

A PALAEOOLITHIC PLANETARIUM UNDERGROUND - THE CAVE OF LASCAUX (PART 1)

by

Dr. Michael A. Rappenglück M.A.

Summary

The cave of Lascaux (near Montignac, Dép. Dordogne, France) seems to be an important expression of the cosmovisions of Palaeolithic man, approximately 17,000 years ago. In two contributions for this journal I present a short overview about the main results of my research work concerning some striking rock picture panels in this grotto. Both articles are based on a special so-called “integral methodology”, which includes ways and results from several natural sciences and humanities, like archaeology, astronomy, ethnology, cartography, mythology, photogrammetry, scientific study of religion, semiotic and symbolism. In this first part some rock paintings in the “Hall of Bulls”, the “Axial Diverticle”, and the “Ship” are studied in detail. The scientific analysis indicates that the rock pictures among other things show seasonality and are related to certain celestial phenomena. In one case a composition of paintings in the “Axial Diverticle” points to the representation of the course of the moon related to important time of the animals seasons. In a second case the representation of an aurochs with a cluster of six spots floating above his back, to be found in the “Hall of Bulls”, may illustrate the Pleiades in a constellation, which is similar to the well-known Bull of our today’s sky. It is suggested that the people of Lascaux noticed a special star phase of this open cluster – the heliacal setting around the autumnal equinox – and fixed this special time in the year by a rock painting on the walls. This scientific result is further substantiated by traditions referring to the Pleiades, which are handed down by ancient people throughout the world.

EACH YEAR, during the high season in summer, every day, crowds of visitors are fascinated by the masterpieces of Palaeolithic art in the artificial grotto of Lascaux II. This excellent 3D-copy of the famous Lascaux cave – now often called Lascaux I – is located only 200 m away, a little bit downwards the hill, which is situated to the southeast of the small village of Montignac, Dép. Dordogne, France (ϕ : 45 °3'17 " N | λ : 1°10'44 " ; alt. 185 m MSL [Lascaux I]).

Sine the discovery of the cave in 1940 thousand of tourists a week visited the underground galleries: The great number of people caused a lasting perturbation of the special climate in the cave, which normally is marked by a susceptible balance of air humidity, temperature and air exchange. Algae and micro-organisms occupied the rock faces and strongly harmed the rock pictures so much, that an irreparable, complete destruction of the whole ensemble was feared. To ensure the protection of the masterpieces in 1963 the original cave was closed for the general public. Since 1983 an enormous concrete construction, which had been built in a former stone quarry, rescues the impressive facsimile, now called Lascaux II. Primarily the "Hall of the Bulls" and the "Axial Diverticle", which contain a majority of the paintings were copied, while other parts, including a big number of engravings are still waiting for a replica. Some few other facsimiles of the cave are exhibited in the Centre d'Art Préhistorique du Thot, close to Montignac: The "Frieze of the Swimming Stags", the "Crossed Bison" and the famous "Scene of the Dead Man". Although only a third (ca 35 m) of the galleries of Lascaux had been reproduced, Lascaux II is also able to become a profound and lasting experience for everyone. Who once has an opportunity to travel to the Valley of the Vézère, should not fail to visit Lascaux II and the museum in Le Thot: There one can get one's own impression whether the interpretations of some rock pictures, which I present in this

study, sound plausibly.

The paintings and engravings in Lascaux remained enigmatic to this day, although there had been presented many more or less speculative interpretations. Since 1984 I have intensely studied the rock pictures in this grotto. During this research work I visited many other European places with parietal and mobile artwork dating from Palaeolithic epochs. The investigations indicated traces of a kind of proto-science (in particular mathematics, astronomy, cartography a. o.) hidden in an artistic representation, which uses certain pictograms, mythograms and ideograms. In the case of Lascaux I the results of the research moved me to call the cave a kind of a Palaeolithic planetarium. It shows an example of a world view, based on shamanistic and totemistic concepts, which people of those days, ca 17,000 years ago, had illustrated on the rock walls underground. This study summarizes very briefly some important findings of my research work, published elsewhere¹, and add a few further ideas.

FROM A POSITION at the height (216 m MSL), ca 30 m above the original cave of Lascaux, you have a quite good panorama of the charming valley of the Vézère. The surrounding hills form a natural horizon rising about 1-2 ° altitude (ill. 1). Even today the height still is a very good place for astronomical observations, although woods are covering some of the area and new buildings prevent one from having a complete panorama. Also the artificial lighting of houses and streets brightens up the sky. But at the time of the Lascaux rock pictures there was a much better view, because of the half-high vegetation, no artificial constructions and of course no artificial lighting. It would be really surprising, if in the course of a year the deep impressions of clear nights with a beautiful starry sky and the different celestial phenomena hadn't been embodied somehow



Ill.1: The landscape seen from top of the hill of Lascaux to the northeast.

Photo: Michael Rappenglück, 2000.

in the cosmographic concepts of the Lascaux people. Then one would expect to discover something „astronomical“ in the rock art of that cave. Indeed, there are strong proves for that assumption. At first sight walking through the cave one can discover rock pictures, which indicate certain seasons of the animals.

Seasons of the animals

ROCK PICTURES at several places in the cave show special seasons in the course of the year. The two “crossed” bison (no. 65; ill. 2 a) in an area of the cave, called the “Ship”,

indicate the change from winter to spring time, because one of them is painted still in his winter fur, while the other however loose his thicker hair showing the brighter summer clothing. Shortly after the entrance into the “Axial Diverticle” at the southern rock face a belling stag during his rut (no. 46; ill. 2 b) is shown. This season of the animal (*Cervus elaphus*) occurs usual in September/October around the autumn equinox.ⁱⁱ The pregnant mare depicted next to is heavily in-foal. This indicates a time between late spring and early summer (late May to mid July), hardly later, because nature prevents foaling in the middle of the winter, when the conditions to feed up



Ill.2: Depicted seasonality in the cave of Lascaux.

Graphic: Michael Rappenglück based on Photos from Bahn and Vertut, 1997: 67-68 and Bataille, 1996: 122, 141.





a young one are bad. Walking only a small distance deeper into this gallery one can find two heraldic paired ibex, confronting each other (no. 36, 37; ill. 2 c). Between them appears a kind of an abstract geometrical sign – a lattice (ill. 2 c). As in the case of the heraldic paired bison in the “Ship”, one ibex (*Capra ibex*) shows a dark, the other a bright hair cloth, remembering the fur of the animal during winter and summer.ⁱⁱⁱ There are more hints on seasons of the animals: Regarding the antlers of the stags, these animals were depicted in a period reaching from high summer to the start of next spring.^{iv} The horses show either their hair clothing of summer or of winter.^v All that makes clear that the representation of seasonality, in particular around the equinoxes or solstices, was an important part of the mental plan of Lascaux.

But there is much more to find that supports the hypothesis of astronomical relevant depictions in that cave. The first example for that idea can be discovered in the “Hall of the Bulls”, next to the entrance into the cave: There a group of six spots (ill. 3 a) floating above the back of the largest aurochs (ill. 3 a) looks very like the open cluster of the Pleiades (M 45) in the today's constellation of the bull (Taurus, Tau: ill. 3 b).

The aurochs with the six spots^{vi}

The aurochs, with a length of 5.5 m and a contour of 20 m, is the largest picture in the whole collection of cave drawings in Lascaux. It is situated almost entirely on the ceiling above a rock projection exactly in the south of the hall, between the junction of the “Axial Diverticle” and the “Passage”. The painting is almost entirely preserved, except for quite a large area around the animals neck: There a part of the rock has come off. Above the aurochs back a strange figure, a cluster of six floating points can be seen (ill. 3 a, 4 f). The distribution of the spots does not seem to be haphazard, having instead a

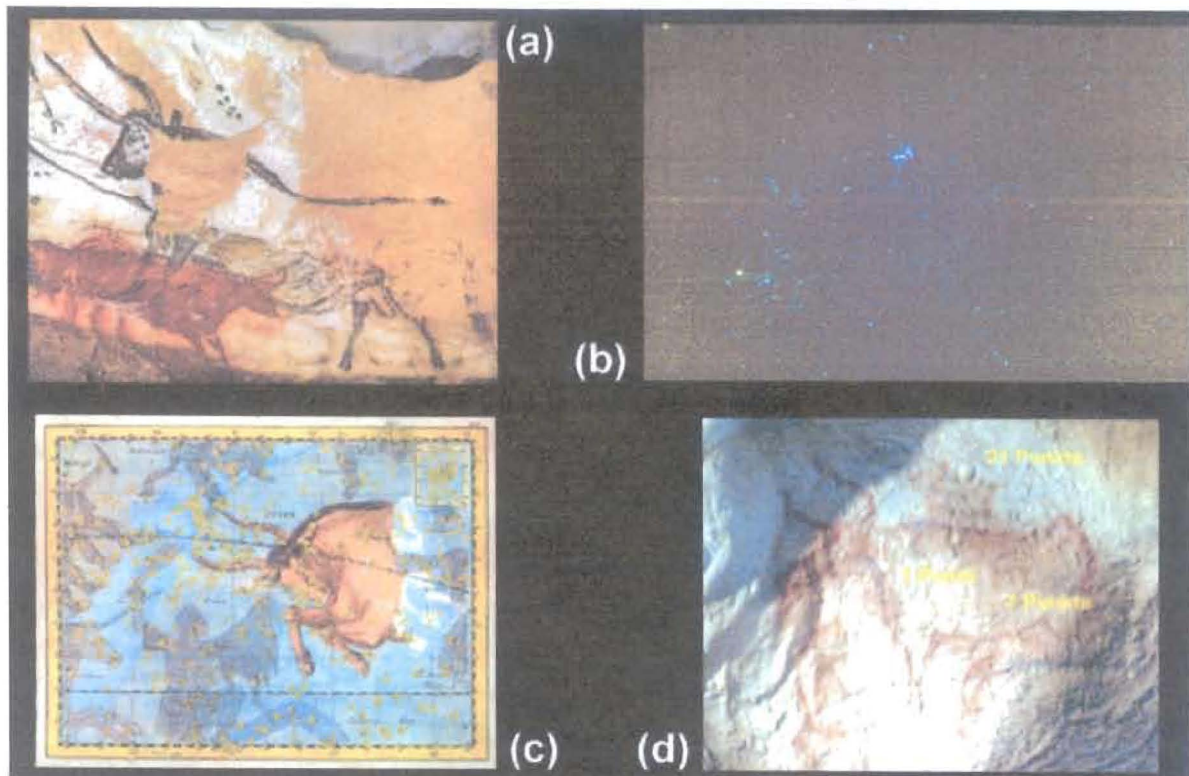
clear structure, which is more or less suggestive of a natural object. Anyone who is familiar with the night sky is immediately reminded of a very well known open cluster of stars, which have observed since ancient times: the Pleiades (M 45 / NGC 1432; 1.5^m; ill. 4 a).

THE PLEIADES certainly had been one of the first constellations, which excited the interest of the earliest star gazers enough for them to figure prominently symbols, myths, rituals and works of art of many cultures.^{vii} All over the world people have observed this magical cluster of twinkling stars.

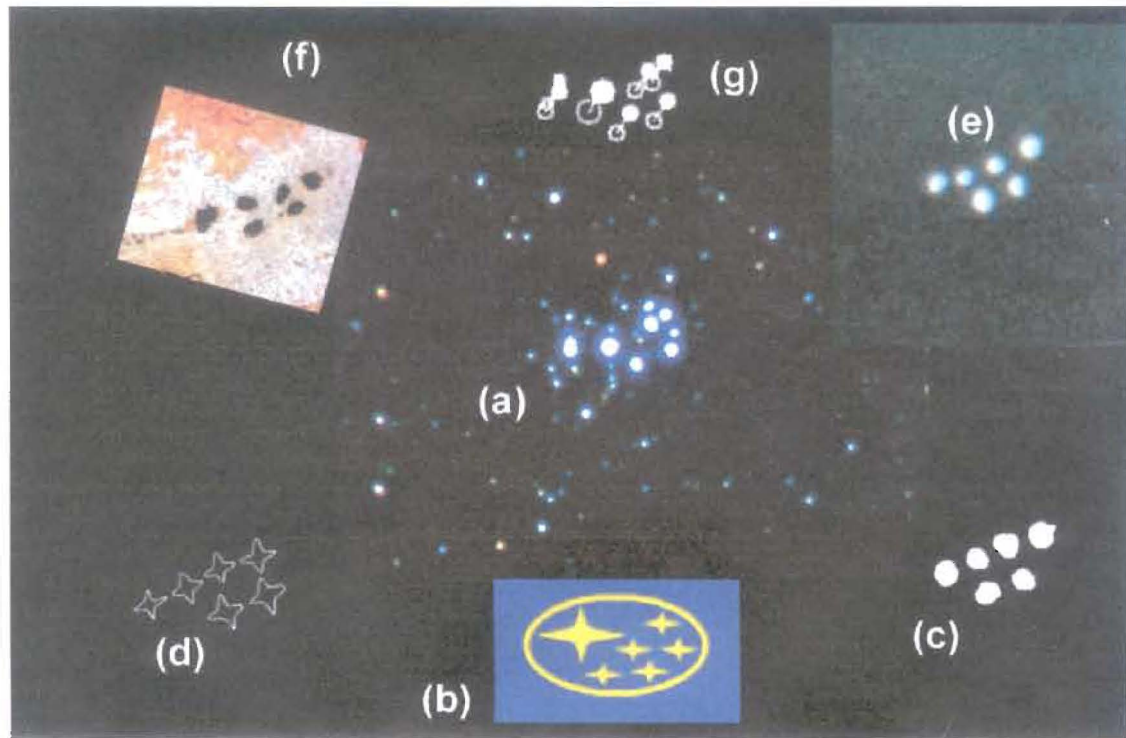
Nonetheless, the ancient people and even some of those living today see different numbers of stars. Mostly they observed seven^{viii}, with reference to the unaided eye and normal conditions, that is a clear sky and a good vision at night. But they also counted six^{ix} and up to sixteen^x.

For the bare eye actually only six stars are to be seen without any difficulties under average sight conditions: η Tau (Alcyone; 2.9^m), 27 Tau (Atlas; 3.6^m), 17 Tau (Electra; 3.7^m), 20 Tau (Maia; 3.9^m), 23 Tau (Merope; 4.2^m), 19 Tau (Taygete; 4.3^m). The apparent brightness of 28 Tau (Pleione; 4.8-5.5^mv) varies about 0.7^m. So, depending on the given weather conditions and the individual power of vision, this star during his maximal phase of brightness can be seen surely well. Being his minimal one, however, he can be watched only with some efforts. Then seven Pleiades form the cluster. Almost on the limit of visibility (assumed to be around 6.0^m) are 16 Tau (Celaeno; 5.6^m) and 21 Tau (Asterope; 5.8^m). If these both are observed under very good sight conditions, the number of the Pleiades rises up from six/seven to nine.

MANY PEOPLE worldwide, e.g. the ancient Greeks, the Cherokee, the Onodaga Iroquois, the Japanese, the Mongols, and also the Aborigines in Australia, handed down some particular astral myths concerning the Pleiades.^{xi} They strictly tell about the loss of



III.3 (a): Six dots above the aurochs no. 18 in the “Hall of Bulls“, cave of Lascaux (France) after Bataille, 1986: 47, (b) Constellation of the Bull (Taurus; Tau) and the Pleiads (M 45), photo: Michael Rappenglück, 2002, (c): Constellation of the Bull and the Pleiads (M 45), copperplate engraving XIV in Bode, 1782, (d): Seven dots and another one on the body of an aurochs, 21 points in a double-bent row above the animal, photo of a replica in the Solutré Prehistoric Museum, Solutre-Pouilly, Burgundy, France made by Michael Rappenglück, 2003.



Ill.4: Pleiades (M 45) – (a): Photo of the open cluster at the sky, made by Michael Rappenglück, 2002, (b): The Trademark of the car producer Subaru (after Krupp, 1991: 7), (c): A depiction on a tent of the Navajo (Rappenglück, 1996: 219), (d): A depiction on a Hopi kiva (Miller, 1997; 185, fig. 10.9 b), (e): A depiction on a Chuckchi shaman's map (Rappenglück, 2001: 397, fig. 3 d), (f): The depiction in the „Hall of Bulls“, cave of Lascaux (Bateille, 1986: 47).

a star in this cluster, which changed the number of the set from seven to six.^{xii} Still today the Japanese automobile producer Subaru (in Japanese „the Pleiades“), following ancient traditions, shows in his maker's emblem (ill. 4 b) the six stars, arranged according to the natural outlook of the cluster for the bare eye.^{xiii} There exist some older representations of the six Pleiades, which resemble amazingly the rock picture in the cave of Lascaux: One (ill. 4 c) was painted on a Navajo-Tipi (North America), a second (ill. 4 d) was found at a Hopi Kiva (North America), and a third (ill. 4 e) was depicted on a Chukchi (Asia) cosmographical map. Despite their separation by space and time they all had been designed to visualize the natural appearance of the six brightest stars in this famous cluster.^{xiv} The same objective seems to be the case regarding the Lascaux rock painting.

The aurochs: today's constellation Taurus and the open cluster of the Hyades

THE TODAY'S representation of this area of the starry sky still show the constellation of a bull (Taurus: Tau) beneath the Pleiades or including them (ill. 3 b). An association of the Pleiades with a celestial bovine isn't common worldwide^{xv}. But since antiquity it occurs in Mesopotamian cultures as the precursor of the today's constellation Taurus. The ancient Babylonians for example recognized a heavenly bull in that area of the sky (Sumerian: GUD.AN.NA [=GU₄.AN.NA], GUD.AN)^{xvi} with the Pleiades (Sumerian: MUL.MUL, MUL2.MUL2, MUL, MUL2; Accadian: *zappu*)^{xvii} forming a bristle at the back of the animals neck. According to the given written sources this concept is at least about 3700 years old.^{xviii} Later in time similar concepts of the bull with the Pleiades are handed down mostly by people from the Mediterranean area to the Indian subcontinent.^{xix} Depending on the culture and the epoch the depiction

varies slightly: The Pleiades can be situated on the head, above the shoulder or over the backbone of the bull.^{xx} There also exist different depictions of the beast – attacking, standing, crouching. It is strange that the younger iconography present the bull mostly cut in a half^{xxi}, while the older one shows a complete animal.^{xxii} The mutilation of the bull, for which the reason isn't quite clear, must have happened some time in antiquity.^{xxiii} The rock picture of the aurochs and the six spots in the cave of Lascaux resembles stylistically very much this iconography of the Taurus-Pleiades-association, in particular the older versions, which have a complete animal instead of a half.

In addition some the representations handed down by the Greco-Roman culture show the constellation of the Bull as an animal ready to attack, e.g. at the celestial sphere of Atlas Farnese, made between 100 and 150 AD, and now stored in the National Museum, Naples (Italy) or at a celestial globe, which is kept in the Roman-Germanic-Central-Museum, Mainz (Germany) dated to 150-220 AD.^{xxiv} This also fits very well to the gesture of the aurochs no. 18 in the „Hall of Bulls“ of the Lascaux grotto.

There are further similarities comparing the rock picture and the delivered iconography of the Bull constellation. Five spots of medium size and seven or more smaller one are speckled in a pattern over the face of the aurochs no. 18 (ill. 3 a). A further large dot with a half bow drawn across it indicate the eye with the brow. If the hypothesis is right that the first set of spots floating above the animals back represent the Pleiades, then one can presume that the second one indicates the other open cluster in Taurus, the Hyades, distributed around the main star of the constellation, Aldebaran.

DEPENDING on the seeing and the vision at night of the unaided eye some ancient skywatchers counted 2 up to 4, mostly however, 5 to 6 stars, which all have the

apparent brightness of from $3^m.4$ to $4^m.3$ ^{xxv}. Sometimes they added Aldebaran (α Tau; $0^m.9$) so that the number rose up to seven.^{xxvi} In the above mentioned culture area it was a frequently concept that the Hyades together with Aldebaran model the head of the celestial bull resembling the letter „v. In particular this star cluster was thought to give the face of the animal a characteristic speckled pattern.^{xxvii} The Babylonians for example called the Hyades *li-e* (= g^s li-e) „jawbone of the bull“.^{xxviii} Probably since 4,000 BC Aldebaran, shining in a strikingly bright red colour, was recognized as one eye of a celestial bovine, which is seen from the side.^{xxix}

IN ADDITION it is very interesting that depictions comparable to the spotted face of the aurochs no. 18 are found in Çatal Hüyük (Çumra, Turkey, Anatolia; ϕ : $37^\circ 39' N$ | λ : $32^\circ 49' E$, 1,000 m MSL).^{xxx} There in the sanctuary VI B 8, dating 7,079-6,110 cal BC ($95.4\% / 2\sigma$)^{xxxi} several sculptured bull heads (bucrania) show similar patterns painted on their faces (ill. 5 a). They consist of 7 up to 15 dark coloured lozenges, each of them contains a white circle in the centre. The impression is very like a set of „stars“. The bulls faces also show „combs“ or „rakes“, which in rock art often indicate an association to rain.^{xxxii} They may represent the Hyades open star cluster, which is thought to be an heavenly time signal for the rainy season as handed down by many people worldwide since several thousands of years.^{xxxiii} Such an idea is supported by the fact that the three bovine heads are fixed on the wall directly over a peculiar mural (ill. 5 b). This is hypothesized to be a lunar calendar related to stellar signifiers like the Bull (Aldebaran, Pleiades), the Ram (Hamal), the Twins (Castor and Pollux) and also referring to the life-cycle of bees and the agricultural period of barley around the spring equinox 7,000 BC.^{xxxiv} One may speculate, that there once existed similar concepts concerning the Bull, Hyades and Pleiades, based on a hunter-gatherer

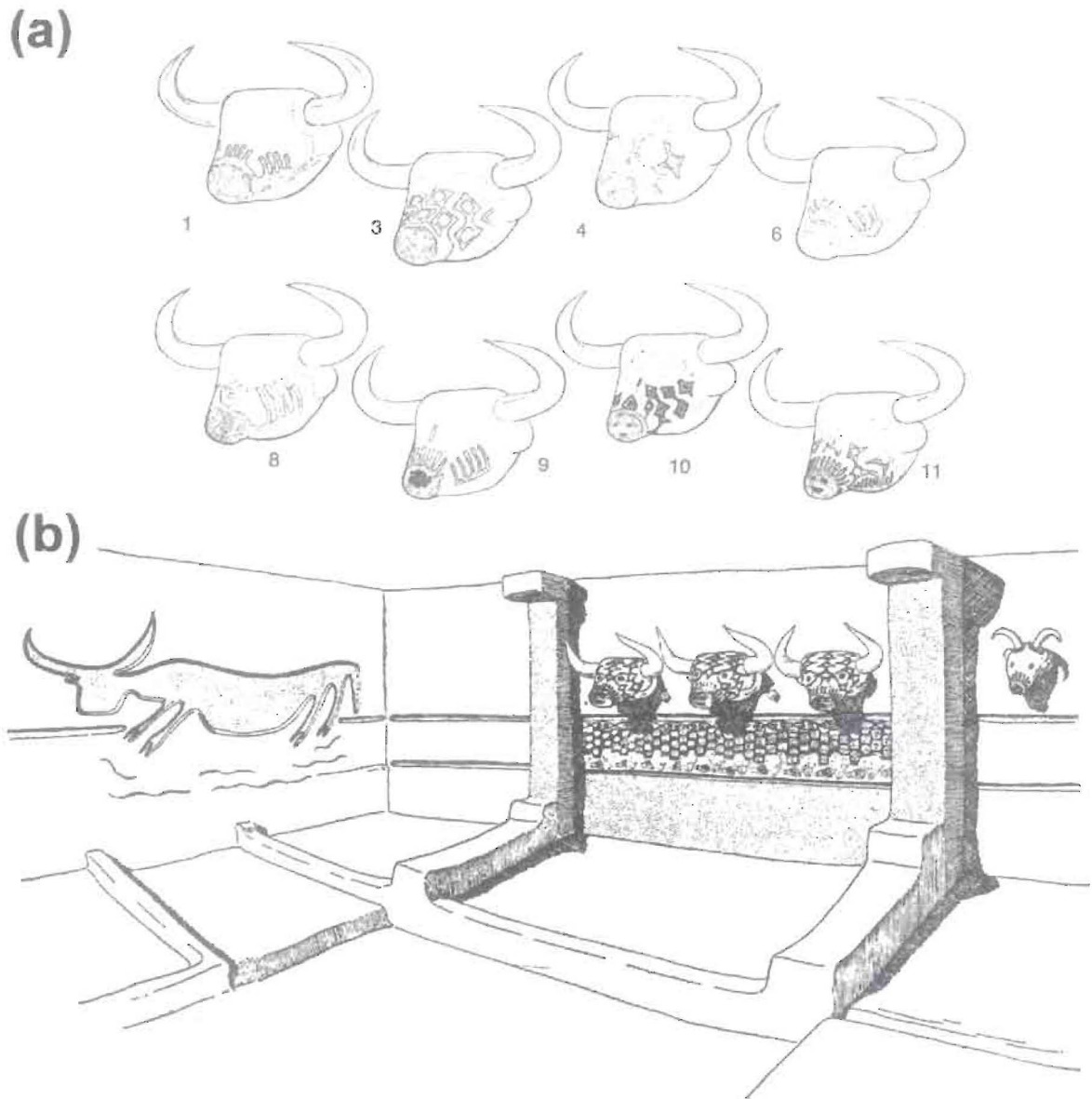
worldview, some thousands of years earlier, rooted in Palaeolithic epochs.

If one finally compares the rock painting in the „Hall of Bulls“ of the Lascaux grotto with a well-known copperplate engraving (no. XIV) in Johann Elert Bode's „Vorstellung der Gestirne auf XXXIV Kupfertafeln. Nach der Pariser Ausgabe des Flamsteedschen Himmelsatlas“ (1782), the striking similarity is really obvious (ill. 3 c). But the high formal correspondence isn't enough. It is necessary to prove, at what time in the course of the year and how the constellation Taurus, including Hyades and Pleiades, appeared above the natural horizon, with reference to the epoch of the art of Lascaux. Therefore it is unavoidable to know the age of the rock paintings most accurately.

How old is the art of Lascaux?

THE ART OF Lascaux can't be dated exactly. The artists used charcoal only very sparingly for painting. Thus up to now there isn't any 14C-age available directly from the rock pictures. Nonetheless pieces of charcoal were found in archaeological relevant layers at the entrance and in some parts of the cave („Axial Diverticle“, „Passage“, „Well“). Nine 14C-dating have been made up to now:^{xxxv} $18,600 \pm 160$ (Gif A 95582) BP*, $17,190 \pm 140$ BP (GrN-1632), $16,100 \pm 500$ BP (Sa-102), $15,516 \pm 900$ BP (C-406), $9,070 \pm 90$ BP (GrN 3184), $8,660 \pm 360$ BP (Ly-1197), $8,510 \pm 100$ BP (GrN-1182), $8,060 \pm 75$ BP (GrN-1514), $7,510 \pm 650$ BP (Ly-1196).

It is difficult to calibrate 14C-dating into solar calendar years before the dendrochronologic limit of 11,885 calBP* at present.^{xxxvi} Until quite recently a continuous glacial radiocarbon curve (Calendric Age Conversion) has been established with the exception of dates beyond 40 ka BP^{xxxvii} and prior to the Interstadial I (13-18 ka BP).^{xxxviii} Still there are uncertainties. But because astronomical interpretations base upon a calendric age, I use a calibrated timespan.



III.5: The head of a sakral bull with spotted face and rain combs in the cult building VI B 8 of Catal Hüyük (Cumra, Anatolia, Turkey) – probably a depiction of the open cluster of the Hyades, (b): The heads of three bulls and one ram above and near the mural, which could represent a calendar based on Aldebaran in the constellation of the Bull, the Pleiades, Hamal in the constellation of the Ram and other stars in the relation to the life cycle of bees and the vegetation rhythm of barley (graphics after Mellaart, 1967: 146, fig. 34 and 148, fig.36).

Some years ago at the time I published my first studies about possible astronomical relevant depictions in the cave of Lascaux, these new investigations hadn't been available. This doesn't mean that we now really know exactly, when the rock pictures had been created, but the space of time is seized more clearly.

With respect to a 99,7% probability (3σ) the results can be arranged into an older group, from 21,380 calBC to 12,865 calBC* (Badegoulian/Magdalenian), and a younger one, from 8,646 calBC (78,5 %) to 4,204 calBC (Mesolithic).^{xxxix} Based upon the known archaeological industry, pollen analysis, and stylistic evaluations, it is thought that the majority of the rock pictures are to be associated with the final Badegoulian and mostly the Lower Magdalenian, 17,000-15,000 years ago.^{xi} But at present it can't be excluded that a few following a different style may belong to later Mesolithic epochs up to about 5,000 BC. In addition some of the younger ages are regarded as unreliable, because of mixed up archaeological layers.^{xli} Keeping this archaeological framework of dating in mind, what the people of Lascaux would have observed looking up to the sky?

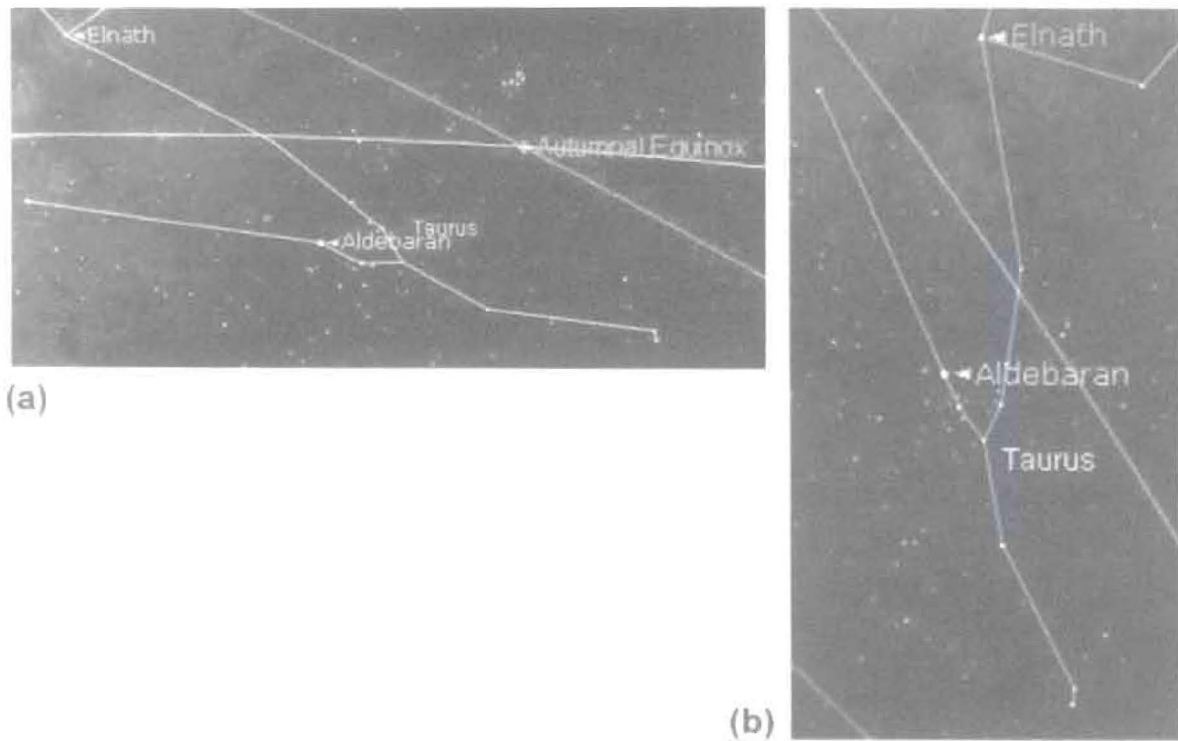
The six star and the aurochs signal the start of spring in the late Magdalenian era

IT IS A PLAUSIBLE assumption that the Pleiades were depicted on the rock wall. The constellation of the bull together with the Pleiades and the Hyades, must have been a very impressive heavenly marker, signifying an important astronomical date in the course of the year. It is known that ancient cultures worldwide watched special star phases of the Pleiades around the equinoxes (spring/autumn) and the solstices (summer/winter). Aided by an advanced planetarium software, like Guide 8.0 or Starry Night Pro 5.2^{xlii} for example, it is possible to calculate and display graphically those prominent positions. As a quick result

the vernal equinox at about 2,300 BC is clearly out of question for a close position of the Pleiades^{xliii} at the epochs considered. The summer solstice at approximately 21,600 BC doesn't fit to the oldest calibrated 14C age of about 21,380 calBC (99,7% probability), but it is, however, close to it. Another case is given with the winter solstice, which happened close to the Pleiades at about 8,600 BC. This date lies within the limits set by three of the calibrated 14C dates belonging to the younger group (GrN 3184, Ly-1197, Ly-1196). If one assumes 2σ standard deviation (95,4 % probability) to restrict the age, the date of the winter solstice lies outside that timeframe. The Pleiades stood close to the autumn equinox about 15,300 BC (ill. 18). This date pretty well fits into the older group of calibrated 14C-ages. Therefore two candidates remain for a prominent association with the Pleiades, the winter solstice at about 8,600 BC and the autumn equinox at approximately 15,300 BC. How to decide between both? A look on the proper motions of the stars in the Bull can help a little bit to answer the question.

TAKEN INTO account the proper motions of the stars during the calibrated radiocarbon epoch it can be found that they didn't change the appearance of the Pleiades with respect to the unaided eye. However, the open cluster as a whole was located the equivalent of about $\frac{1}{4}$ of the Moon's radius north of its present position. But during the same period Elnath (β Tau), the upper tip of the Bull's horn and Aldebaran (α Tau), the eye of the bull moved also. The change in the position of the latter is significant. 15,300 BC this star was much more clearly framed by the "spotted drawing" of the Hyades than it is today or even about 8,600 BC (ill. 6 a, b). This fact is brought out clearly by the painting in the „Hall of Bulls". Thus the older calibrated radiocarbon dating is more probable, than the younger one. The proper motions of the other stars hasn't influenced the form of the Bull, except for some negligible exceptions.

It is clear that no one really can observe the

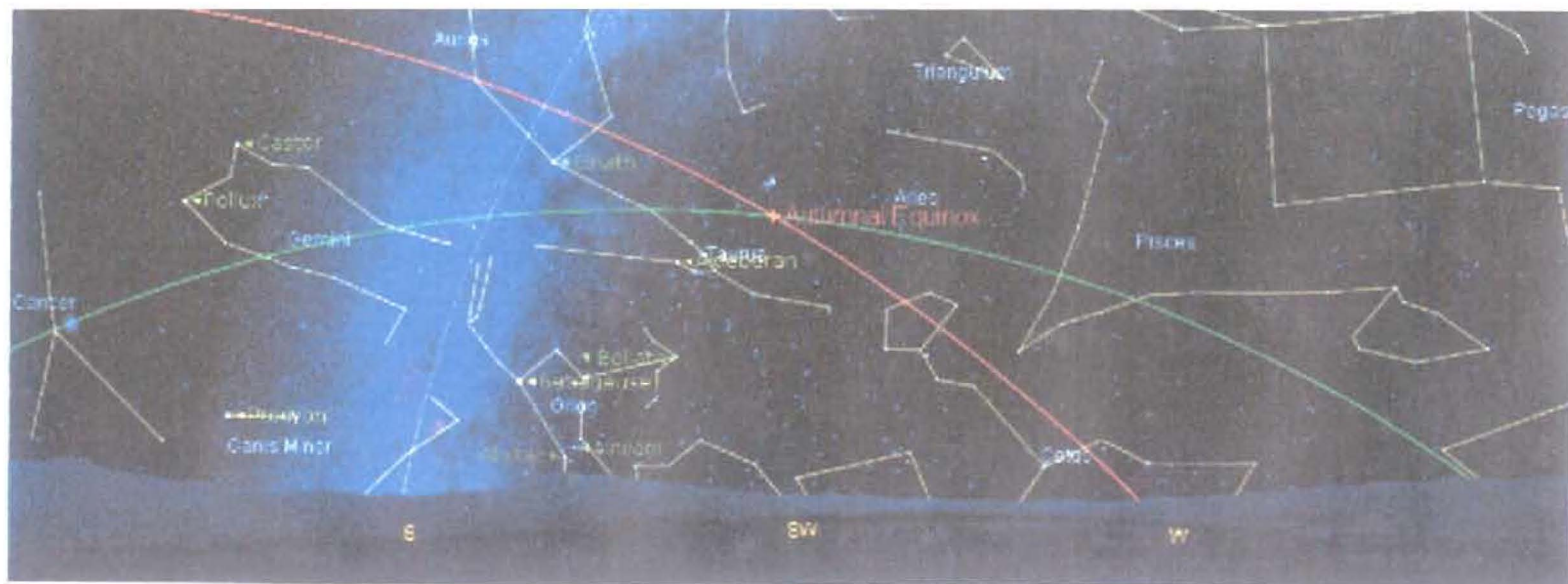


Ill.6: The proper motions of the stars:

(a): ca 15.300 BC and

(b): 2004 AD.

Graphic made with Starry Night Pro 5.2, <http://www.space.com> by Michael Rappenglück.



**III.7: The Pleiades at the autumnal equinox ca. 15.300 BC,
above the western horizon at the place of the hilltop of Lascaux. Graphic made with Starry
Night Pro 5.2, <http://www.space.com> by Michael Rappenglück.**

sun together with the Pleiades located at the abstract celestial points of the equinoxes and solstices. Therefore the ancient people tried to approximate the position of the sun at the solstices or equinoxes. They watched day by day, whether the Pleiades will be irradiated by the sun (first visibility or heliacal rising/last visibility or heliacal setting). Another possibility was to observe them rising just at the time the sun is setting and vice versa (cosmic [or morning] setting and acronychal [or evening] rising).

At the place of Lascaux and at 15,300 BC the Pleiades were invisible for 46 days between the 26th of August and the 11th of October (some days plus/minus). Under the best conditions of observation, for example the top of the hill of Lascaux, the Pleiades were visible around the 11th, that is the 283 day in the year, eighteen days after the autumn equinox in the dusk, shortly before sunrise. The first glow took place at 7° above the horizon. The sun then was located 8° below the true horizon (arcus visionis: about 15°). After another 161 days, exactly at the beginning of spring at midnight local time, the Pleiades reached their highest position of about 47.8° in the south above the true horizon. Then the constellation of the Bull loomed up steeply in the sky with its head turned downwards and its rump upwards. But this isn't painted on the rock face. 158 days later, on the 237th day of the year, the 26th of August, they could be seen for the last time in the dusk after sunset. The position of the Aurochs in the rotunda could result from the attempt to convey this image (ill. 7). The autumnal equinox came 28 days later (a sidereal month) and the cycle of the star year of the Pleiades was completed again. About 319 days passed from the first to the last visibility, the beginning of spring dividing this period almost exactly in half (161 to 158 days). It is very probable that such a striking celestial time signal had been noted and then painted in a cave, such as the Lascaux grotto. This hypothesis can be confirmed by the traditions of the people throughout the world,

who used the practice to divide the year according to the star phases of the Pleiades.^{xliv}

The sidereal year of the Pleiades

THE REPRESENTATION of the Pleiades as a rock painting isn't unique in a Palaeolithic grotto. A further example, nearly 4,000 years older than that in Lascaux, is present in the cave of La Tête-du-Lion (near Bidon, Dép. Ardèche, France; ϕ : 44°20' N | λ : 4°33' E, 165 m MSL).^{xlv} It dates from 19,000 BC, that is the Solutrian epoch. There a rock picture shows an aurochs carrying one single and a separated cluster of seven dots on his body – Aldebaran and the Pleiades (ill. 3 d). A double-bend row of 21 points is painted above the animal. The astronomical reconstruction makes it plausible that the Pleiades associated with the Bull are represented. At that time the open cluster set heliacal about 21 days before the summer-solstice.

A MYTH OF THE Blackfoot Natives in North America^{xlvi} throws light on the picture in the „Hall of Bulls“. These people synchronise the star phases of the Pleiades with the changes in the coats of the buffalo calves. The rutting time of the buffalo, as was the case with the Aurochs in olden time, is between August and October, that is in autumn. After about 280 days, that is nine synodic or ten sidereal months the cow delivers her calf. Its coat has a yellowish colour. In the course of the month the coat of hair grows darker and has a deep brown tone by the time its first autumn comes. Adult animals undergo their annual change of coats at the beginning of spring.^{xlvii}

The calendar of the Teton Sioux and of the Cheyenne in North America^{xlviii} follows also the natural rhythm of the bison. The year begins in October (the first month). The names of some months are very interesting.

November was „the moon of the fertilisation of the buffalo cows“ (the second month) - January, was „the moon, when the coat of the young buffaloes takes on colour“ (the forth month), - February, was „the moon, when their hair grows stronger“ (the fifth month), - July, was „the moon, in which the buffalo cows give birth“ (the tenth month). In the same way the Aurochs in the „Hall of Bulls“ could depict a calendar, which is based on the seasonal rhythms of the bovines and is cross-referenced to a special astral time signal: the heavenly Aurochs with the six spot. The year in those times could have begun with the season of heat and rutting of the Aurochs, which was pretty well determined by the open cluster of Pleiades plus or minus some days from the evening dusk until the early morning around the 11.th of October.

A strikingly strange sign comparable to a branch is painted in front of the aurochs no. 18 in the „Hall of Bulls“ (ill. 8). Similar depictions are known from antiquity: At that time bulls are sometimes represented together with a „branch“ or a „trident“, an „ear of corn“ or a „kind of tree“ close by. This sign, which always has some reference to a plant, was used by the Babylonians to indicate the rising of the Bull.^{xlix} One can speculate that the peculiar sign in front of the aurochs no. 18 perhaps had a similar function: It may have indicated the upcoming season of spring.

Because of their location close to the ecliptic and their surface brightness of 1.37^m the Pleiades in general are well suited for defining a starting point of an ecliptic division. Especially a position close to the equinoxes or solstices, depending on the course of precession, was appropriate for relating the sidereal to the solar year. In addition the movement of the moon in reference to the Pleiades and to the sun could be included. Out of that ancient people created a combined stellar-solar-lunar-

calendar, which started with the Pleiades and added other stars to set a circle of marks along the ecliptic. From them ancient cultures developed the so-called zodiacal „houses“ or „stations“. Though they often have some things in common, they nonetheless differ in number and type. The Pleiades however are present in most of them. Since several thousand years the people closely linked this open star cluster to the zodiacal constellations.ⁱ

AT ABOUT 2,300 BC the Pleiades stand close to the vernal equinox. At that time the ancient Chinese and Indian used them as the starting point of their lunar zodiacs.^{li} The second station of the Indian moon station is called „rohine“, meaning „the red, the red-like“, which refers to a red cow, the star Aldebaran.^{lii} 15,000 years earlier a very similar distribution could be seen in the night sky, only with opposite positions: At that time the Pleiades stand close by autumnal equinox. They therefore were the main asterism of the spring. Their heliacal setting, however, signalled the approach of autumn.

WORLDWIDE the people frequently considered the Pleiades as heavenly markers for the natural seasons of hunting, fishing, and fieldwork, and for special purposes concerning measuring space and time.^{liii} Since thousands of years their star-phases have been used to divide the year in two parts, to establish and to arrange a special kind of sidereal year, the so-called „Year of the Pleiades“ (Fur-Year).^{liv} In some cases the solar calendar was adjusted to the sidereal one by certain leap year regulations, which were based upon the star phases of the Pleiades.^{lv} It is very probable that the people of Lascaux used the asterism in quite a similar way for time-reckoning.

Keeping in mind all what has been said, could then the set of all animals in the „Hall of Bulls“ be a „circle of living beings“, a „zodiac“ in the proper sense of the word? Does the aurochs no. 18 with the six spots above in that case represent the first



Ill.8: The peculiar sign in front of the aurochs no. 18 in the „Hall of Bulls“, cave of Lascaux, photo after Bataille, 1986: 47.

constellation of a paleozodiac, which was identified? Some authors propose affirm this quickly and very speculative by simple laying the constellations over the animals.^{lv} But a really scientific effort to answer these questions has to respect the different styles of the pictures, which indicate several distinct artists and probably also dissimilar objectives. In every case one has to be very cautious to overstress the astronomical approach. Further research has to add the results of other specialities, if a better decoding of the picture panels not only in the "Hall of Bulls", but also in the other galleries, should succeed. In other parts of the cave of course, there are some clear hints on further astronomical related rock painting.

A part of the lunar cycle in the "Axial Diverticle"

Looking at the scene with the belling stag and the pregnant horse one can recognize a strange row of black coloured spots and a rectangle (ill. 2 b). They are arranged into six groups: At first 6 dots, followed by one moved up a bit from the line, and then once more 6 spots. Then a rectangle is drawn with his short side as basis. Above these depictions the rutting stag completes this impressive part of the whole representation. After a small area on the rock face, which has been left without any painting, another strange thing is attached: A line of dots, shaped as the capital letter S consists of 7, 5, and 13 (in sum 26), seen from left to right. The five spots are very strikingly arranged in a convex curve, which at the same time shapes both forelegs and partly the chest of the horse.

Some researches already suggested that the row of dots would refer to periodical recurring celestial events associated with the seasons.^{lvii} As I think, they are right, but their speculations must be proven. The complete row of dots can consists of two parts, one below the stag contains 13 points (up to the rectangle), the other beneath the horse has 2 x

13 = 26 points. This counting points to a possible interpretation: It may represent one and a half lunar cycle. The lunation (or synodic month), however, takes about 29.53 days, while a sidereal month lasts 27.32 days. The first value differs clearly from the 26-day-period, which perhaps is shown on the rock face, while the second one lies closely to it. This means that the people of Lascaux probably intended to represent the sidereal month. Based on a study of the claviform P-signs in Upper Palaeolithic art, it is very plausible that the striking row of dots is a kind of a time-unit.^{lviii}

AS ALREADY mentioned above the belling stag, who is a stag of eighteen tines, indicates the rutting season of deer, which occur usual in September/October, around the autumn equinox. The pregnant mare depicted next to the stag is heavily in-foal. This indicates a time between late May to mid July. It is plausible that the row of dots running below the horse and the stag is associated to both animals. It then may indicate a certain time in the year related to the period between May and October. One can further speculate that the rectangle, which is drawn beneath the royal stag and positioned within the series of dots have something do with a special seasonal event, perhaps the autumnal equinox. The pregnant horse shortly before foaling could mark the time around summer-solstice. Then the row of dots, based on the sidereal month, may illustrate the time between these striking seasons of both depicted animals. Looking on this picture panel there are some further details, which indicate an astronomical meaning. But at the moment it would be pure speculation to say much more about it, though some authors didn't hesitate to do so.^{lix} Additional interdisciplinary research, which also includes the neighbouring rock pictures, is necessary.

In addition, however, the cave still holds a much more complicated sequence of rock pictures deep in her interior, which very probably include a complete cosmography,

based on shamanistic-totemistic concepts.
The age of approximately 16,500 years
makes this ensemble the oldest known
worldview so far.

Zusammenfassung:

Mit einem interdisziplinär begründeten Forschungsansatz, der „integralen“ Methode, die Ergebnisse aus Archäologie, Astronomie, Ethnologie, Kartographie, Mythologie, Photogrammetrie, Religionswissenschaften, Semiotik und Symbolik zusammenfasst, werden verschiedene Felsbilder in der Höhle von Lascaux (bei Montignac, Dép. Dordogne, Frankreich) eingehend untersucht. Dabei zeigen sich saisonale, kalendarische und kosmographische Aspekte. Im „Saal der Stiere“ dürften der offene Sternhaufen der Pleiaden über dem damaligen Sternbild „Auerochse“ (in etwa das heutige Sternbild Stier) in Zusammenhang mit einer Kalenderrechnung abgebildet worden sein. Im „Axialen Divertikel“ gibt es einen klaren Hinweis auf die Darstellung des Mondlaufs im Zusammenhang mit wichtigen saisonalen Rhythmen. Schließlich führt die detaillierte Untersuchung eines kompletten Bildzyklus im „Schacht (des toten Mannes)“ auf die Abbildung eines außergewöhnlichen Himmelsanblicks, der sich dem Menschen des Magdalenien ca. 14,500 BC, kurz vor Mitternacht Ortszeit, zum Datum der Sommersonnenwende darbot. Aber es ist nicht nur ein Himmelsbild, sondern eine komplette uralte Kosmographie dargestellt, die von Menschen des Eiszeitalters gebildet wurde. Sie basierte auf einer archaischen Form einer schamanistisch-totemistischen Weltanschauung, die eng mit der Lebensweise der Jäger-Sammler-Völker jener Zeit verbunden war. In dieser Kosmographie vereinigten sich, symbolisch dargestellt, in Mythen ausgedrückt und mit Riten verbunden, Bereiche menschlicher Erfahrung von der Welt und sich selbst, die im Verlauf der weiteren Jahrtausende Kulturgeschichte stetig verfeinert, jedoch auch zusehends voneinander getrennt wurden: Fertigkeit, Glaube, Heilung, künstlerischer Ausdruck, Überlieferung, Wissenserwerb und Zusammenleben waren in einer Weltbeschreibung und Weltanschauung kombiniert, die als Verbindung und Rückbezug auf den Ursprung des Kosmos verstanden werden muß. Die Ergebnisse dieser Forschung führen zur Vorstellung, die Höhle von Lascaux könnte eine Art urgeschichtliches Planetarium gewesen sein, das zugleich die Funktion einer Kultstätte besaß.

NOTES

ⁱMy papers and doctoral thesis list very much references to prove my argumentations. The quantity of the matter makes it impossible to repeat all what I wrote elsewhere. Therefore I refer generally to my published studies and only make further notes, if I present new material.

ⁱⁱReichholf, 1983: 208

ⁱⁱⁱRuspoli, 1986: 46

^{iv}Ruspoli, 1986: 175

^vRuspoli, 1986: 172-173

^{vi}The following paragraphs summarize my research work, which I published in Rappenglück, 1997, 2001a, 2003

^{vii}Some researchers also believed in having found the first indications to the oldest observations of the Pleiades: In 1916 and 1926 Marcel Baudoin speculated that the people would already have watched them some ten thousands of years ago. In 1978 Robert Burnham jr. suggested that the rock paintings of the bovine in the caves of Altamira and Lascaux are somehow related to the zodiacal bull. In 1985 Heino Eeissalu supposed that in the „Hall of Bulls“ of the Lascaux cave the aurochs speckled with spots represent the Pleiades. In 1991 and again in 1997 Frank Edge tried to prove that the aurochs no. 18 and the group of six spots depict the zodiacal bull with the Pleiades as a part of a complete archaic zodiac cycle. In 1994 Luz Antequera Congregado suggested the same interpretation. In 1996 I presented my interdisciplinary attempt which supplies a detailed analysis and interpretation, instead of the partly very speculative explanations above. In the year 2000 Chantal Jegues-Wolkiewicz supposed again the same hypothesis as Frank Edge has it done, without citing any of the research papers above mentioned. These papers, except my own one, didn't include all necessary astronomical computations, e.g. the proper motions of the stars. They also missed to respect the archaeological and stylistical data. In particular the other authors didn't take care of the calibrated radiocarbon datings. It isn't here the place to criticize these studies much more in detail. This remains for a future paper.

^{viii}Allan, 1963: 391-413; Gundel, 1952: c. 2498-2499; Krupp, 1991a: 134, 241-242, 1991b; Scherer, 1953: 145-146

^{ix}Allan, 1963: 400; Gundel, 1952: c. 2523; Hudson, 1984: 46; Krupp, 1991a: 245, 1991b; Maas, 1924/25: 403 and fn. 36/37; Norman, 1925: 132; Schleberger, 1986: 136; Werner, 1952: 142

^xKrupp, 1991a: 246-247, 1991b

^{xi}Jobes, 1964: 335-348; Krupp, 1991a: 6; 1991b; Roe, 1993; Miller, 1997; Selin, 2000 (catchword: Pleiades); Vaiškunas, 1997; Kolev, D., Kaloyanov, A. and Koleva, V., 1997

^{xii}Allan, 1963: 391-413; Jobes, 1964: 335-348; Schlosser and Cierny, 1996: 96-97

^{xiii}Krupp, 1991: 245

^{xiv}In contrary see the suggested interpretation of the at the Nebra disk (Schlosser, 2003).

^{xv}See fn. 10.

^{xvi}Van der Waerden, 1980: 295

^{xvii}Van der Waerden, 1980: 296

^{xviii}Koch, 1989: 16-18

^{xix}Allan, 1963: 392

^{xx}Allan, 1963: 392; Bode, 1805: Tafel VII; Gundel, 1952: c. 2500; Krupp, 1991: 134

^{xxi}around the star 39 Tau (5.9^m)

^{xxii}See e.g. Gundel, 1992: p. 69-70. Gundel gives several examples in his book and catalogue.

^{xxiii}Kunitzsch, 1974: 265

^{xxiv}Künzl, 2000: coloured plate VIII, 1, b/w plate 34, 4 and 36, 1

^{xxv} θ^2 Tau (3.4^m), ϵ Tau (3.5^m), γ Tau (3.68^m), δ^1 Tau (3.8^m), θ^1 Tau (3.8^m), δ^3 Tau (4.3^m)

^{xxvi}Allan, 1963: 387; Gundel, 1913: c. 2617-2618, 2622

^{xxvii}Gundel, 1913: c. 2617-2618, 2623

^{xxviii}Van der Waerden, 1980: 295; Hartner, 1968: 233. It is very interesting that some Amerindian tribes also have the concept of the „jawbone“ of an animal – here a Tapir - related to the Hyades (Roe, 1993: 312).

- ^{xxix} Allan, 1963: 384-385; Gundel, 1913: c. 2618, 2619; Hartner, 1968: 230; Krupp, 1991: 134; Kunitzsch, 1974: 266-268
- ^{xxx} Mellaart, 1967: 148, fig. 36
- ^{xxxi} Calibrated with Radiocarbon Program CALIB Rev. 4.4.2, Copyright 1986-2002 M Stuiver and PJ Reimer. Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230; Raw 14C data given by Stuckenrath and Ralph, 1965: 191-192 and Stuckenrath and Lawn, 1969: 154-156.
- ^{xxxi} Biedermann, 1989: 357
- ^{xxxi} See fn. 10 and
- ^{xxxi} Matossian, 1980: 9-17.
- ^{xxxi} Rappenglück, 1999; Aujoulat et.al. 1998; The shortening in brackets notates the name of the laboratory which had examined the sample together with a serial numbering.
- ^{xxxi} Kromer and Spurk, M. 1998: 1117-1125. There are several attempts to continue the calibration further back in time (up to 12,410 cal BP).
- ^{xxxi} Völker et al., 1998, 2000
- ^{xxxi} Jöris and Weninger, B. 2000: 461-471. Also see: Comparison of Dating Results achieved with Different CALPAL Calibration Curves, Latest CalCurve-Update: January 2004, CALPAL (Cologne Radiocarbon Calibration & Paleoclimate Research Package), URL: <http://www.calpal.de>
- ^{xxxi} The calibration was made with OxCal Viewer Version 3.9 (Software created by Bronk Ramsey, 2003; URL: <http://www.rlaha.ox.ac.uk/orau/oxcal.html>); The 14C-date of 18,600 ± 160 BP (Gif A 95582) indicates that the cave had been visited as early as the end of the Badegoulian (18,500-17,000 BP).
- ^{xi} Up to now the age of the rock pictures in the cave of Lascaux isn't really clear. See Lorblanchet, 2000: 285, 299-300, 316
- ^{xii} I discuss this problem much more in detail in Rappenglück, 1999: 43-48.
- ^{xiii} A debate on the necessary features that an astronomical software has to include, to be really useful for purposes of archaeoastronomy, in particular paleoastronomy, can be found in Rappenglück, 1999: 72-80. The newer versions of programs, such like Guide 8.0 or Starry Night Pro 5.2, are well-suited, but they also lack some important tools of analysis or partly don't work exactly enough. Therefore by all means it is demanded to work with several software packages, to get an impression of accuracy and to apply a calculus of error.
- ^{xiii} The computation refers to Alcyone (η Tau; 2.9^m), the brightest star of the Pleiades.
- ^{xiv} Steinen, Karl von den, 1894: 243-246; Ginzel, 1906: 59 and fn. 2, 1911: 128, 149; Gundel, 1952: c. 2502, 2505; Erren, 1967: 48-53; Sesti, 1991: 455; Urton, 1980: 178, 180-181
- ^{xv} Rappenglück, 2001b
- ^{xvi} Norman, 1925: 135
- ^{xvii} Kuegler, 1990: 15
- ^{xviii} Ginzel, 1911: 147; Kuegler, 1990: 32
- ^{xix} Hartner, 1968: 238
- ⁱ Von Bunsen, 1879
- ⁱⁱ Ginzel, 1906: 72-73, 75; Gundel, 1952: c. 2493; Scherer, 1953: 152-154; Parpola, 1985: 100, 135-140
- ⁱⁱⁱ Scherer, 1953: 154
- ⁱⁱⁱ Andree, 1893: 362-366; Gundel, 1952: 2507; Gundel, 1952: c. 2506, 2522-2523, 1981: 45, 57-58, 66-67, 108, 113, 173-175; and fn. 10; Krupp, 1982
- ^{iv} Hartner, 1968: 233, 236-238; Sesti, 1991: 455; Albani, 1994
- ^{iv} Albani, 1994
- ^{vi} Eelsalu, 1985, Edge, 1997; Jegues-Wolkiewicz, 2000
- ^{vii} Kuhn und Kuhn, 1968: 12-14; Frolov, 1978: 77; Marshack, 1972: 185, 189, Fig. 82.
- ^{viii} Rappenglück, 2002
- ^{lix} Larichev, 1998

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- ⁶The following paragraphs summarize my research work, which I published in Rappenglück, 1997, 2001a, 2003
- ⁷Some researchers also believed in having found the first indications to the oldest observations of the Pleiades: In 1916 and 1926 Marcel Baudoin speculated that the people would already have watched them some ten thousands of years ago. In 1978 Robert Burnham jr. suggested that the rock paintings of the bovine in the caves of Altamira and Lascaux are somehow related to the zodiacal bull. In 1985 Heino Eelsalu supposed that in the „Hall of Bulls“ of the Lascaux cave the aurochs speckled with spots represent the Pleiades. In 1991 and again in 1997 Frank Edge tried to prove that the aurochs no. 18 and the group of six spots depict the zodiacal bull with the Pleiades as a part of a complete archaic zodiac cycle. In 1994 Luz Antequera Congregado suggested the same interpretation. In 1996 I presented my interdisciplinary attempt which supplies a detailed analysis and interpretation, instead of the partly very speculative explanations above. In the year 2000 Chantal Jegues-Wolkiewicz supposed again the same hypothesis as Frank Edge has it done, without citing any of the research papers above mentioned. These papers, except my own one, didn't include all necessary astronomical computations, e.g. the proper motions of the stars. They also missed to respect the archaeological and stylistical data. In particular the other authors didn't take care of the calibrated radiocarbon datings. It isn't here the place to criticize these studies much more in detail. This remains for a future paper.
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- ⁹Allan, 1963: 400; Gundel, 1952: c. 2523; Hudson, 1984: 46; Krupp, 1991a: 245, 1991b; Maas, 1924/25: 403 and fn. 36/37; Norman, 1925: 132; Schleberger, 1986: 136; Werner, 1952, 142
- ¹⁰Krupp, 1991a: 246-247, 1991b
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- ¹²Allan, 1963: 391-413; Jobes, 1964: 335-348; Schlosser and Cierny, 1996: 96-97
- ¹³Krupp, 1991: 245
- ¹⁴In contrary see the suggested interpretation of the at the Nebra disk (Schlosser, 2003).
- ¹⁵See fn. 10.
- ¹⁶Van der Waerden, 1980: 295
- ¹⁷Van der Waerden, 1980: 296
- ¹⁸Koch, 1989: 16-18
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- ²¹around the star 39 Tau (5.9^m)
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- ²⁵ θ^2 Tau (3.4^m), ϵ Tau (3.5^m), γ Tau (3.68^m), δ^1 Tau (3.8^m), θ^1 Tau (3.8^m), δ^3 Tau (4.3^m)
- ²⁶Allan, 1963: 387; Gundel, 1913: c. 2617-2618, 2622
- ²⁷Gundel, 1913: c. 2617-2618, 2623
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- ²⁹Allan, 1963: 384-385; Gundel, 1913: c. 2618, 2619; Hartner, 1968: 230; Krupp, 1991: 134; Kunitzsch, 1974: 266-268
- ³⁰Mellaart, 1967: 148, fig. 36
- ³¹Calibrated with Radiocarbon Program CALIB Rev. 4.4.2, Copyright 1986-2002 M Stuiver and PJ Reimer. Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230; Raw 14C data given by Stuckenrath and Ralph, 1965: 191-192 and Stuckenrath and Lawn, 1969: 154-156.
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⁴⁵Rappenglück, 2001b

⁴⁶Norman, 1925: 135

⁴⁷Kuegler, 1990: 15

⁴⁸Ginzel, 1911: 147; Kuegler, 1990: 32

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⁵²Scherer, 1953: 154

⁵³Andree, 1893: 362-366; Gundel, 1952: 2507; Gundel, 1952: c. 2506, 2522-2523, 1981: 45, 57-58, 66-67, 108, 113, 173-175; and fn. 10; Krupp, 1982

⁵⁴Hartner, 1968: 233, 236-238; Sesti, 1991: 455; Albani, 1994

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⁵⁶Eelsalu, 1985; Edge, 1997; Jegues-Wolkiewiez, 2000

⁵⁷Kuhn und Kuhn, 1968: 12-14; Frolov, 1978: 77; Marshack, 1972: 185, 189, Fig. 82.

⁵⁸Rappenglück, 2002

⁵⁹Larichev, 1998

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Correspondence address:

Dr. Michael A. Rappenglück M.A.

Bahnhofstr.1
D-82205 Gilching
Germany

Tel.: 0049-8105-37-76-01
Fax: 0049-8105-37-76-02

e-mail: mr@infis.org