆντα πάλιν ἀφίκετο. Πόλλα βιβλία τῷ τῆς Ἀστρονομίας μαθήματος ἔχων μαθ' ἑαυτῷ. Οἰκεία δὲ γνώμη ταῦτα ἐξελληνίσας μνήμης ἄξιον ἔργον ἐποίησεν. Εἰσὶ μὲν καὶ ἕτερα βιβλία τῆς συντάξεως τῶν Περσῶν ἅπερ αὐτὸς ἐξελληνισε.

“ He (Manuel) told me that a certain Chionides, brought up in Constantinople, and deeply versed in all the sciences, felt desirous to learn another language, by which he might acquire wisdom, and improve himself in the practice of medicine; and having understood from several Persians, that unless he went to Persia he could never obtain his wishes, he laid aside all other pursuits, and commenced the journey with all possible haste. On his way he stopped at Trebizond, where he met the illustrious Commenus, with whom he remained a considerable time; and upon communicating to him his intention, was treated with the greatest kindness, and received from him ample means for prosecuting his journey in safety to Persia. In a short period he had made himself acquainted with all the sciences of the Persians, and had frequent intercourse with their king, from whom he received much attention. But when he sought to be instructed in astronomy he was not able to find a teacher for that purpose; a law existing in Persia which permitted every one to study any science he might choose, but confined astronomy to the

Persians. On his inquiring the reason of this regulation, and being told that there was an ancient belief prevailing amongst them, that their empire would be overthrown by the Greeks by the means of astronomy, he was more anxious to make himself master of this noble science; but it was only by continued exertions, and after many services rendered to the king, that he could obtain his wishes. He then, by the royal command, assembled teachers about him, and became in a short time so much respected throughout Persia for his knowledge of astronomy, that he was even honoured with the royal favour; and having amassed great wealth and purchased many slaves, he returned to Trebizond, carrying with him many books on astronomy, which he translated into Greek; and thus performed his praiseworthy task. Besides the books alluded to, he rendered into Greek the astronomical tables of the Persians."

Theodorus Meliteniota, who flourished about A.D. 1300, and was the compiler of a treatise on astronomy entitled *'Αστρονομική τριβιβλος*, expressly declares in his preface that he had incorporated into his work astronomical tables compiled in Persia.* For the Arabs, who soon after the time of Mahommed had founded an extensive and firmly established empire in Arabia, were not contented to confine themselves and their new creed within its limits, but carried their victorious arms into Persia, which they conquered, and ruled over with as absolute a sway as their other dependencies; and notwithstanding the heavy losses which this unfortunate country sustained, and the destruction of its literary treasures, the sciences, under the patronage of mild and enlightened governors and princes, soon raised their heads again; and Persia and the adjoining countries became famous for the flourishing state of their literature, which did not yield to that of any other nation of that age. The consequence was, that several learned men appeared whose proficiency in astronomy procured them an honourable place among the astronomers of that period. The learned Alcazvini (who died in 1283), to whom we are indebted for an accurate account of the constellations known to the Arabs, and the names of the stars of which they consist, was a native of Persia.

We find ample information on this subject in his work entitled *Ajāib Almakhlūkāt* (عجایب المخلوقات) of which the chapter descriptive of the constellations has been published by that accomplished astronomer, Professor

* Εἶτα καὶ τὴν τρίτην (βίβλον) τὰς τῶν Περσῶν προχίρων κανόνων Ψηφοφορίαι περιέχουσα συμπεράσαι τῆς παύσης συντάξεως ἢ περὶ ἀστρονομικῆ τριβιβλος τῆνομα.

Ideler of Berlin ;* whose instructive annotations greatly enhance the value of his translation, and have afforded me considerable assistance in describing the constellations of the globe preserved in the museum of the Royal Asiatic Society.

Alcazvini, however, was not the only astronomer who did honour to his native country : many others might be enumerated if the limits of this essay permitted me to expatiate upon the subject : but as brevity is necessary, the only remark I presume to add is, that the author of the treatise on the construction of the astrolabe, from which I have inserted extracts in this memoir, as explanatory and confirmatory of what Alcazvini asserts, appears to have been a Persian, although of a later period ; his name is Abd ul Rahman Sherif, and his work was compiled in 1743, under the title of مقصد المطالب Maksud Ulmutalib.

It was especially under the patronage of the Khalifs of the Abbasside race, who began to reign A. D. 749, that the flourishing state of the science of astronomy commenced : for these Khalifs, contrary to the usual bigotry of Mohammedan princes, delighted to sacrifice ancient prejudices to the welfare of literature, and assembled around them the learned of all denominations. The first of them who introduced a decided taste for the sciences into his kingdom, and who may be designated as the founder of the successful cultivation of astronomy, was Almansur, who ascended the throne in the year 754 ; and the astronomer who may claim the merit of having seconded and carried into effect Almansur's noble designs, and thus left a precedent to others, was Mohammed ben Ibrahim Al-fazari.

The Khalif Mahdi succeeded his father Almansur, and inherited his taste for literature : he was succeeded by Harun Alrashid, who was not less distinguished for the zeal with which he promoted all literary pursuits. It is a fact well known, that he presented to the emperor Charlemagne (amongst other valuable presents) an astronomical watch : which proves the great progress the Arabs had made in the arts and sciences during his reign. Under his auspices many Greek authors were translated into Arabic. The works of Ptolemy chiefly attracted the attention of the mathematicians and astronomers ; and the *Almagest* (the title given by the

* Untersuchungen über den Ursprung und die Bedeutungen der Sternnamen, von L. Ideler. Berlin, 1809, 8vo.

Arabs to Ptolemy's *σύνταξις μεγίστη*) was several times rendered into their language, and commentaries written upon it descriptive of the names and figures of the constellations. The only alteration the Arabs allowed themselves to make in the names, was to translate them into their own language, or to substitute for such as they could not understand, other denominations, that conveyed an idea to their minds applicable to the constellations before their eyes; thus they called *Andromeda*, "the chained lady;" *Cassiopea*, "the lady in her chair;" *Orion*, "the giant," &c. In some cases, however, they retained the names which had been handed down to them from their ancestors.

These names alone afford sufficient proof, that Christian Europe derived its knowledge of astronomy from the Mohammedans; and a glance at a list of the stars will incontrovertibly shew, that many of their names are derived from the Arabic language, although they are often so much mangled and disfigured as to render it a matter of difficulty to trace them to their origin.

But the monarch who most distinguished himself in the promotion of literature and science, was the Khalif Almamun, who reigned from 812 to 833. An ardent encourager of letters, and particularly of astronomy, with which he was so conversant, that he made astronomical observations himself, and determined the obliquity of the ecliptic to be $23^{\circ} 35'$, he evinced his zeal by inviting a great number of distinguished men to Bagdad, for the purpose of improving astronomical instruments, and thus enabling observers to acquire an accurate knowledge of the motions of the heavenly bodies. Such works of Greek literature, also, as had not been at all translated, or at least not satisfactorily, but appeared to be worth rendering into Arabic, were confided by him to the most able scholars for translation.

Many princes imitated Almamun's illustrious example, and we read of several who made astronomical observations themselves. Naser ben Mohamed Abul Gioush, king of Castile, was much devoted to astronomy; in which he acquired such proficiency as enabled him to construct some useful astronomical instruments. The Mongol, Hulagu Khan, about A. D. 1264, erected an observatory in his capital, Maragha, near Tabriz, under the superintendance of Nasir ud Din Tusi, and was so strongly attached to the astronomers whom he had brought to Maragha, that he even expressed a wish to die amongst them. With equal, or perhaps greater ardour, was astronomy encouraged by Ulugh Beg, grandson of the conqueror Timour,

who was born in 1393, at Sultania, near Kazvin, and died in 1444. He was thoroughly acquainted with the mathematical sciences, and caused a magnificent academy to be erected at Samarkand, whither the most learned men of the time flocked to partake of his patronage. Ulugh Beg's name has acquired perpetual lustre by the compilation of astronomical tables, which, to this day, are held in high esteem.

That such application to astronomy did not fail to produce many learned works upon that science, as well as various instruments connected with its study, may be inferred from what has been already said; and it has been clearly ascertained that the construction of astronomical instruments at that period was brought to a high degree of perfection. Not only astrolabes, but also celestial globes were made; and many astronomers are expressly recorded as having been particularly expert in the construction of them.* Ebn Alnabdi, who was himself an extremely clever mechanic, mentions two globes which he had examined, and admired for the excellence of their execution, in the public library at Kahira in 1043. One of them he describes to have been made of brass by Ptolemy himself, which, of course, cannot be adduced as a proof of Mohammedan skill; but the second, made of silver, was constructed by Abul Hassan Alsufi, for the immediate

* Of the many individuals recorded as having added to a knowledge of astronomy that of constructing instruments, I think it not improper to give here a short list; such a one, to my knowledge, having never yet been published. Amongst those whom Almamun invited to Bagdad for the cultivation of this science we may name the following, *viz.* Abbas ben Said Algiouhari; Send ben Ali; Yahya ben Abi, Monsur Almamuni (or astronomer to Almamun), &c. Besides whom may be mentioned, Abu Jafar ben Ahmed Habush; Ali Abul Hassan ben Ismael Giouhari, at Bagdad; Alhassan ben Alhassan ben Alhaitham Abul Ali Albasri, who wrote on almost every branch of mathematics and astronomy; Fath ben Nagiaba, surnamed Al-Astralabi (died A.H. 1058); Mohammed ben Isa ben Ali; Harun ben Ali ben Yahya ben Mansur, who flourished at Bagdad, under the government of the Dilemides; and Habbat Allah ben Alhossain Abul Kasem, who also flourished at Bagdad, in the time of the khalif Mostarshed. The most skilful mechanic, however, according to the testimony of the Mohammedan authors, was Ahmed ben Mohammed, a Persian, who not only made the finest instruments, but invented several new ones, to the great advantage of the science.

Amongst those above mentioned, are some who wrote also on the construction and use of instruments: for instance, Jafar ben Ahmed ben Habush; Mohammed ben Isa ben Ali, and others. The following Mohammedans published treatises on the astrolabe, *viz.* Thabet ben Korra, about 840; Abu Ali Hussain ben Ahmed ben Maz Alaslemi, about 1274; Ahmed ben Alsophar, of Cordova; Mohammed Sebth, of Maredin; Moslama ben Ahmed Almagrebi, of Spain; Ali ben Isa Alashbili, of Seville; Mohammed ben Omar ben Alfarkan; Abu Bir Fadhl Mashalla, &c.

use of the king Adad Eddoula (of the race of the Buides), who had declared himself independent, and had even established himself in Bagdad, where nothing was left to the Khalif but the Imamut, or supreme ecclesiastical dignity.

We should, however, form but an imperfect judgment of the mechanical skill of these learned men, if no instruments executed by them had reached our time. This, fortunately, is not the case; and the few that have been preserved must be looked upon as highly valuable monuments, illustrative not only of the astronomical works written by Mohammedans, but also as furnishing the means to enable us to judge accurately of their proficiency in the science itself. Only three, or at the most four, of these globes are known to have escaped the injuries of time; and as the object of this essay is to give an account of one of them, I have thought it proper to prefix a brief description of the others.

The first and oldest of these globes, of which a description has been given to the public, belonged to the extensive and celebrated collection of antiquities and curiosities of the late Cardinal Borgia, at Velletri, in Italy. It was made of brass in A.H. 622 (A.D. 1225) in Egypt, in the reign of king Alhamet, by Kaissar ben Abul Kasem ebn Musafer Elabiaki Alhanefi, as the Cufic inscription intimates, and has been described by Simon Assemani, in a work entitled "*Globus cœlestis Cufico-Arabicus Veliterni Musei Borgiani, a Simone Assemano (LL. Or. Prof.) illustratus. Patav. 1790, 4to.*" But although Assemani, being a native of the East, was thoroughly conversant with the Arabic language, he could not avoid being sometimes greatly mistaken in the names of the stars, which he had to make out from a very bad and inaccurate copy of the globe transmitted to him; and his publication must therefore be perused with some caution.

The second globe, also of brass, is deposited in the Astronomical Museum at Dresden, in Saxony, and was very accurately and skilfully illustrated by Counsellor Beigel, in Bode's *Astronomischem Jahrbuch* for 1808. It was constructed in the year 1289, by Mohammed ben Movajed Alardhi, an astronomer at Hulagu Khan's court, at Maragha; and the characters engraven on it appear, from a specimen given by Professor Ideler, to bear a strong resemblance to those on the globe deposited in the museum of the Royal Asiatic Society.

The third globe, of rather a smaller size, and which I had an opportunity of seeing and examining myself, was brought to England from India, and

belongs to the Astronomical Society of London. The names of the stars on it are engraven in Arabic; without, however, the figures of the constellations being added. Neither the year of its construction, nor the name of the maker, appear on it; but it is evidently of so very recent a date, that it has been even supposed to have been made in England. We know, at least, that it was once the custom in Holland, to construct celestial globes with the names of the stars in Latin and Arabic.

The fourth globe is preserved in the museum of the Royal Asiatic Society, in which it was deposited by Sir John Malcolm, and is undoubtedly one of its most valuable curiosities. It is made of brass, and apparently of Persian workmanship; which not only the manner in which the animal figures are represented, but also the mode of denoting the year of its construction, seem to indicate. The inscription, which is engraven in Cufic characters, in the vicinity of the South Pole, runs thus:

صنعه الفقير الي الله تعالى محمد بن هلال المناجم الموصلية في سنة خعو هجرية

“Made by the most humble in the supreme God, Mohammed ben Helal, the astronomer of Mousul, in the year of the Hejra 674.”

This year answers to the year 1275 of the Christian era, and proves the globe to have been made in the same century in which both the Borgan globe and that at Dresden were constructed.

This globe has, besides the constellations then known, amounting to forty-seven, including the signs of the Zodiac, the other requisites of a celestial globe; the Zodiac, with the degrees marked on it; the ecliptic, &c.; and we find in their respective places on the circumference of the horizon, the words شرق east, غرب west, شمال north, جنوب south. But as the globe is accessible to every member of the Society, I think it unnecessary to dwell longer on its mere form, and shall therefore proceed to the constellations and their stars, which are to be found upon its surface.*

The Northern Constellations.

1. الدب الاصغر The Lesser, or Little Bear.

Ἄρκτος μικρὰ Arctos, Ursa Minor.

This constellation, according to Kazvini, consists of twelve stars; seven of which lie within, and five without the figure; and which together are

* The constellations of the northern hemisphere, as represented on this globe, are given in the accompanying plate A.; those of the southern hemisphere, in plate B.

called فاس الزحاح, the pivot of the mill; on this globe, however, there appear only eight. The seven stars lying within are called بنات نعش الصغرى, the lesser Benat-nash, or Daughters of the Bier; which name they bear on account of their being compared by the Arabs to mourning daughters, or females preceding a bier: the bier being formed by the four stars in the belly, and the daughters by the three in the tail of the animal. The star at the extremity of the tail, which is supposed to point out the direction of the Kebla, is called المجدي, the Kitten; in the vicinity of which there is a hole made in the globe, representing the north pole, which is denoted by the words adjoining, القطب الشمالي the north pole. Ebn Mahommed Sherif says, احدهما الذي في جانب بنات النعش قريبا من كوكب الجدي هو القطب الشمالي "One of the two stars which lies at the side of the Benat-nash, near the Kitten, is the north pole." The two bright stars in the bier β , γ , are called الفرقدین the two Calves, from الفرقد the calf. Hariri compares bright eyes to these two stars, see Makama 7: ثم فتح كريمته ورأى بتوامتيه فاذا سراجا : وجهه يتقدان كأنهما الفرقدان "He then opened his two noble (eyes) and looked about with his two twins, so that the two lights of his face sparkled, as though they were the two Calves."

2. الدب الأكبر The Greater Bear.

Ἄρκτος μεγάλη Arctos, Ursa Major.

The constellation of the Greater Bear was known in the remotest ages of antiquity, and is mentioned in the book of Job by the name of עֵפֶר, the Bear; the three stars in the tail being denominated בְּנֵיָהּ, its sons: see chap. ix. 9; and xxxviii. 32. This explanation of the word עֵפֶר is also confirmed by the learned Rabbin Aben Esra, who was deeply versed in astronomy, and interprets עֵפֶר by the more common noun דָּב, the bear. The following stars are pointed out by name on the globe: الظبا, the Ghazels, comprising those on the eyes, eyebrows, ears, and mouth; their young ones اولاد الظبا (which, on the Borgian globe, is written اولادها, the ghazels and their young) lying between the fore and hind feet, and amounting, according to Kazvini, to the number of six. Three other names of stars referring to ghazels, are القفزة الاولى, the first leap, on the right hind-foot; القفزة الثانية, the second leap, on the right fore-foot; and القفزة الثالثة, the third leap, on the left fore-foot. The four bright stars in the belly, making a square, are termed نعش, a bier. Tizini gives four

particular names for them, in conformity with their respective positions, namely: ظهر, the back, α ; مرق, the loins, β ; فخذ, the thigh, γ ; and مغرز, the rump, δ . In the shoulder we find the star called العوض, the Pond. At the commencement of the tail is the first bright star, denominated الجون Al-djoun, whence originated the word Alcor, in common use with our astronomers. The large star in the middle of the tail, is العناق, the Goat; and the little darker one close to it, السها Al-soha, the Forgotten, or Concealed. Hariri says: “وكم مشكلات حكين السها خفاء فصرن بكشفي شموسا” How often difficult things resemble the Soha in abstruseness, but become suns by my interpretation.” Makama, 32. The last star at the extremity of the tail is القايد Alcaid, the Governor, or Leader; which has passed into the Spanish language as Alcaide. These three stars are together called بنات نعش Benat-nash, the daughters of the Bier. Under the tail of the Bear, we may observe two stars, and with them their denomination ذنب الاسد, the tail of the Lion.

3. التنين (Hebr. תנין) The Dragon.

Δράκων Draco.

This constellation consists of thirty-one stars, but the globe furnishes only five names. The star in the tongue (μ) has been represented by the Arabs as resembling a person dancing, and is consequently called الراتص the dancer; which corresponds with the four stars in the head called, العوايد the players on lutes; for thus we read it, with Ulugh Beg and Sherif, in preference to الرافص which Ideler and Beigel believe to be more correct. In about the middle of the body we behold two stars (ζ, η) situated close to each other, and each of them marked with the name الذيب the wolf; another, at some distance from the last, towards the tail, is termed الذبيح the hyena.

4. قيفاوس Cepheus.

Κηφείος Cepheus.

The name of this asterism is written distinctly enough not to read قيقاوس Cekeus, as we sometimes find it spelt. The star in the breast (ξ) is called الفرجة the Fissure; that on the right foot الراعي the Shepherd; and that on the left كلب the Dog; making together كلب الراعي the Shepherd's Dog.

5. العوا The Crier.

Βούτης, Ἀγκτοφύλαξ, Bootes.

The Arabic denomination of this constellation, which comprises twenty-two stars within, and one without the figure, is evidently a mistranslation of the Greek word βούτης, which the Arabs seem to have mistaken for βοάτης the crier. The globe gives only two names; first, the name of the star in the left shin bone (ن) الرمح the Spear; and secondly, that between the thighs, السّمك الرامح Essimāk errāmih, the Ear with a spear (Arcturus), which has passed over into the Alphonsine tables in the words Ascimech aremeah. Chrysococces, in conformity with the Arabic denomination, calls the star Κονταράτος, from κόντος a javelin.

6. الفكة The Northern Crown.

Pers. درويشان كاسه Στέφανος βόρειος, Corona Borealis.

This asterism, which consists of seven stars within the figure, has the name of one only marked on the globe; namely, المنير الفكة the bright star of the Crown. Alcazvinī calls it النير من الفكة.

7. الجائي The kneeling (Hercules).

Ἐν γόνασιν, Geniculatus, Engonasin, &c.

The denomination الجائي has been applied to this asterism, on account of its representing a man kneeling: on the globe we find the star in the cheek called كلب الراعي the Shepherd's Dog; and near the left arm, extended across the breast, the words النسق الشامي the Syrian string.

8. السلباق The Lyre.

Χέλυσ, Lyra.

Of ten stars, of which, according to Kazvini, this constellation consists, I can only discover eight on the globe; of which the brightest bears the name النسر الواقع the falling Vulture; in Chrysococces, γύψ καθήμενος. I may observe that the word *wega* in the Alphonsine tables, which is often used by astronomers, is merely a corruption of the word الواقع El wāki, the falling.

9. الدجاجة The Hen (Swan).

ὄρνις, κύκνος, Ales, Volucris, Olor, Cygnus.

In this constellation we may number eighteen stars; although Kazvini says it comprises only seventeen perfect and two imperfect ones. The four stars in a straight line that cross the milky way ($\delta, \gamma, \epsilon, \xi,$) are denominated الفوارس the Horsemen; the word on the globe being engraven across the breast. The bright one in the tail which is next to the four Horsemen (α) is called الدف the Backrider, but it is more commonly designated ذنب الدجاجة the Tail of the Swan. This name, however, does not appear on the globe.

10. ذات الكرسي The Lady in her chair.

Κασσιόπεια, Cassiopeia.

The brightest star (β) of the thirteen that appear on the globe in this constellation, is denominated الكف المخصيب the Dyed Hand; in Chrysococces, Χείρ βεβαμμένη; the stars between the right leg and the left arm of Perseus are called معصم الشريا the arm of the Pleiades.

11. حامل رأس الغول The Bearer of Medusa's Head.

Περσεύς, Perseus.

The figure of this constellation represents a man standing upon the left foot, lifting up the right, stretching the right hand over his head, and holding in the left a monstrous head, called رأس الغول the head of the monster, or Medusa. To the star on the right side the name جنب برشاوش the side of Perseus, (in Chrysococces, Πλευρά Περσεύς,) has been assigned; and it appears thus on the globe.

12. ممسك الاعنة The Charioteer.

Ἡνίοχος, Auriga.

This constellation is situated between the Pleiades and the Great Bear, and comprises fourteen stars, of which the globe only specifies four by name; *viz.* the bright star on the left shoulder, العميق the Kitten, in Chrysococces Ἀΐον, Capella: that in the right shoulder, العنز the Goat; and that on the right knee, الجديان the two He-goats.

13. الحوّا The Charmer of Serpents.

Ὀφιῶχος, Angoifer, serpentarius;

with الحية the serpent; ὄφις, Anguis, Serpens.

The name of the star on the head of the human figure is الراعي the Shepherd; that of the star in the part of the serpent crossing the body of the man, النسق اليمني the Yemen or southern string. النسق الشامي the northern string, which, according to Kazvini, is contained in the same asterism, we find placed on the globe in the constellation of the kneeling Hercules; as it is also on the globe at Dresden.

14. السهم The Arrow.

Ὀϊστός, τόξον, Sagitta.

Turkish: اوتسن قلم (a bare, unfeathered arrow).

This constellation comprises five stars; but the globe is destitute of the Arabic denominations of the stars in this asterism.

15. النسر الطائر The flying Eagle.

Ἄετός, Aquila.

This constellation contains, according to Kazvini, nine perfect stars and six imperfect ones, and is properly called العقاب the Eagle. Three of its stars are termed النسر الطائر, which appellation is marked on the globe, without that mentioned by the Persian astronomer.

16. الدلفين The Dolphin.

Δελφίν, Delphinus.

It contains, according to Sherif, ten stars; four of which, in the middle of the constellation (α , β , γ , δ ,) are denominated المعود; which word, however, I conceive to be mistaken by the engraver for العقود the Knots; which both Alcazini and Sherif give as the name of these stars.

17. قطعة الفرس Part of the Horse (the Horse's head).

Προτομή, Sectio equi.

The Arabic name of this asterism is a literal translation of the Greek word Προτομή, which denotes that part of the body in animals, for which, in men, the word Πρόσωπον, the face, is used. No names of the stars that compose this constellation appear on the globe.

18. الفرس الأعظم The greater Horse.

ἵππος, Πήγασος, Equus, Pegasus.

This constellation, according to Sherif, comprises twenty stars, of which six are pointed out by name on the globe. The pair in the neck are called سعد الهمام the beneficent star of the Hero : the two in the heart (λ, μ,) سعد البارع the beneficent star of the brave Man ; and those in the right knee (η, θ,) سعد مطر the beneficent star of Rain. Further on, in the body, we meet with the word العرب the Rope of a Bucket, applied to the two stars in the body (τ, υ); the pair (α, β,) that lies over them, is called الفرغ المتقدم the first aperture of the Bucket, in opposition to الفرغ المؤخر the second aperture ; which we read across the body where it ends.

19. السلسلة The Chain ; but probably mis-written for

المسلسلة The chained Lady ; Andromeda.

This asterism, according to Kazvini, contains twenty-three stars, besides a bright one that is common to it and the navel of the horse ; on the globe I could only discover twenty. One star in the waist (β) is called بطن السمكة the Belly of the Fish, which Ulugh Beg calls جنب المسلسلة the side of the Chained Lady. The star of the third magnitude (γ) in the foot, which Ulugh Beg denominates رجل المسلسلة the foot of the Chained Lady, is termed on our globe عناق الارض, literally the Earth-goat, a species of lynx, called in Persian ميهه كوش.

20. المثلث The Triangle.

Τρίγωνον, δελτωτόν, Triangulum.

It consists of four stars : the name of the star at the top of the figure is so indistinctly written that I am not able to decypher it. Ulugh Beg, Tizini, Kazvini, and Sherif, call it رأس المثلث the point of the Triangle.

The Signs of the Zodiac.

The Zodiac was known to the Arabs under the name of منطقة البروج the Girdle of the Castles : the word البرج, of which البروج is the plural, being derived from the Greek Πύργος, a castle, and originally denoting a tower ; as though the twelve compartments of the Zodiac were twelve castles, in which the celestial signs were placed.

21. الحمل The Ram.

Κριός, Aries.

The pair of stars ($\beta \gamma$) on the horn, is called الشَّطِينِ the Marks; those in the tail ($\epsilon \delta$), with the one on the left leg ($\epsilon \rho$), forming an equilateral triangle, bear the name of البَطْنِ the Little Belly; which is also the name of the second mansion of the moon. Sherif says: الحمل كواكب ثلاثة عشر والخارج خمسة من كواكبه “The Ram has thirteen stars, and five imperfect ones; amongst the former are the two Marks and the Little Belly.”

22. الثور The Bull.

Ταῦρος, Bos, Taurus.

This constellation, according to Kazvini, is composed of thirty-two stars. The large and reddish star in the southern eye is denominated دبران Debran, but more commonly written with the article, الدبران Al debran; which name, in Ulugh Beg and Tizini, denotes the Hyades. The group of stars between the shoulders are the ثريا, the Pleiades; which word also has commonly the article ال *al* prefixed. This constellation, the Pleiades, was known to the author of the book of Job; who says, chap. xxxviii, v. 31: הַתְּקִינָה בְּיָמֶיהָ, “Canst thou fasten the bands of the Pleiades?” Ebn Mohammed Sherif has the following remark: واشهر الكواكب عند الأكثر الثريا المسمي بالاجم خمسة كواكب متقاربة علي هيئة عنقود العنب علي سنام الثور وقيل ستة وقيل سبعة “The constellation most known to almost every one is the Pleiades, called also *the star*. It consists of five stars which lie near to each other, in the form of a bunch of grapes, resting upon the Bull's back; but, according to some, it contains six or seven stars.”

Ovid says, (Fast. iv, 70).

“Pleiades * * * * *
Quæ septem dici, sex tamen esse solent.”

23. الجوزا The Twins.

Δίδυμοι, Gemini.

Kazvini numbers eighteen perfect stars and seven imperfect ones as belonging to the Twins. The name of the two bright ones in the head of the Twins

is الذراع the Arm ; that of the pair in the foot of the second Twin السعة , which probably is to be read الهنعة , a mark burnt in on the Camel's neck.

24. السرطان Cancer, the Crab.

Καρκίνος, Cancer.

We find on the globe only one star pointed out by name in this constellation, viz. النشرة the Manger, φάτνη ; which is also applied to the eighth mansion of the moon.

25. الأسد The Lion.

Λέων, Leo.

The Lion consists, according to Kazvini, of twenty-seven perfect, and eight imperfect stars. On the head there is an inscription which I am unable to decypher. The four stars in the neck and the heart are denominated الجبهة the Forehead ; which also designates the tenth mansion of the moon. One of these stars is distinguished by the particular name of قلب الأسد Kalb-el-Asad, the Lion's heart, whence the term Kalbeled in the astronomical tables is derived. It occurs also under the name of Regulus, the little king, as Aratus has used the word instead of the other name ; and Ulugh Beg has rendered it ملكي the Royal (star). The pair of stars on the loins and thigh are known by the name of الزبرة the hair of the Lion's mane ; being also the name of the eleventh mansion of the moon. The name of the star at the extremity of the tail on the globe is الصرفة the Change ; inasmuch as, according to Kazvini, the change of weather depends on its setting or rising at different times.

26. السنبلة The Ear (the Virgin).

Παρθένος, Virgo.

In this sign we find the names of three stars on the globe. The group of stars at the extremity of the left shoulder, which serves also to designate the thirteenth mansion of the moon, is known under the general appellation of العوا the Barker. The bright star in the vicinity of the hand is السماك الأعزل the unarmed Spearman, called by Chrysococces μικρός κονταράτος ; and that situated near the left foot is الغفرة the Covering or Carpet ; to which denomination the Greek word σίγμα (the training-gown) has given rise.

27. الميزان The Balance.

Ζυγός, Libra.

None of the stars of this sign have been considered worthy of being pointed out by name. One however, situated near it, but properly belonging to the Scorpion, is termed الزبانيين Al-zubenén, the Claws; whence the word Azubenén has been derived, or rather corrupted.

28. العقرب The Scorpion.

Σκορπίος, Scorpius.

The Scorpion contains, according to Alcazvini, twenty-one perfect and three imperfect stars. The three stars in the forehead (β , δ , π), to which Ulugh Beg adds a fourth (ν), and supposed to form the crown of the Scorpion, are called الاكليل the Crown, and indicate also the seventeenth mansion of the moon. The large bright star in the body is called the Scorpion's heart, قلب العقرب, Καρδία Σκορπίου; and the pair near the extremity of the tail (λ ν) الشولة the point or sting of the Scorpion's tail. Upon this constellation, Ebn Mahommed makes the following remark: *وصورة العقرب معلوم للاكثر معروف*: ويكون عند مغرز ذنب كوكب نيراحمر من القدر الثاني هو قلب العقرب من منازل القمر "The constellation of the Scorpion is known to every one; on the buttock there is a bright reddish star of the second magnitude, which is the Scorpion's heart, and one of the mansions of the moon."

29. القوس The Bow (the Archer).

Τοξότης, Sagittarius, Arcitenens.

This sign numbers thirty-one stars, which are included within the confines of the figure. Eight stars in its head, denoting also the twentieth mansion of the moon, are known under the name of النعائم the Camels going to pasture. The stars in the left shin-bone and the thigh (α , β), to each of which the Borgian globe gives a particular name, *viz.* ركبه the Knee, and عرقوب the Tendon, are comprehended on our globe under the appellation عرقوب الرامي the Archer's Tendon. The word البلدة, which is to be read at the extremity of the band of the Archer's cap, denotes, according to Kazvini, a spot in the heavens where there is an obscure star, not easy to be observed, and surrounded by six small dull stars, called القلايد the Strings of Pearl. It

is also the term used to signify the twenty-first mansion of the moon. This spot is, according to Ebn Mohammed Sheríf, called also المغارة the Desert, and الفرجة the Fissure.

30. الجدي Capricorn.

Αἰγόκερος, Aigoceros, Capricornus.

The twenty-eight stars composing this sign lie all within the compass of the figure. The two stars on the eastern horn (α, β) bear the name of سعد الذابح the beneficent star of the Butcher; thus denominated from a small star close to it, which the Arabs consider as a sheep to be slain.

31. الدلو The Ewer (Waterbearer).

Ἰδρὸχόος, Aquarius.

In this sign we find three names on the globe. The three stars on the left hand are called سعد بلع the beneficent star of the Devourer; the pair of stars in the left shoulder (β, ξ) together with that in the tail of Capricorn, denoting the twenty-fourth mansion of the moon سعد السعد the beneficent star of Fortune; and the one in the upper part of the right arm, together with the three in the right hand, سعد الاخبية the beneficent star of the Concealed; so called, according to Kazvini, because, on their rising, the worms that were concealed in the earth during the cold season creep out of their holes. This explanation, however, does not appear very satisfactory; and it is much more probable, that الاخبية is the plural of the word خباء signifying a tent made of wool or camel's hair, and supported by three poles; which denomination is exceedingly appropriate to the stars in question, as they form an equilateral triangle with one star in the centre, thus affording the appearance of a tent. See Ideler, p. 199.

32. السمك The Fish.

Ἰχθύες, Pisces.

As no star of this sign is named on the Globe, I shall merely insert here what Ebn Mohammed Sheríf says respecting it: والسمك ويقال له السمكتين كواكبه: "The Fish, or the Fishes, embrace thirty-four perfect and four imperfect stars."

The Southern Constellations.

33. كيتس Ketos, The Whale.

Κῆτος, Cetus.

The Arabic name of this constellation, which comprises twenty-two stars, is evidently derived from the Greek κῆτος; our globe furnishes the names of three stars only. To those in the head the name الكف المجذما 'the Maimed Hand' has been assigned, because, according to Kazvini, they cover a smaller space than the Dyed Hand in Cassiopea. The five stars in the belly are called التعامات the Ostriches; and the star in the southern part of the tail الثاني الصغد the second Frog, in opposition to the first Frog in the sign of the Water Carrier.

34. الجبار The Giant.

Orion.

Of the thirty-eight stars composing this constellation, six only are named on the globe. The three stars in the face are denominated البقعة the White Speck on the Horse's foot; they form also the fifth mansion of the moon. The large and bright star on the left shoulder is called المنكب the Shoulder, "Ωμος δίδυμων; that on the right shoulder, المرزم the Lion (?); and the large and bright one on the left foot رجل الجوزا *Rigel-ul-joza*, the Giant's Foot; which has given rise to the denomination of that star, common among European astronomers, Rigel.

35. النهر The River.

Ποταμός, Amnis, Eridanus.

It is formed by thirty-four stars. Its extremity is called اخر النهر the End of the River, "Εσχρατος τῆ ποταμῆ; which has been corrupted into Acarnar, and passed over into our astronomical tables.

36. الأرنب The Hare.

Λαγώς, Lepus.

This constellation contains twelve stars, according to Kazvini; of which the four in the belly and the two in the hind feet (α, β, γ, δ) are called كرسى الجوزا the Throne of the Giant.

37. الكلب الأكبر The Greater Dog.

Ἀστροκύνων, Canis.

It has obtained its name, according to Kazvini, on account of its following after the Constellation of the Giant like a dog. One large bright star in the mouth bears the name of اليمنية the Star of Yemen, in consequence of its setting in the direction of this country. Chrysococces renders the Arabic word into Σιαὴρ ἰαμανή, in conformity with another and more common name الشعري Sirius; which seems to have been sacred to the Egyptian goddess Isis, from an inscription copied by Diodorus from a column, in which she says of herself: Εἶμι ἐν τῇ ἀστρῷ τῇ κυνὶ ἐπιτέλλασα, "I rise in the constellation of the Dog." Four stars, one of which is situated in the shoulder, another in the tail, and the other two (δ, ε) between the tail and the thigh, bear the common name of العذاري the Virgins; which word, on the globe, is engraved across the belly of the animal. The star in the left shoulder is called المرزم. Under the figure, there are six single stars denominated الفرد the Solitary.

38. الكلب The Dog.

Πρόκυων, Procyon.

This constellation has only two stars belonging to its figure. The brighter one is called الشعري الشامية or الشامية (which latter is on the globe) the Syrian Star, thus denominated on account of its setting in the direction of Syria. The star on the shoulder is known by the name المرزم.

39. السفينة The Ship.

Ἀργὼ, Argo, Navis.

It numbers forty-five stars. The bright and large star on the southern oar is called سجيل, Κάνωβος, Canopus.

40. الشجاع The Hydra.

Ἵδρη, Hydra, Anguis.

In this constellation we find three stars only named on the globe: الفرد, the Solitary, is the name of the star situated at some distance under the head of the animal; and عنق الشجاع, the Hydra's Neck, that of the one in the neck near the first convolution of the body, as in Ulugh Beg. Near the constellation of

the Censer we read the word *الشرايف*, the Ribs, evidently applied to several stars, as we are entitled to infer from its position.

41. *الباطية* The Flaggon.

Κράτης, Crater, Urna.

This constellation comprises seven stars, but exhibits the name of none on the globe.

42. *الغراب* The Crow.

Κόραξ, Corvus.

It numbers seven stars ; two of them, the one lying in the body, the other in the foot, are called *عرش السماك* the Throne of the Simak.

43. *قنطورس* The Centaur.

Κένταυρος, Centaurus.

This constellation, consisting of thirty-seven stars, exhibits but two names on the globe. The pair of stars, one of which lies in the right foot and the other in the left, are together called *حضار والوزن* and also *مختلفين*, which, however, does not appear on the globe.

44. *السبع* The Beast.

Θηρίον, Fera.

This contains nineteen stars, some of which are common both to it and to the Centaur, who holds the fore-foot of the Beast in his hand. The stars of the two constellations united are called *الشماريخ* the Branches or Clusters of Dates, on account of their numbers, and being crowded together.

45. *المجرة* The Censer.

Θυτήριον, *Θυματήριον*, Thuribulum.

It embraces seven stars, but none of them are named on the globe.

46. *الأكليل* The (Southern) Crown.

Στέφανος νότιος, *Οὐρανίσκος*, Cælulum.

Of the thirteen stars forming this constellation, none are named on the globe.

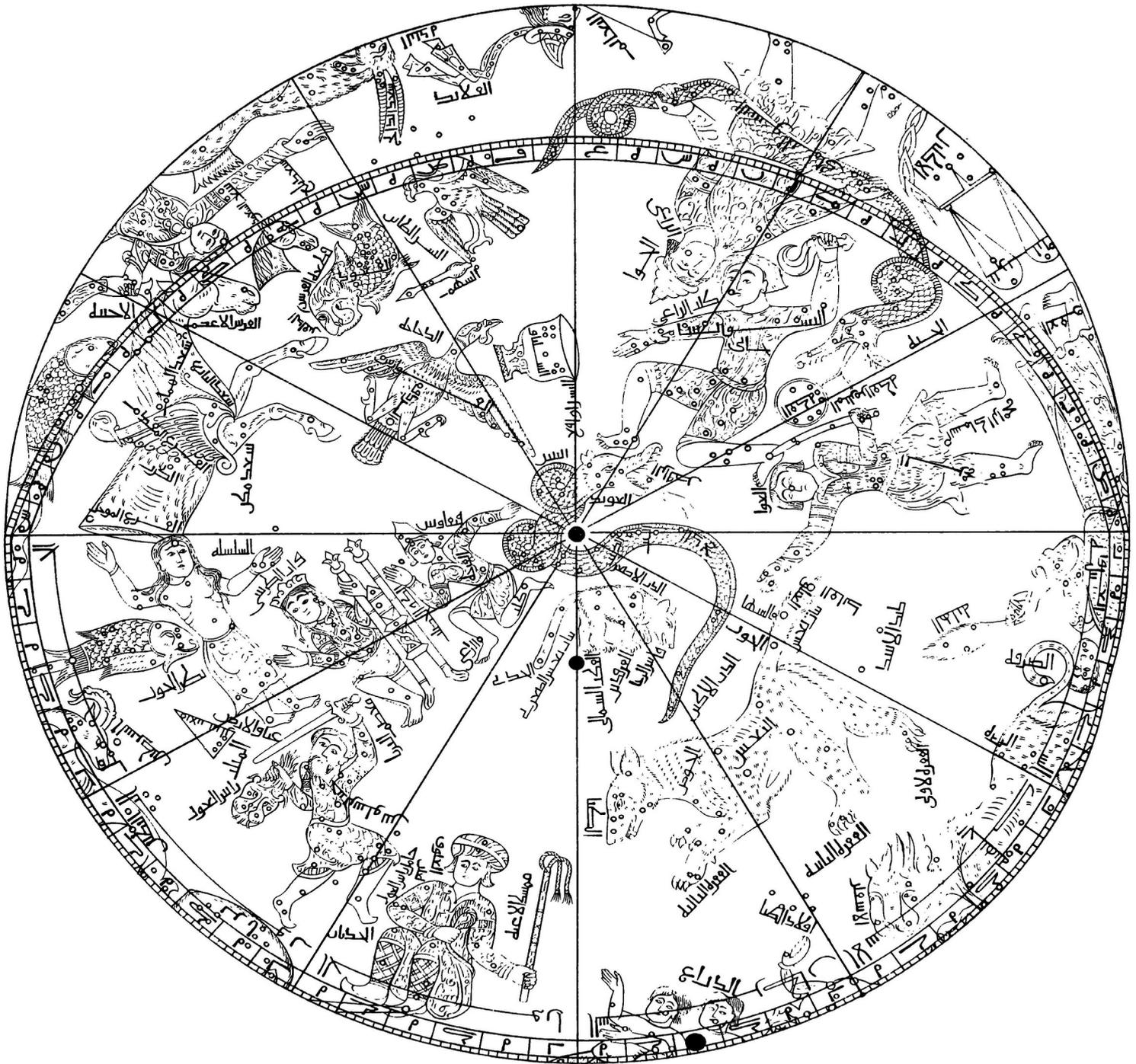
47. السموت الجنوبي The Southern Fish.

Ἰχθὺς νότιος, *Piscis australis*.

It comprises eleven stars, lying south of the Water Carrier. The large bright star in the mouth, which Kazvini calls *فم السموت* the Mouth of the Fish, is on the globe denominated *الظليم* the Ostrich.

Note.—It is expected that Sir John Malcolm will soon communicate to the Royal Asiatic Society the history of this Globe, from the time of its construction to its coming into his possession.

Northern Hemisphere



AN ANCIENT ARABIC SPHERE

