

2.5 ANCIENT CHINESE AURORAL RECORDS:
INTERPRETATION PROBLEMS AND METHODS

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Abstract: In recent years a number of auroral catalogues have been compiled from Oriental records, but the auroral identifications given vary greatly from one catalogue to another. This is due to the fact that, up to now, no reliable criteria have been found which could help us discriminate between auroral and non-auroral ancient records. In this paper two new criteria are propounded and their usefulness illustrated by the solution of a few currently much debated questions.

I INTRODUCTION: CURRENT ORIENTAL ARCHAEO-AURORAL STUDIES.

In recent years great interest was aroused in the study of Chinese, Korean and Japanese historical records on the Aurora Borealis in order to obtain new data on the secular variation of the geomagnetic dipole field. It was hoped that by comparing these records with the many catalogues that have been compiled of the historical observations of the Aurora Borealis in the Occident, such as those by Hermann Fritz (1881) and Frantisek Link (1962, 1964), one could find examples of simultaneous appearances of the Aurora Borealis in the Orient and the Occident, and indeed a few such cases have already been detected and discussed (Keimatsu et al. 1968).

This method was first applied by *Mitsuo Keimatsu*^a and *Naoshi Fukushima*^b, and after the publication in 1968 of their preliminary results, *Keimatsu* (1970) started to compile a list of all sunspots and auroral records he could find in Oriental sources written in classical Chinese. His work soon attracted the interest of Chinese scientists and historians of science who, finding that they could not agree with many of *Keimatsu's* auroral identifications, started compiling their own lists of auroral records for the Orient. Up to now three such systematic catalogues have been compiled (see Reference: Articles in Chinese), all at variance with one another and with *Keimatsu's* catalogue.

It must be noted here that the exploration of Oriental auroral records is in fact as old as Occidental sinology. Just after the publication in France of the first book ever devoted entirely to the Aurora Borealis and its history, the famous *Traité Physique et Historique de l'Aurore Boréale* (Paris, 1733), its author, Jean Jacques Dortous de Mairan, sent

a copy to Antoine Gaubil (1689-1759)¹ who seems to have received it around the beginning of August 1736 (Gaubil 1970, p.473). Mairan must have asked Gaubil to look in Chinese records for observations of the Aurora Borealis and consequently Gaubil was to give two auroral identifications in his *Histoire de l'Astronomie chinoise, depuis le commencement de la monarchie chinoise jusqu'à l'an 206 avant J.-C.* which he sent to France in 1754, one copy being sent to Mairan.² After Gaubil, another French sinologue, Edouard Biot (1803-1850), who was very much influenced by Gaubil's works, took up the matter again in 1844 and extracted from Chinese sources over 40 records which he identified with Aurora Borealis and of which he published only two (Needham 1954, p.482), but no one in the Occident seems to have pushed further in this way after him, perhaps because nowadays the Aurora Borealis is a very rare occurrence in China (Teboul 1985).

II TWO NEW AURORALNESS CRITERIA.

It would seem that neither Gaubil nor Biot bothered much about giving reasons for their auroral identifications³, *Keimatsu* being the first to be fully aware of the great difficulty of the precise identification of the phenomena described in the original sources with an Aurora Borealis. This he tried to overcome by giving each record a reliability coefficient, which was not a very happy solution as in most cases it still left his reader facing the same problem as at the outset, namely, which record should be treated as an auroral one, and which should be discarded. In fact, Chinese scientists disagreed with many of *Keimatsu's* auroral identifications, the relevant records being rather, they argued, records of meteor showers, comets or even plain meteorological phenomena. The reasons they invoke all deal with some aspect or another of the physics of the upper atmosphere, but, as a matter of fact, it is because of this wealth of theoretical considerations that the three catalogues so far compiled in mainland China, all mostly based on the same primary sources⁴, differ greatly in their results, each compiling team having chosen, from the beginning, its own set of assumptions on what it should treat as an Aurora Borealis and what it should rather classify into another category of celestial phenomena. By so doing they forgot that the records we are dealing with were, after all, written a long time ago, in a language vastly different from even modern Chinese, by people whose views on Nature were perhaps not the same as ours and whose recording aims were much more astrological than astronomical. Besides, the Aurora Borealis being a phenomenon which can display an infinite variety of shapes, colours, structures and movements, we must expect to come up with descriptions couched in a language too strange to be immediately apprehended as referring in fact to some kind of auroral event. It would thus seem highly advisable, as far as auroralness criteria are concerned, to shift our emphasis from pure physics to: first, a re-examination of the records from the point of view of traditional Chinese philology, in order to get some fresh insights into their real meanings, that is to say the meaning they had for the people who wrote them down as observational records, and second, a comparison with modern auroral descriptions⁵, in order to confirm that our tentative philological reconstruction is compatible with the

mechanisms of Aurora Borealis⁶. I would like to present briefly here one case study and a few implications of these two criteria, in order to illustrate this entirely new way of tackling suspected ancient Chinese auroral records.

III THE AURORAL RECORDS IN THE BOOK OF CHANGES

The date of the *Book of Changes*^c is still a highly disputed matter because it is in fact an amalgam of elements whose different origins are distributed over a great span of time and space. It has already been shown by Chinese scholars that some of these elements refer to natural phenomena, but it seems to have escaped previous researchers that the text of the second Hexagram, *Kun*^d, seems, at least in part, to describe some auroral display of a band travelling upwards from the horizon until it develops into a drapery with ray-structure. Though the Chinese original, being extremely concise, is difficult to interpret, we may try to give for it the following rendering⁷ (Sung 1973, p.17).

- A First line: (After) treading on frost we arrive(d) on strong ice. This gives the setting, which looks very much like a description of some travel towards the land of "eternal winter".
- B Second line: In front, aside, (all was) vastness.
The travel into the frozen vastness goes on.
- C Third line: (That which) contains brightness (and to which) can be put questions (shows).
This is the first hint of the Aurora Borealis. Incidentally, we have here the motive of the travel up north referred to in A. and B. :the search for the oracle Aurora Borealis was considered to be.
- D Fourth line: (It is a) fastened-up bag. It does not drum, it does not expand⁸.
Attentive looking shows that this brightness emanates from a "close bag" of clouds, low on the horizon. No sound comes out of it, and it does not move.
- E Fifth line: A yellow lower garment (shows).
The homogeneous arc located near the horizon shows a yellow-green lower border.
- F Sixth line: Dragons are fighting in sight. Their blood (is like) dark-purple and yellow rays.
The arc has risen towards the zenith and is developing now variegated rays.

We can now fulfil the second part of the proof by producing the following extracts from a well known book(1885,p.203) by Sophus Tromholt (1851-1896):

- 1.b. "... , and a solemn silence reigns over the endless icefields which surround us on all sides."
2.a. "Even the snow seems to have become ice,..."
Which parallel very well with the text of the Second and First Lines, respectively.

- 3.d. "In some part of the horizon or another lies a close cloud."
This sentence is a striking analogy with the Chinese expression found in the Fourth Line, "a fastened-up bag".
- 4.c. "Its upper edge is illuminated,...."
This explains very well the text of the Third Line.
- 5.e. "... , the band slowly but steadily alters its position and form. The width is considerable, and the intense whitish-green light stands out in magnificent relief on the dark background."
This is but an expanded statement for the text of the Fifth Line.
- 6.f. "The band now falls into manifold curls,... Waves of light course constantly through the entire length of the band with an undulating motion, now they run from right to left, now from left to right; they seem apparently to cross each other, as they appear on the nearest or furthest side of a curl."

This should not be so difficult to interpret in terms of dragons, fighting one with another. Such a fight must be associated with the shedding of blood, hence the end of the text of the Sixth Line which would appear to describe a drapery with ray-structure.

This kind of analysis has for immediate consequence the fact that the text of the first Hexagram, *Qián*^e, describes also an auroral display, the only difference being that the emphasis there is put on the word "dragon" which, in the text of the second Hexagram, appears only once.

That the word "dragon" referred in fact to Aurora Borealis in the *Book of Changes* is not to surprise us, since in Europe also many auroral displays were, quite rightly if we think of the motions of a folded band, described in terms of dragons (Eather 1980, p.44), and is fully corroborated by many texts up to the end of the Posterior *Hàn* dynasty (Teboul 1985).

IV RECORDS IN TERMS OF "STARS FALLING LIKE RAIN".^f

The first record on which opens *Keimatsu's* catalogue is a record of "Stars Falling Like Rain" which Gaubil, sometimes between 1735 and 1754, had already identified as some kind of Aurora Borealis². Many such records can be found in Chinese sources but Chinese scientists have decided, of late, that it would be safer not to interpret them as auroral descriptions but rather as records of meteor showers. *Keimatsu* on his part based his auroral identification on the fact that in the second Official Dynastic History of China there are three different records of what he took to be the same phenomenon observed on the 27th of March, 15 BC (Julian style) (Keimatsu 1970, record no 16, Keimatsu gives the date as March 23), one of which is unmistakably an auroral record, while the other two are in terms of "Stars Falling Like Rain". Making then the explicit assumption that all three records were extracts from one and the same observation report which had later been arbitrarily distributed between three different parts of this second Official Dynastic History of China (Keimatsu 1970, pt.1,p.3), he inferred: first,

that the two extracts in terms of "Stars Falling Like Rain" were simply to be equated with the third one, and second, that the majority of Chinese historical records using this same technical expression was auroral in nature.

Needless to say, *Keimatsu's* assumption must have been based on the fact that there is a very low probability for an aurora and a meteor shower (or shooting stars) to be both observed and reported on one and the same night. It is true that this is a rare occurrence, but it is not unknown and we can quote an observation report from Camille Flammarion (1842-1925) describing just such a coincidence during the auroral display which was seen over Paris on the 13th May, 1869 (Flammarion 1888, p.766).

"Quelques étoiles filantes ont signalé cette période¹⁰. Un bolide est parti du voisinage du zénith à onze heures trente-cinq minutes, pour s'éteindre en arrivant à la hauteur de la Grande-Ourse. Un autre a semblé tomber de Véga à onze heures quarante-cinq minutes."

Another, sinological, argument may be given against *Keimatsu's* assumption: it can be shown that the Chinese historical works which are our main sources of auroral records, such as the *Monographies on Astronomy*⁹, or the *Monographies on the Five Elements*ⁿ of the successive Official Dynastic Histories of China, are themselves very strictly structured in terms of the astrological theory prevalent at the time when they were compiled, each sub-section of these Monographies dealing in fact with one and the same type of astrological event. It is therefore impossible for the same *astronomical* event to be listed under two or more different *astrological* headings¹¹, since a given astronomical event could have one, and only one, type of astrologically associated meaning¹².

Though it is thus quite clear that on the 27th March, 15 BC, there had been two different celestial phenomena duly reported by the Imperial Observatory and later recorded in the appropriate parts of the second Official Dynastic History of China, which contradicts *Keimatsu's* basic assumption, it is nevertheless quite probable that his conclusion, namely that (if not all, at least some of) the historical records using the technical expression "Stars Falling Like Rain" must be records of auroral displays, is correct.

To prove this we must first notice that the Chinese character *xīng* 星 which, even in the context of Aurora Borealis is nearly always translated as "Star", may have in fact quite different meanings, the best translation being probably the word "Meteor" as it was understood before it took on its modern technical meaning of a "shooting star" (Eather 1980, p.61)¹³. The Chinese expression under consideration here should thus read (in first approximation) "*Meteors* Falling Like Rain" which we may accept as referring, under appropriate conditions, to some kind of auroral display of the type seen over Iceland on the 20th

August, 1886, and described by the French explorer Noël Nougaret (Flammarion 1888, p.764).

"L'aurore est alors dans tout son éclat; du ciel se détache (sic) de longues franges qui descendent mollement et que l'observateur croit pouvoir saisir avec les doigts."

Where the original French "de longues franges qui descendent mollement (du ciel)" fits in perfectly with Peter Van Musschenbrock's (1692-1761) general definition of the *meteor* (Eather 1980, p.61). Indeed, the same kind of metaphor flows naturally from the pen of Flammarion when, describing the light of the aurora seen over Paris on the 24 October, 1870, he writes: (Flammarion 1888, p.767).

"....., lumière blanche qui se dissémine à ses bords comme une rosée d'argent."

so that we would like to think that a possible translation conveying all the shades of meaning of the original Chinese

星隕如雨 should be akin to
 "Des météores s'effrangeaient en pluie (de feu)"
 on the model of a beautiful sentence by Théophile Gautier.

V CONCLUSION: CHINESE AURORAL RECORDS AND THE WOBBLING OF THE GEOMAGNETIC POLE.

By applying the same kind of twofold analysis propounded here to suspected ancient Chinese auroral records, one should be able to correct and complement all the existing auroral lists which, up to now, tried to discriminate true aurorae on mainly intuitive or partial physical considerations. The very nature of the records, put down for astrological reasons and couched in a literary language in which it has always been considered elegant to model oneself on expressions found in the Classics and/or the first two Official Dynastic Histories, as well as the infinite variety of auroral forms of which even a trained observer can often discover new ones he never saw before, make the two criteria probed here probably the only means of some practical value we have to compile auroral catalogues reliable enough for modern scientific investigation.

This kind of compilation shows then that in the most ancient Chinese auroral records the metaphor predominantly used to describe the Aurora Borealis was that of a Dragon. This image, though found in later records, is far less important than we would have thought, had we assumed it to maintain the same momentum throughout Chinese history. In fact, it soon came to be replaced by the concept of *Qi*, "Vapour", which is used in about 80% of all the auroral records compiled in the published catalogues. One might argue that this was a mere consequence of the prevailing Chinese philosophical ideas which used this *Qi* concept as a kind of universal tool in order to analyse all the spectrum of Nature, from matter to energy. But this is contradicted by the fact

that the "Dragon aurora" image always reappears in-between long spells of Qi-aurorae. This leads us to suspect that the so-called Qi-aurorae referred in fact to amorphous aurorae, i.e. aurorae seen at low geomagnetic latitudes, which is corroborated by their predominant colour always recorded as red, or reddish. On the other hand, the "Dragon aurorae" should refer to aurorae of such sharply organized forms that the human eye could recognize in them form concepts analyzable by (or perhaps already pre-existent in) the human mind, hence the dragon records of ancient times. These being so numerous until the end of the Posterior Han dynasty we must admit that during all of the formative period of the Chinese scientific outlook on Nature, China was in much higher geomagnetic latitudes than now, since structured auroral forms can be seen only in the vicinity of the auroral oval. The spells of Qi-aurorae periods marked times when China was in lower geomagnetic latitudes¹⁴. If we eliminate from this phenomenon the "noise" represented by periods of high solar activity, we can get a proof and even an indirect measure of the wobbling of the geomagnetic pole in historic times.

NOTES

- 1 One may well suppose that Gaubil, who had studied astronomy under Cassini and Maraldi at the Paris Observatory, was fully acquainted with Maraldi's writings, published in 1716-7, on the Aurora Borealis (Eather 1980, p.53). That was just before he left France to go to China (1721).
- 2 Both these two indentifications are still matters of discussion today.
- 3 They must have contented themselves with some kind of intuitive identification process.
- 4 The Official Dynastic Histories of China complemented, in various proportions, by data taken from Local Chronicles and Korean and Japanese histories.
- 5 Of which there is ample literature.
- 6 This is, of course, justified by the known fact that auroral forms have remained the same since the dawn of history.
- 7 Because of space limitations, I shall skip here the first part of my proof, i.e. the philological analysis of the text. This I would like to publish later, with full details. I recall here, for the benefit of the reader not familiar with the text of the *Book of Changes* that it consists primarily of sixty-four Hexagrams, each of which is made up of a combination of six Lines, either broken or unbroken. To each of these Lines, numbered 1 to 6 from bottom to top, is appended a very short text which often (but not always) can be analysed into a protasis giving the setting, and an apodosis traditionally interpreted as a portent and which we may omit here.
- 8 This last sentence belongs, properly speaking, to the ominous part of the Fourth Line. However, it is striking to see that, if we take into account very ancient meanings of the Chinese characters it is made up of, the rendering thus obtained still makes sense in an auroral context.

- 9 In 1.b. and 2.a. Tromholt quotes in fact an auroral description by Weyprecht (1838-1881); it is not quite clear whether the rest of the description is due to Weyprecht or Tromholt.
- 10 i.e. the period of duration of the auroral display which had begun a little before 23.00 H.
- 11 This was precisely the case of the three records made use of by *Keimatsu*
- 12 This precluded one and the same event to be recorded twice within the same Monography, but, of course, did not preclude it to be recorded a number of times in as many different Monographies of one or several Official Dynastic Histories.
- 13 It is quite illuminating on this point. In order to stress it, I shall hereafter underline the word "meteor" each time I use it in its old sense.
- 14 For all of the above I am greatly indebted to Professor *N.Fukushima* who, in the course of many discussions, helped me to clarify my views on the historical and scientific analysis of Chinese auroral records.

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|----|-------|----|------|
| a. | 慶松 光雄 | b. | 福島 直 |
| c. | 易經 | d. | 坤 |
| e. | 乾 | f. | 星隕如雨 |
| g. | 天文志 | h. | 五行志 |
| i. | 氣 | | |

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DISCUSSION

- Xu Zhentao** (Comments) : The data of ancient Chinese astronomy are written in classical Chinese, which is a very difficult language. It is not so easy to grasp the real meaning of these data. Chinese

researchers in different teams are currently working very hard to overcome these difficulties. Now we would like very much to unite our efforts with foreign scholars working in the same fields, so that we can achieve better results, and I think this is the best way towards solving the problems we meet.