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5.10.2004 Figs 9/10 corrected

Mistletoe berry shapes and the zodiac

Stephan Baumgartner, Heidi Flückiger and Hartmut Ramm

Translation of: Mistelbeerenform und Tierkreis. Stephan Baumgartner, Heidi Flückiger and Hartmut Ramm. *Elemente der Naturwissenschaft* **79** (2), 2-21 (2003).

Summary

In previous investigations it was observed that the shapes of ripening mistletoe berries fit path curve surfaces and can be exactly described by the shape parameter λ. Furthermore a correlation was found between the shape of mistletoe berries and the position of the moon in the zodiac. In the present study two questions were addressed: 1) Does an unencoded determination of the λ value combined with knowledge of a hypothesis under investigation imply an unconscious falsification of the data? 2) Are the shape changes in mistletoe berries correlated with the moon's position in front of the phenomenological zodiacal constellations or with its position in front of the equidistant zodiacal signs?

There was no evidence of an unconscious manipulation of the λ values with unencoded measurement when the observer knew the hypothesis under investigation in comparison with measurement which was encoded or made by an observer who did not know the hypothesis. In addition, it appears that the position of the moon in front of the phenomenological zodiacal constellations is definitive for the behaviour of the mistletoe berry shapes; a correlation of the moon's position relative to the zodiacal signs contradicts the data obtained. An attempt was also made to estimate empirically the spheres of influence or transition points of different zodiacal constellations. The data produced correlate very well with the forms of the constellations that stem from antiquity.

Introduction

In previous investigations (Flückiger & Baumgartner 2002) we noticed that ripening mistletoe berry shapes fit path curve surfaces (Ostheimer & Ziegler 1996). The shape of these path curves is exactly described by a single parameter called λ after Edwards (1986).

The values of λ for mistletoe berries vary from about 0.8 to 1.2, which correspond to downwards or upwards pointed egg shapes respectively (Fluckiger & Baumgartner 2002). During the ripening period from June to December, mistletoe berry shapes generally change from slightly upwards pointed (λ > 1, see Fig. 1a) to slightly downwards pointed (λ < 1, see Fig. 1b).

This ripening trend is modulated by a more or less rhythmic shape change with a period of nine to ten days, which we were able to observe during three independent periods of investigation (1995, 1997 and 1998) and which were correlated with the position of the moon in the zodiac. Thus, relative to the longer term ripening trend, the shape parameter λ of mistletoe berries acquired somewhat lower values when the moon was in front of the zodiacal constellations Aries, Taurus, Leo, Virgo, Sagittarius and Capricorn whereas the

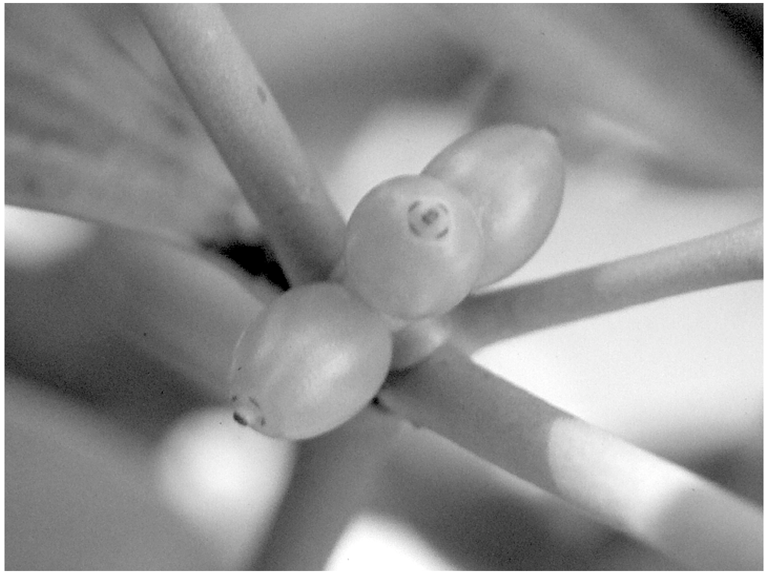

Figure 1a. Mistletoe berry in mid-July (slightly pointed upwards, $\lambda > 1$).

Figure 1b. Mistletoe berry at the end of November (slightly pointed downwards, $\lambda < 1$).

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values were somewhat above average when the moon stood before Gemini, Cancer, Libra, Scorpio, Aquarius and Pisces (Flückiger & Baumgartner 2002).

Grouping the zodiacal constellations according to their trigonal relationships (see Table 1) the shape parameter λ of mistletoe berries had below average values when the moon was in front of the fire or earth trigons whereas the values were above average when the moon was in front of the air or water trigons. If the moon position is reckoned relative to the equidistant zodiacal *signs* there is a corresponding shift of one sign.

Element	Fire	Earth	Air	Water
Constellation or sign of zodiac	Aries ♈ Leo ♌ Sagittarius ♐	Taurus ♉ Virgo ♍ Capricorn ♑	Gemini ♊ Libra ♎ Aquarius ♒	Cancer ♋ Scorpio ♏ Pisces ♓

Table 1. Relationship of constellations and signs of the zodiac to the 'elements' according to the Hellenistic view (Gundel/Böker 1997).

However, the work for the three study years (1995, 1997 and 1998) published previously left a number of questions unanswered (Flückiger & Baumgartner 2002).

As regards the methodology, it could be argued that the relationship of berry images to measurement dates was known and that therefore in the years 1997 and 1998, for which an explicit hypothesis was proposed, an unconscious manipulation could have falsified the results of the measurements. But this objection would be overruled if the harvesting dates are coded during measurement or the measurements are made without having a particular hypothesis in mind.

A second unanswered question was whether the observed phenomena regarding the moon's position were connected with the actually visible zodiacal constellations of astronomy or with the equidistant zodiacal signs used in astrology. If it is not the signs but rather the constellations that are definitive, then the measurement data can be used empirically to determine the region of influence of various constellations and to compare them with the boundaries and patterns of the traditional constellations.

Data sets of three further measurement periods (1991, 2000 and 2001) were used to answer these questions. The 1991 data were identified through an investigation of archives and processed for this publication; the measurement series in 2000 and 2001 were planned and carried out specifically for dealing with the unanswered questions.

Materials and methods

Mistletoe shoots yielding 15 to 20 berries on each harvest date in the years 1991, 2000 and 2001 were picked between 8.00 and 9.00 am several times a week from previously marked clumps of mistletoe on an apple tree. Three different apple trees were used in the three periods of investigation (see Table 2). The berries sampled each time had an average degree of ripeness.

The precise periods of investigation, the number of harvests, the trees visited and the initials of the harvester are given in Table 2. Information for the three 'old' data sets from the years 1995, 1997 and 1998 is provided for the purposes of comparison with the three new data sets from the years 1991, 2000 and 2001.

Year	Start	Finish	Harvests	Tree number	Location	Harvester
1991	13.8.1991	14.11.1991	55	1	Haus Widar	H. R.
1995	5.7.1995	2.12.1995	48	1	Haus Widar	H. F.
1997	17.10.1997	8.12.1997	18	1	Haus Widar	H. F.
1998	12.10.1998	15.12.1998	22	1	Haus Widar	D. S.
2000	12.10.2000	15.12.2000	16	2	Lukas Klinik	H. F.
2001	13.9.2001	11.12.2001	28	3	Institut Hiscia	H. F.

Table 2. Details of harvest in all six periods of investigation. All apple trees investigated are situated in the grounds of the Institute for Cancer Research, Arlesheim, Switzerland.

Immediately after harvest, each berry together with a small piece of stem was carefully cut off its shoot so as to avoid damaging it and thereby risking measurably changing the shape. Each berry was photocopied in two or three different positions (enlarged twofold).

Photocopies of the berries that were sufficiently sharply outlined and not tilted with respect to the light source were selected. Measurement of the berries followed the indications of Edwards (1986). Tangents were placed at the base and tip of the berry image and the long axis drawn in. The long axis of the berry was divided into eight equal sections, intersecting the berry at various levels (T, A-F). Level T bisects the long axis. The diameter of each section was measured at each level and related to the diameter at level T. The λ values were calculated for each level. Further details, formulae and examples are given in Fluckiger & Baumgartner (2002).

Based on the experience of Edwards it is advisable to give various weightings to the λ values at the different levels. We adopted his method and weighted the levels as follows: A and F fourfold, B and E twofold leaving C and D unweighted. From this the average λ values and standard deviations were calculated for each berry as well as for the entire sample on a given day. The latter defines a data point.

The scatter of measurements in the 1991 experiment was greater than in subsequent years. In order to obtain a reasonably comparable data set, the measurement dates with standard deviations greater than 9% (n = 6 out of a total of 55) were omitted from further analysis. The resulting standard deviation of the day mean was around 5%. In 2000 and 2001 all standard deviations from the day mean were under 5%. A tolerance limit was set for the standard deviation of the mean λ value of a single berry: berries with standard deviations greater than 12% were regarded as deformed and the corresponding λ values excluded.

Table 3 lists the initials of the people carrying out the measurements, the number of measurement points and information regarding possibly relevant prior hypotheses which might interfere with the objectivity of the measurements and the blinding of the harvest

One day, in 1939 in winter (I cannot present this in any other form), a delegation of spiritual beings came to me and said approximately the following: "We are the beings which are needed in order to work within the physical and chemical forces in nature in such a way that the formative forces become visible. We have aided you in your striving because we hoped that thereby the force of imaginative perception (bildhafte Urteilskraft) in those persons who came into contact with it would be developed. We feel that we should co-operate only in the task of cognition of the etheric. You have engaged in paths where you demonstrate etheric formative forces, but other people want to make from this proofs along materialistic lines. This is not in the original intention of the spiritual world, which wants to replace materialism by imaginative cognition".

The consequences which I had to draw from this conversation, were that I can personally perform and ask to be performed only such crystallizations where that which the spiritual world revealed as abuse does not enter.'[7]

Pfeiffer is here concerned only with the copper chloride crystallisation method which he developed. However, I feel it applies to all imaging methods that have arisen from anthroposophical endeavour. When I use them, at least to be gin with, it is precisely as Pfeiffer put it: helping beings are needed who soon flee if we force the 'evidence intention' too far in the exoteric direction.

Thus for me the central issue is: how can natural scientific methods originating from the esoteric become a cultural factor in today's exoterically oriented world? There is already a whole list of answers which could and should be discussed one day, for example at a conference.

Acknowledgement

I warmly thank Ursula Balzer-Graf who gave me much practical advice for the successful preparation of capillary dynamolysis experiments and who can contribute much to the question I raised at the end.

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19).

I conclude from my investigations that when repeating Kolisko experiments one needs to take into account the actual constellation conditions. This appeared all the more necessary than I first thought. Indeed, on 28 December 2001 at 8.26 hours GMT there was a conjunction with a 0.6° separation arc which I had taken as 'good', so I was expecting an effect similar to the one on 3 November 2001. Again it occurred but with a maximum 'colour-zone reduction' only two hours after the conjunction. This is not necessarily a contradiction: Rudolf Steiner stressed that Saturn must work 'alone'.[2] This necessitates a detailed appraisal of each particular constellation.

So far I have been able to produce a sufficient number of positive results to encourage me to continue my investigations between December 2006 and October 2007 when the Moon and Saturn once again will have the smallest arcs of separation at conjunctions. From the few experiments that I have managed to fit in alongside my Waldorf teaching work, I do not yet dare to claim that there must in all circumstances occur a correlation between a Moon-Saturn conjunction and the results of capillary dynamolysis with lead nitrate. But the indications that I have been able to gather seem to me to confirm that one cannot simply dismiss Lili Kolisko's experiments out of hand. I welcome the initiative of Johannes Kühl (Science Section, Goetheanum, Dornach, Switzerland) to renew the discussion and I look forward to further contributions.

However, there seems to me to be yet another aspect that is in just as much need of consideration. As I see it there is the issue of whether with such experiments we ought to be proving reproducibly, in the conventional scientific sense, a connection between Saturn in the sky and lead on the earth, or whether this discovery of new phenomena embarked on from esoteric knowledge, ought to be regarded quite differently, namely as a stimulus to a new way of beholding the world, initially as a kind of intuitive looking behind the outer phenomena. In 1945, Ehrenfried Pfeiffer commented on this in an article he called 'A Soliloquy' as follows:

> 'In another realm, in that of crystallization research, a very peculiar experience was had. Crystallization research was started in order to study the "anschauende Urteilskraft" (power of perceptive judgement [a term coined by J. W. von Goethe and subsequently identified in an essay by S. T. Coleridge with 'contemplation'. *Tr.*]) with regard to life processes: that is, to become more familiar with the etheric and formative forces. Under the pressure by some co-workers and the audiences, consisting at first of anthroposophists, it was demanded to develop the crystallization more and more as "proof" for the formative forces. It had not been my original intent to publish the work. But it was talked about so much, that I preferred to make the work public in my own words. Through this "providing of proof" was necessitated, that is from a method started to develop the perceptive judgement, an analytical, scientific method resulted. It was estranged from its original spirit and when the medical application came, the majority of the anthroposophical physicians demanded that the path of "proof" be followed instead of training the imagination. I have complied with this demand out of a feeling of duty, more or less successfully.

date by a third person (St. B.) for measurement.

Year	Data points	Observer	Prior hypothesis	Blinding
1991	49	H. R.	none	no
1995	48	H. F.	fortnightly rhythm	no
1997	18	H. F.	trigon rhythm	no
1998	22	H. F.	trigon rhythm	no
2000	16	H. F.	trigon rhythm	no
2001	28	H. F.	trigon rhythm	yes

Table 3. Details of measurement or determination of λ values in all six study years.

Meteorological data were kindly supplied by the Basel-Binningen Meteorological Station, Venusstraße 7, CH-4102 Binningen, Switzerland. Relative sunspot numbers came from the Solar Influences Data Analysis Centre, Department of Solar Physics, Royal Observatory of Belgium, Avenue Circulaire 3, B-1180 Brussels, Belgium. Astronomical constellation data were obtained from Wolfgang Held, Mathematisch-Astronomische Sektion am Goetheanum, CH-4143 Dornach, Switzerland. These are the same data that form the basis of the ephemeris published by the Mathematisch-Astronomische Sektion am Goetheanum (Held 2001). Daily constellation data were calculated from the positions of all planets in the zodiac at 9.00 hours Central European Time. The boundaries of the constellations set by the International Astronomical Union in 1930 were taken from Delporte (1930). As they are related to the 1875 equinox, they were recalculated for the year 2000 according to the formulae of Voigt (1980) and checked against the Cambridge Star Atlas of Tirion (1996) which is based on the 2000 equinox. The recalculation into ecliptic length was carried out using standard equations of spherical trigonometry (Green 1985).

Results

1991, 2000 and 2001 measurement periods

The development of the λ values in the new measurement periods 1991, 2000 and 2001 correspons essentially with expectations (Fig. 2). The values for 1991 are appreciably lower than those of the later years. Furthermore there appears to be a 'collapse' in the λ values from the end of August to the middle of September. In 2001 too, the λ values rise until the end of October only thereafter assuming a slow downward trend, as happened in the years 1995 to 2000.

In 1991, 2000 and 2001 sunspot activity was generally higher than in 1995–1998 (Fig. 3). Thus it is conceivable that in these years sunspot activity could have influenced λ values, even if this was not the case in 1995–1998 (Fluckiger & Baumgartner 2002). A Spearman rank correlation of λ values and relative sunspot numbers for 1991 showed a significant positive relationship ($p<0.01$), i.e. high relative sunspot numbers appear to be

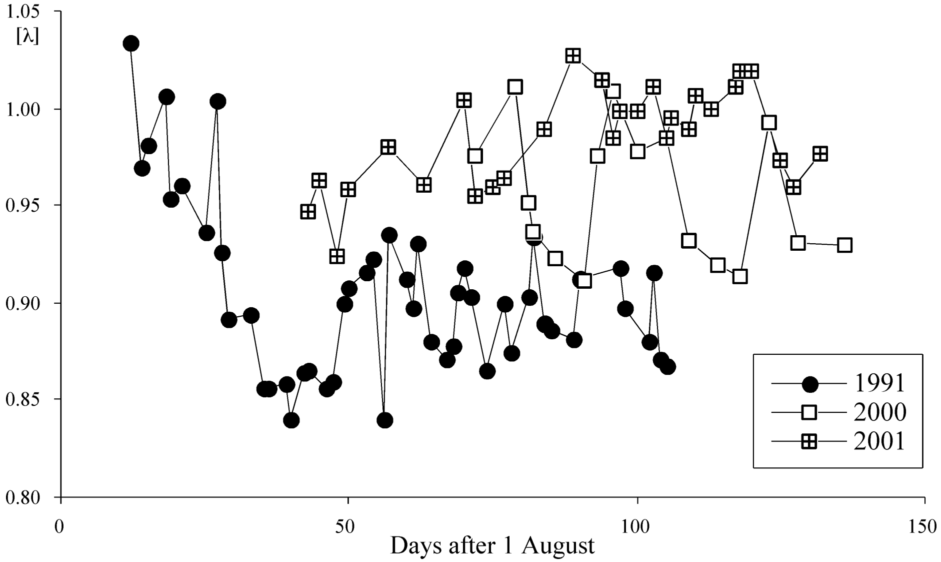


Figure 2. Development of the shape parameter λ in the years 1991, 2000 and 2001 (uncorrected raw data).

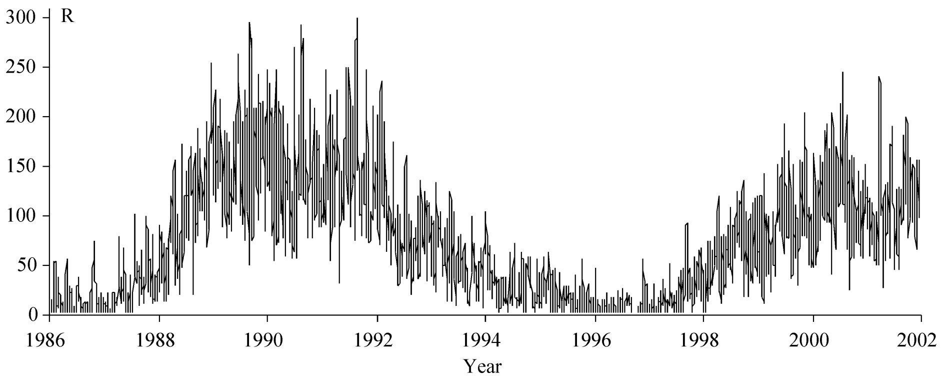
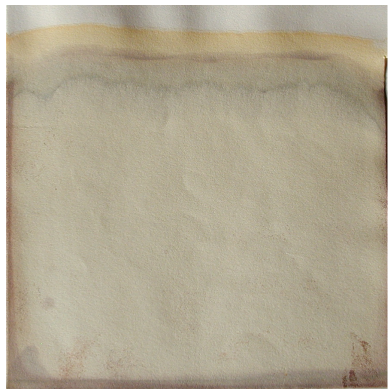


Figure 3. Daily changes in the relative sunspot number R from 1986 to 2002.

associated with high λ values. There was no significant correlation in 2000, but these variables were again correlated in 2001, albeit inversely ($p<0.001$). High λ values were associated with low relative sunspot counts and vice versa. Whether this inversion is attributable to the 22-year activity cycle of the sun's magnetic field or whether it is due to chance must for the time being remain unanswered. The question can only be resolved by obtaining further series of measurements. Therefore, the situation is insufficiently clear for us to be able to 'correct' λ values for any possible effect of sunspot number R.

With lead nitrate *Without lead nitrate (control)*

Figure 13 1 hour before 3 November 2001 conjunction Figure 17



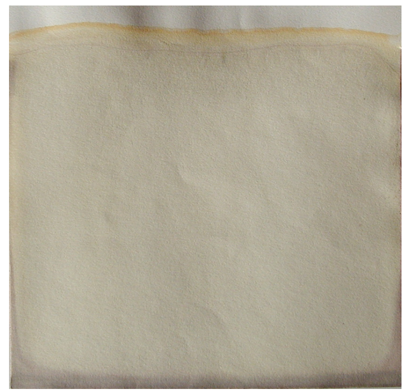


Figure 14 During 3 November 2001 conjunction Figure 18

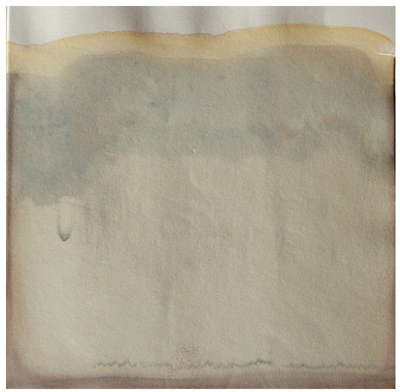


Figure 15 Half an hour after 3 November 2001 conjunction Figure 19

the position of having results from various times of day/night and from various seasons of the year, accompanied by their various conditions of weather, temperature and daylight. But the results were always more or less the same.

I wondered if I could have overlooked something important in all of them. Then it struck me that no two conjunctions are the same. I was able to observe that Saturn remained easily visible while the conjunction was happening. Volker Heinrich had already supplied me with data from which it emerged that at the 1 September 1999 conjunction, for instance, there was a 3.3° arc separating them. This separation varies rhythmically from conjunction to conjunction – as the helpful information from Wolfgang Held of the Mathematical-Astronomical Section of the Goetheanum (Dornach, Switzerland) revealed – leading to the 'moon nodes coinciding with Saturn every 5.86 years'. From this it is clear that there are 'good' and 'not so good' conjunctions. In the best case the separation between Moon and Saturn will be 0°. A total eclipse of Saturn occurs when the separation lies between 0° and 0.25° of arc. Thus, for my work, 3.3° was probably a particularly 'bad' separation. Interestingly, Michel Bader of the Mathematical-Astronomical Section was able to inform me that at the time when Lili Kolisko obtained several of the conjunction pictures that she published, particularly 'good' conjunction conditions prevailed: January 1927, Moon-Saturn separation 0.006°; July 1927, 0.543°. Perhaps Lili Kolisko did not think this particularly important, but it prompted me to wait for the next 'good' conjunction period between June 2001 and May 2002.

And I discovered it was worthwhile waiting! On 3 November 2001 there was a conjunction at 21.33 h GMT with a 0° separation. Fig. 12 shows the initial situation with lead nitrate two hours before the conjunction. Already by an hour before (Fig. 13) it was possible to detect a retreat of the upper coloured zone in favour of the greatly increased, almost colourless middle zone. This effect intensified during the conjunction. The whitish area clearly dominated at that moment, pushing back the lower violetish zone (Fig. 14). And only half an hour after the conjunction this effect was already diminishing (Fig. 15). But the controls showed no evidence of the effect, changing only a little (Figs. 16-

With lead nitrate

Without lead nitrate (control)

Figure 12 2 hours before 3 November 2001 conjunction Figure 16

As with data for the years 1995–1998 (Flückiger & Baumgartner 2002), Spearman rank correlations were carried out between λ values in 1991, 2000 and 2001 and the following meteorological data sets: temperature (°C), pressure (hPa), relative humidity (%), cloud cover (%), wind speed (m/s), each as 24 h mean values; precipitation (mm), hours of sunshine and global radiation (Wh/m^2), each as absolute values. As before, any obvious annual trends in these data sets were eliminated by linear regression. A phase shift in λ values of up to five days was allowed. In 1991, λ values were significantly correlated ($p<0.01$) with temperature (with or without a shift of one day), precipitation (with a shift of two days) and pressure (with a phase shift of three days). As in 1995, 1997 and 1998, there were no significant correlations ($p>0.01$) in 2000 and 2001. Furthermore, as the correlation in 1991 was not particularly strong and occurred in only a short period of time (October) we judged the relationship to be irrelevant.

To be able to compare the 1991, 2000 and 2001 data sets with those of 1995, 1997 and 1998 and to evaluate them together, the long term trend was subtracted. For the 2000 data, analogously to those of 1995–1998, a linear regression was subtracted. For 1991 and 2001 data, a quadratic regression that better fitted the long-wave course of the curve was used. The trend-free form parameter λ' was obtained in this way.

The harvesting dates for 1991 were chosen at random, but those for 2000 and 2001 were deliberately selected in that they were often placed at the junctions of the zodiacal constellations or signs. Because of this it was possible to use only the 1991 data for examining the correlation with the conventional constellations or with the signs. As expected, the trend-free λ' value for moon positions in the fire and earth trigons were below zero (-0.011 ± 0.008 or -0.006 ± 0.008, average ± standard error respectively) and for moon positions in the air and water trigons were above zero (+0.006 ± 0.008 or +0.016 ± 0.013, mean and standard error respectively). A Kruskal-Wallis analysis of variance of the λ' values according to the four trigons gave no significant differences ($p=0.162$). If the values for the fire and earth trigon pair taken together are compared with those of the air and water trigon pair treated likewise there is a significant difference between the two groups ($p=0.041$, U-test).

Measurements with and without prior hypotheses

The measurements for 1997, 1998 and 2000 were carried out with the hypothesis of a moon-zodiac-trigon rhythm in mind and without coded mistletoe berry photocopy data. From this one could hypothesise that the measurements in these years could have been falsified through unconscious manipulations. In contrast, the measurements for 1991 and 1995 were carried out without a hypothesis of moon-zodiac-trigon rhythm. Furthermore, the measurements for 2001 were performed with coded data. Therefore the data for 1991, 1995 and 2001 should have been obtained without the possibility of unconscious manipulation.

The data sets for 1991, 1995 and 2001 ($n=125$) as well as those for 1997, 1998 and 2000 ($n=56$) do not deviate from a normal distribution (Kolomogorov-Smirnov test). The same applies to all data taken as a whole ($n=181$). For this reason it is possible to use parametric statistical methods for all further analysis of the data.

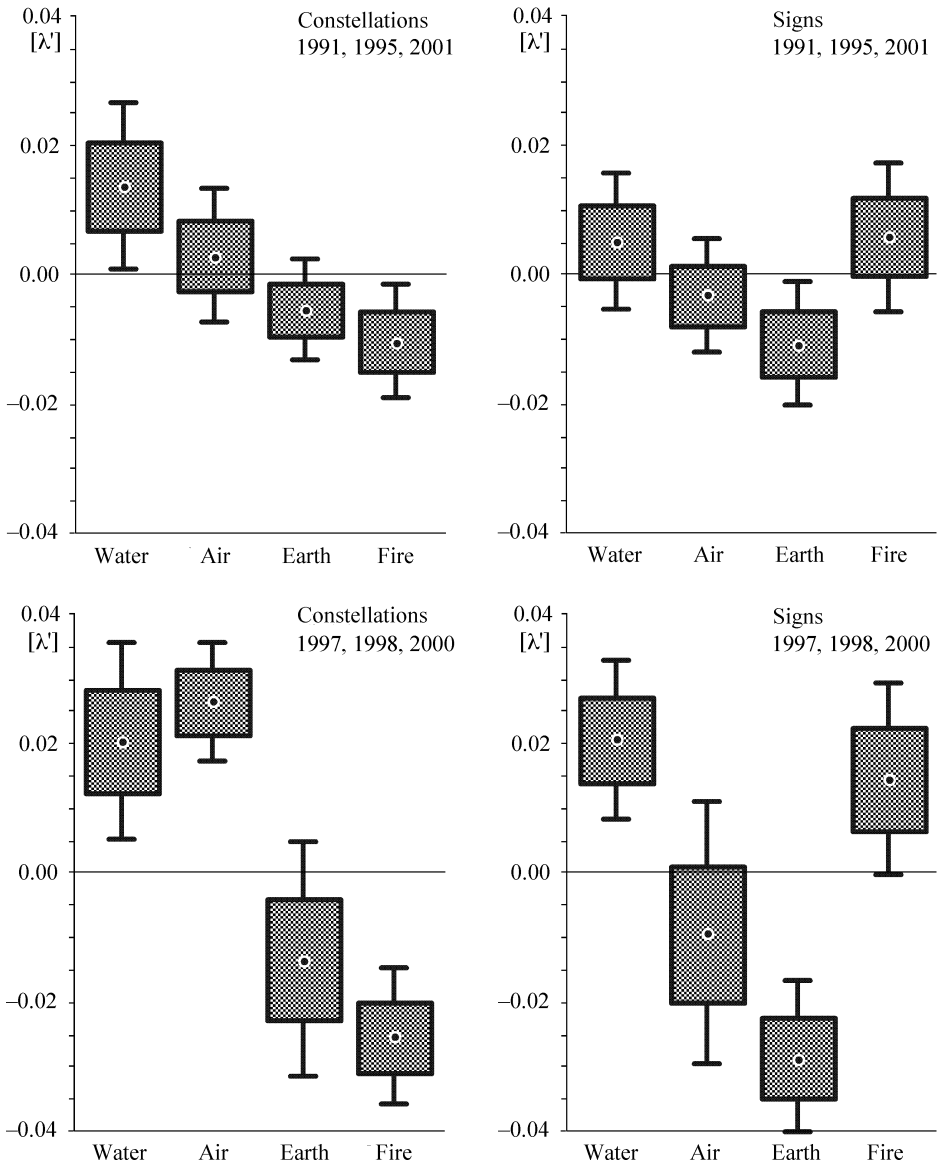


Figure 4. λ′ values of mistletoe berries grouped according to both the position of the moon in front of zodiacal constellations (left) or signs (right) and the study periods without a hypothesis (1991, 1995, 2001; top) or with a hypothesis (1997, 1998, 2000; bottom).

With lead nitrate | *Without lead nitrate (controls)*

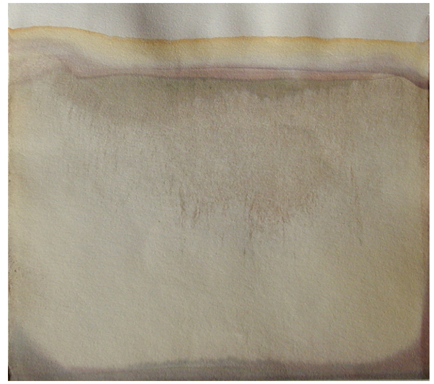


Figure 6 | 1 hour before 1 September 1999 conjunction | Figure 9

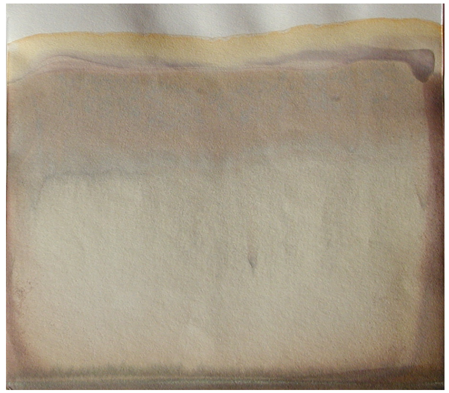


Figure 7 | During 1 September 1999 conjunction | Figure 10

Figure 8 | Half an hour after 1 September 1999 conjunction | Figure 11

Figure 2. Silver nitrate alone

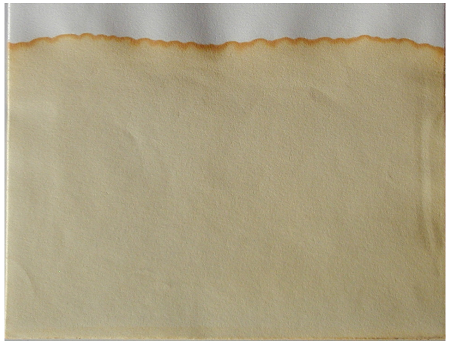


Figure 3. Ferrous sulphate alone

Figure 4. Silver nitrate and ferrous sulphate

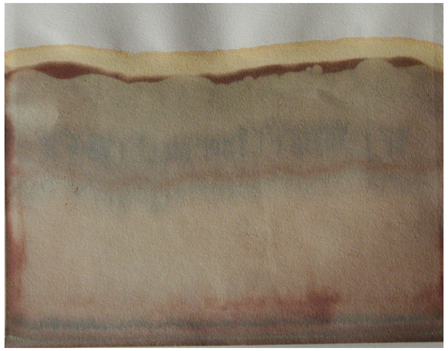


Figure 5. Silver nitrate, ferrous sulphate and lead nitrate

are not visible here. So far, they have hardly ever appeared in my experiments.

On this basis I began to carry out experiments with Moon-Saturn conjunctions. I obtained accurate astronomical data through the friendly help of Volker Heinrich, National Observatory, Frankfurt. A Moon-Saturn conjunction (which normally happens about once a month) occurred on 1 September 1999 at 8.53 h Greenwich Mean Time (GMT). Figs. 6, 7 and 8 show the results with lead nitrate an hour before, during and half an hour after the conjunction. One could say that the picture during the conjunction looks somewhat ‘washed out’ and the brownish-red zone at the top is narrower, whereas the greyish-white zone at the bottom is broader. These tendencies do not occur with the control pictures prepared at the same time (i.e. only silver nitrate, iron sulphate and distilled water, Figs. 9-11). (It is also noticeable from the border effects that I was not always successful in preventing the edges of the paper roll from touching each other. This also applies to subsequent pictures.)

I did not find this result very satisfying. From Lili Kolisko’s results I had expected something more pronounced. So I repeated the experiment several times until I reached

Analysis of variance of the λ′ value data for 1991, 1995 and 2001 (without a hypothesis) according to zodiacal constellations and signs produced an overall significance in the F test at the levels of p=0.006 and p=0.105 respectively. In single comparisons (LSD, least significant difference) according to zodiacal constellations, it was possible to distinguish fire from water (p=0.001) and earth from water (p=0.005). All other pair comparisons were not significant (cf. Fig. 4, top left). From this it can be assumed that the connection between the shapes of mistletoe berries and the position of the moon in the zodiac is not a subjective artefact. At the same time, a preliminary indication is given that the relationship with the constellations is stronger than with the signs (Fig. 4, top). This aspect is examined in more detail below.

The λ′ values for measurement series 1997–2000 made with a hypothesis in mind are shown in the bottom half of Fig. 4. A comparison of the figures suggests that the dynamics of the values measured was greater in 1997–2000 (Fig. 4, bottom) than in 1991, 1995 and 2001 (Fig. 4, top). Indeed, in a two-way analysis of variance, the interaction between the trigon constellation and the period of investigation (1997–2000 versus 1991, 1995 and 2001) is significant (p=0.034). But in individual comparisons (LSD) only the values for the air trigon were significantly different (p=0.036); values for water, earth and fire in the two periods respectively were not significantly different. When the above analysis excluded the data from 2001, in which many measurement points were intentionally placed on the transitions between individual constellations and consequently the differences when grouping the points according to the conventional constellations should be less apparent, the relationship between trigon constellation and period of investigation (1997–2000 versus 1991 & 1995) was no longer significant (p=0.12), i.e. the two series of measurements can be regarded as equivalent.

Furthermore, it could also have been possible that the high solar activity in 1991, 2000 and 2001 (cf. Fig. 3) produced disturbances in the interaction of moon and zodiac that could have obscured differences between the trigons. In the period of investigation 1991, 1995 and 2001 this involved 62% of the data whereas in 1997–2000 it was only 29% (cf. Table 2).

In our view this provides no evidence of a relevant difference between the two measurement periods and therefore no evidence to support the hypothesis that the 1997–2000 data were strongly falsified by unconscious manipulation. Therefore we consider it permissible to group the data for all six years of investigation together and to treat them as a single set in further statistical analysis.

An analysis of variance of trend-free λ′ values for all six years of investigation grouped according to constellations (p=0.00002, Fig. 5, left); signs (p=0.00019, Fig. 6, left); constellation trigons (p<0.00001, Fig. 5, right) and sign trigons (p=0.00006, Fig. 6, right) yielded highly significant results in the F test. In this analysis, the division of the ecliptic into constellations was according to the boundaries of Held (2001). Whether these phenomenologically determined transitions from constellation to constellation represented the optimal choice for this analysis is examined in more detail below.

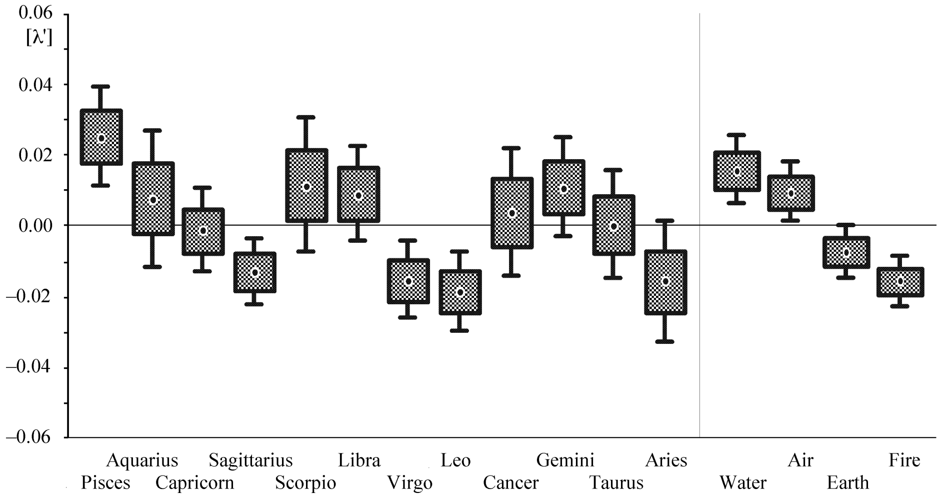


Figure 5. Mean values (± simple and doubled standard errors) of the shape parameter λ′ of mistletoe berries grouped according to the position of the moon in the zodiacal constellations or trigons of the constellations (assignment of constellations according to Held 2001).

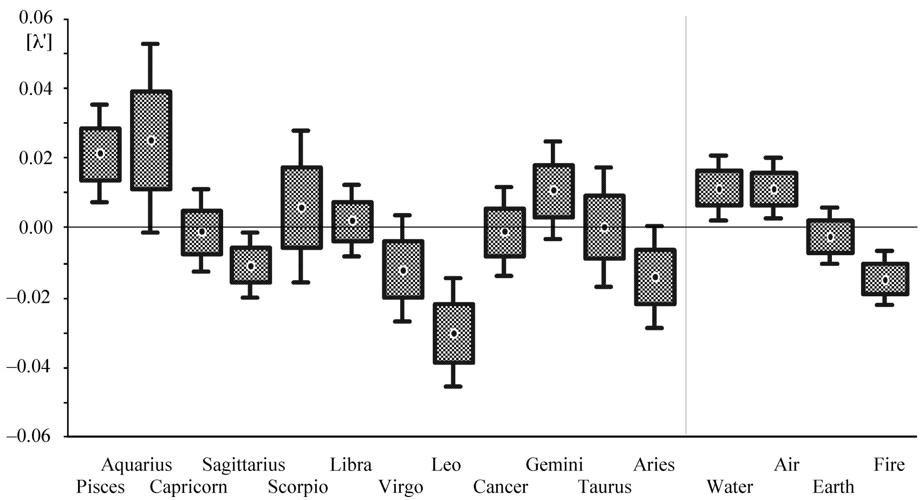


Figure 6. Mean values (± simple and doubled standard errors) of the shape parameter λ′ of mistletoe berries grouped according to the position of the moon in the zodiacal sign or trigons of the signs.

ment, i.e. about two hours before the conjunction, I prepare fresh 1% solutions with freshly distilled water according to Lili Kolisko in glassware used only for these experiments. Each time I allow two replicates to rise up the paper, with and without lead, before, during and after the conjunction.

About 2 min before the appointed time I put 0.9 ml of the silver, iron and lead solution (in this order) in the two ‘lead’ dishes and 0.9 ml silver and iron solution as well as distilled water in the two other dishes. Then I agitate each dish twelve times and place in it the prepared paper cylinder which I hold at the top without plastic gloves. A horizontal adjustable glass sheet is used as a base in order to permit an even rising of the solutions in the papers. The paper sheets point towards Saturn’s position at the time of the experiment; the lengthwise openings in the cylinder in the opposite direction. The remaining factors vary according to the time of day or season of the year, in particular the temperature and the humidity, which under the conditions of my school laboratory would be difficult to hold constant. And the time of day also has a significant influence as the Moon-Saturn conjunction can of course happen at any time during the whole 24-hour day. In this respect I have influenced conditions only insofar as I excluded direct sunlight with curtains.

In complete ignorance of Závesky’s experiments, at first I arrived at results similar to his (their presentation has to be by means of the originals which were photographed for this publication in February 2004; it was not possible photographically to record the chromatograms immediately after their completion, but I find that they darken only a little subsequently).

Lead nitrate alone gives a totally undifferentiated, almost white picture (Fig. 1). Silver

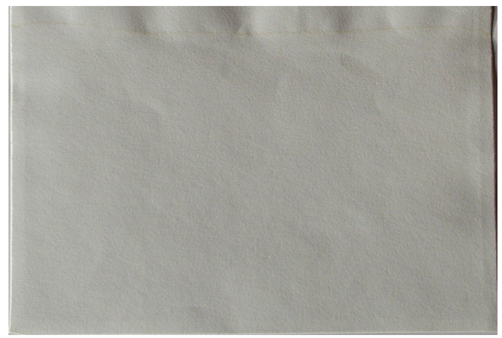


Figure 1. Lead nitrate alone

nitrate (Fig. 2) and ferrous sulphate (Fig. 3) produce brownish-grey and yellowish areas respectively, likewise lacking in differentiation. But silver nitrate with ferrous sulphate gives a differentiation of colour shades (Fig. 4) which is significantly increased by adding lead nitrate (Fig. 5). Fig. 5 is a typical result in my experiments if no special Saturn constellation occurs. It is clear that the drop shapes that Lili Kolisko regularly obtained where then is the documentation of this? When presented with a mineral, I ask: how are we supposed ever to justify such an assertion? And apart from that: how are we supposed to make such things clear to the children from the phenomena?’[4] Certainly Závesky is right when he writes: ‘The challenge of making the cosmic forces fruitful for practical life is a lot more important than just demonstrating such forces experimentally. Ultimately we can learn to distinguish the effects of the cosmic and earthly forces on any plant’. Even so, it does not seem satisfactory to me to approach Steiner’s challenge regarding lead via botanical studies, for instance with hornbeam. Above all, experimentation is an indispensable component of such lessons.

Therefore I began to look into how the matter was tackled by Eugen Kolisko, for whom the aforementioned challenge was set by Steiner with respect to class 12 in the 1924-5 school year. And I came across Lili Kolisko’s informative comment on it: ‘I myself introduced the capillary dynamolysis experiments [meaning the capillary dynamolysis experiments on the different constellations] to the pupils in the Upper School’.[5] Clearly the Koliskos had worked as a husband and wife team, and it is conceivable that Eugen Kolisko introduced the lead topic into lessons in this way. Of course, with Lili Kolisko’s experiments we are not yet dealing with the lead process in the human being, but at least directly with Steiner’s key indication in his first medical course from which *inter alia* we can get closer to the human being: ‘Suppose that a planet in extra-terrestrial space is in an especially favourable position for working on a certain portion of our sphere. Assume Saturn to be the planet in question and that Saturn can best exercise its full influence… Then the Saturnian force impinges directly on our planet. And if conditions are favourable in the portion of earth directly under Saturn’s influence, that unmixed and undeflected Saturnian influence causes a structure to be formed there … Earth’s substances are the combined result of forces from the stars. … In the case cited as illustration, the effect of such action is shown in the production of lead’.[6]

Lili Kolisko considered whether it would be possible to observe some kind of influence of Saturn on lead, when the planet was not able to work ‘particularly favourably’, i.e. ‘alone’,[6] but when another heavenly body stood between it and the earth. An example of such a circumstance is a Moon-Saturn conjunction. When she prepared her capillary dynamolysis pictures at the conjunction, she got results which clearly showed that the extent of the differentiation in the entire picture was greatly reduced in comparison to those prepared at other times. Závesky has already presented the essentials of this.[1]

Lili Kolisko’s observations prompted me to repeat the Moon-Saturn conjunction experiment for myself. Faced with the many imponderables, which all greatly influence reproducibility, I decided to restrict myself exclusively to this kind of experiment and always to keep constant all the factors over which I had proper control. I bought a sufficiently large stock of filter paper (Schleicher & Schuell No. 2043a, 170 x 170 mm) which I am still using today without having to re-order. My capillary dynamolysis dishes were bought new from the Wala company, and are used only for these experiments, each time keeping those for the lead experiments separate from those for the lead-free experiments. I purchased the reagents from the firm Fluka: iron(II) sulphate heptahydrate puriss. p.a., silver nitrate purum p.a. and lead(II) nitrate puriss. p.a.. At the beginning of each experi-

Constellations versus signs

An overview of all values measured presented as a function of moon position on the ecliptic is given in Fig. 7. Values of the same distance (± 0.5°) were combined in a single data point. One λ' value at 354° of $\lambda' = 0.110 \pm 0.016$ lies outside the scale of the figure.

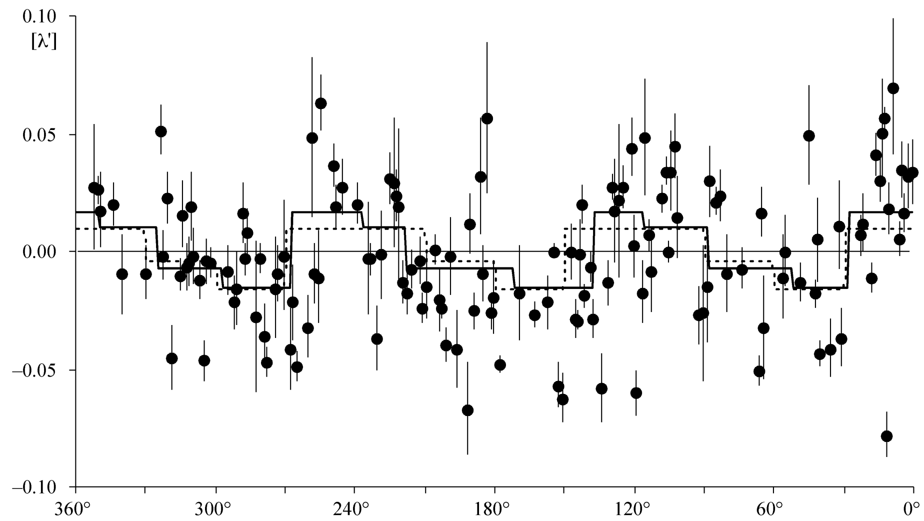


Figure 7. Trend-free shape parameter λ' of mistletoe berries (mean ± standard error) as a function of the position of the moon in the ecliptic (ecliptic length); solid line: expected course according to correlations with the zodiacal constellations (assigned according to Held 2001); broken line: expected course according to correlations with the zodiacal signs.

A first approach to answering the question whether the shape changes of mistletoe berries are better correlated with the moon’s position in the constellations compared with the signs is based on the fact that the division of the ecliptic into constellations (see Held 2001) is different from its division into signs. Of particular interest in this matter are the two regions 138°–150° and 210°–219° (cf. Fig. 8). Low λ' values were expected in the region 138°–150° for the constellation Leo (fire element, Fig. 5) and, in contrast, in the region 210°–219° for the sign Leo high values were expected (fire element, Fig. 6). Likewise, in the region 210°–219° for the constellation Virgo low λ' values were expected (earth element, Fig. 5) and for the sign Scorpio (water element, Fig. 6) high values.

Sixteen data points lie in the aforementioned regions of the ecliptic (138°–150° and 210°–219°); the mean for all data being -0.0121 ± 0.0049 (standard error). Thus the mean is statistically significantly different from zero (p=0.026, t test; p=0.020 U test). This result supports a correlation of mistletoe berry shapes with the moon’s position in front of the non-equidistant, phenomenological zodiacal constellations.

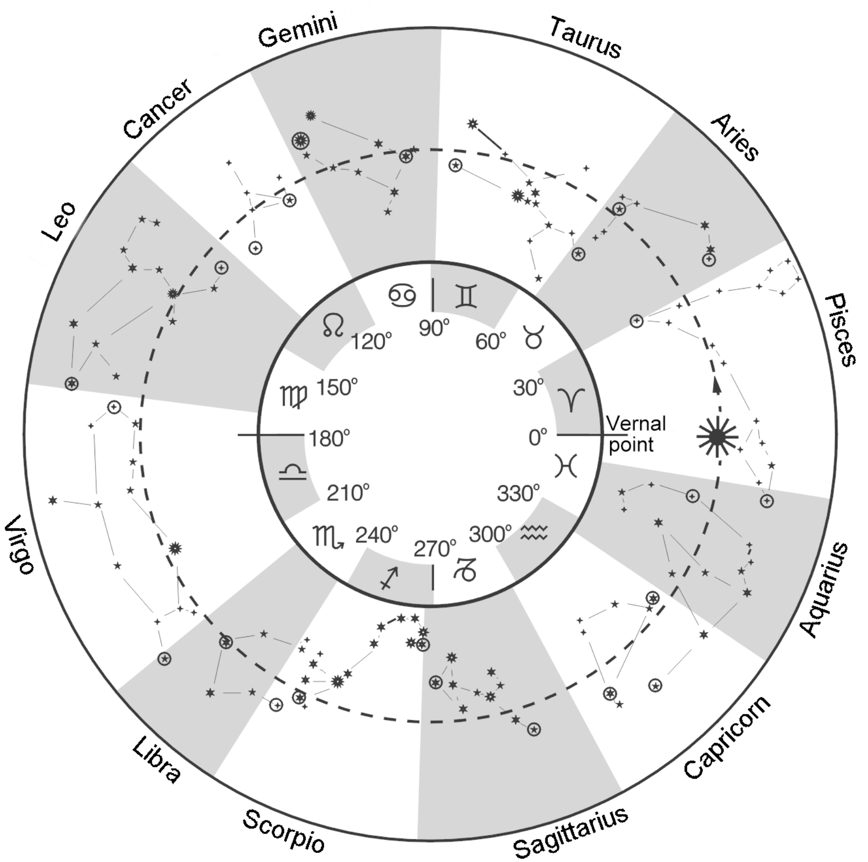


Figure 8. Division of the ecliptic into zodiacal signs (inner circle) and constellations (outer circle); division of the constellations: shading according to the divisions of Held (2001), reprinted with minor changes from Held(2001) with the kind permission of the author and publisher.

Empirical boundaries of constellations

Another approach to dealing with the question of the respective roles of the constellations and the signs is based on the attempt numerically to determine the transitions from low to high or high to low λ' values. This would provide an empirical boundary for six pairs of constellations. A locally weighted regression scatter plot smoothing (‘lowess’, Chambers *et al.* 1983) of the entire data set was used for this purpose. The procedure determines for a given data point a linear regression equation in which a particular percentage P of the surrounding data points are included, with weighting, and from which the smoothed data point is calculated. The greater the percentage P of data points incorporated, the smoother the curve.

Experiments at Moon-Saturn conjunctions using the capillary dynamolysis method of Lili Kolisko

Dirk Rohde

Editorial introduction: The following is a translation by David Heaf of an article which appeared in Elemente der Naturwissenschaft (79, 2003 (2), pp. 123-131). In it, Dirk Rohde was responding to an earlier article by Václav Závesky in the same journal which concluded: ‘Despite many capillary dynamolysis experiments, we cannot show in a single series of chromatograms a significant change in the pattern which correlates temporally with a particular planetary constellation.’[1] Rohde found that in his own experiments this was not always the case. In this contribution to that journal’s ‘colloquium’ he gives a short introduction on the problems facing the Waldorf school chemistry teacher when wishing to present experimental evidence of Rudolf Steiner’s indication regarding the cosmic connections of the earthly metals and then goes on to describe some of his own experiments. The images in the original paper were in black and white. We thank Dirk Rohde for re-photographing his filter papers for this colour re-publication of his article.

I was very pleased to read the excellent, comprehensive and highly informative article by Václav Závesky on his research into Lili Kolisko’s capillary dynamolysis method.[1] I find the results of his painstaking and detailed investigation very instructive and they largely confirm my own observations with the method. That is why I would personally have very much welcomed it if the article had been published a lot earlier. However, in one respect my results diverge from Závesky’s. He wrote: ‘Despite many capillary dynamolysis experiments, we cannot show in a single series of chromatograms a significant change in the pattern which correlates temporally with a particular planetary constellation’. In my experiments this was not always the case.

My approach to this work stems from Stockmeyer’s compilation of Rudolf Steiner’s Waldorf school curriculum for class 12 chemistry lessons where the topics ‘protein’, ‘formic acid’ and ‘oxalic acid’ are also mentioned: ‘The metal processes in man should be approached in such a way that something of the lead principle in man can be understood by the pupils. You must show that all matter and processes are transformed in man’.[2] Not much has been published on teachers’ experiences with the topic ‘lead in the chemistry lesson’. (While this paper was in press the Kassel Research Centre also published on this topic.[3]) Steiner’s challenge to teachers here may at first pose something of a riddle to anyone who takes it up along with his other indications on lead.

How does one get beyond the stage of conventional lead experiments that can be read about anywhere? Chemistry teachers certainly cannot merely pass on Steiner’s research results, but rather it should be possible to demonstrate them experimentally during lessons and then relate them to concepts relevant to today’s pupils. Von Baravalle, one of the early teachers at the first Waldorf school, drew attention to this problem: ‘“In fact metals do not come from the earth, but are rayed in from the cosmos” … How do we know that? From the depths of Steiner’s spiritual science it is said that planets work on metals. So

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Translated by David Heaf.

In the present instance lower and upper limits of this percentage were fixed such that a) the smoothed curve showed at least six transitions through zero (P≥8%) and b) the smoothed curve just crossed the curve expected from the mean values at all maxima and minima (P≥16%). The percentage was then varied in 2% steps and the zero transitions of curve fit held fixed (Table 4; See fig 9 for an example of the middle curve with P=12%). The mean and standard deviation (Table 4) were calculated for each constellation boundary from the five curve fits and compared with the boundaries determined otherwise (Table 5).

Values listed for comparison – apart from those of the signs – include the phenomenologically determined boundaries of both Held (2001) and Delporte (1930). The Delporte divisions were agreed in 1930 by the International Astronomical Union as the 'official' cartographic division of the celestial sphere. According this division there is the extra constellation Ophiuchus situated on the ecliptic between Scorpio and Sagittarius.

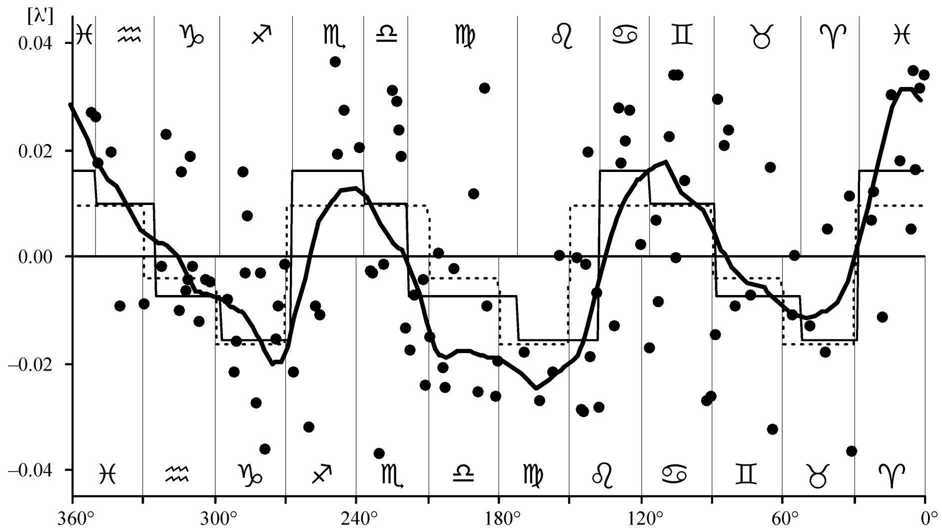

Figure 9. Points: trend-free shape parameter λ′ of mistletoe berries (means only, extended y-axis) as a function of the position of the moon in the ecliptic (ecliptic length); solid stepped line: plot of means according to correlation with the constellations (divisions according to Held (2001)); broken stepped narrow line: plot of means according to correlation with the signs; solid bold line: locally weighted regression scatter plot smoothing (P=12%); vertical lines above: division and boundaries of the constellations according to Held (2001); vertical lines below: division and boundaries of the signs; see Table 1 for key to the symbols of the constellations and signs.

Data included in fit [%]	Pisces to Aries	Taurus to Gemini	Cancer to Leo	Virgo to Libra	Scorpio to Sagittarius (Ophiuchus)	Capricorn to Aquarius
16	30.1°	83.5°	134.2°	222.2°	258.6°	317.3°
14	29.2°	83.5°	134.2°	219.5°	259.5°	316.4°
12	28.3°	84.4°	133.3°	218.6°	258.6°	315.5°
10	26.6°	83.5°	132.4°	217.8°	257.7°	313.8°
8	26.0°	83.5°	131.8°	218.0°	257.0°	314.5°
Mean	28.0° ± 1.7°	83.7° ± 0.4°	133.2° ± 1.1°	219.2° ± 1.8°	258.3° ± 1.0°	315.5° ± 1.4°

Table 4. Empirical boundaries between six constellation pairs (ecliptic length) calculated by the zero transition of a locally weighted regression scatter plot smoothing; individual values for various percentages used in the smoothing process together with mean value and ± standard deviation.

Boundary	Pisces to Aries	Taurus to Gemini	Cancer to Leo	Virgo to Libra	Scorpio to Sagittarius (Ophiuchus)	Capricorn to Aquarius
Mistletoe berries	28.0° ± 1.7°	83.7° ± 0.4°	133.2° ± 1.1°	219.2° ± 1.8°	258.3° ± 1.0°	315.5° ± 1.4°
Delporte, 1930	28.7°	90.1°	138.1°	217.9°	247.2° // 266.2°	327.5°
Held, 2001	29°	89°	138°	219°	268°	326°
Sign of zodiac	30°	90°	150°	210°	270°	330°

Table 5. Empirical boundaries between six constellation pairs (ecliptic length) determined empirically from changes in the shape of mistletoe berries or based on the traditional constellations; the divisions of Delporte (1930) were agreed by the International Astronomical Union as the 'official' cartographic division of the celestial sphere. According to this division there is the extra constellation Ophiuchus situated on the ecliptic between Scorpio and Sagittarius (247.2°–266.2°).

questions requires an improvement of the method of measurement, including both rationalisation of the measurement and reduction of the scatter.

One may also ask whether the rhythmic changes of the berries is reflected in the composition of specific substances within them or with other qualities. If this is the case then it raises the question whether taking such rhythms into account during the mistletoe harvest can be made use of for optimising the quality of plants intended as raw material for pharmaceutical preparations.

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& Böker 1997). Astrology, developed in Greece in antiquity, was not at that time as formalised as it is today. Thus for most Greek authors of the textbooks of that time the constellations were either gods or subordinate gods (demons or astral beings) which were also the object of cultic worship. Correspondingly it seems plausible that certain mood flows could be emitted by these astral beings and have an effect not only on human beings but also on the whole of the natural world (weather, plants and animals). The astrology that existed at that time attempted to grasp these connections.

That the moon is intimately connected or rhythmically correlated with many living processes on the earth can be regarded as an established fact (see for instance the reviews of Endres & Schad (1997) and Burns (1997)). In particular synodic moon rhythms have been observed in many species of plants and animals.

Significantly more controversial is the issue of whether sidereal moon rhythms could be reflected in biological phenomena. The results of the extensive series of experiments of Thun and Heinze (1973), which clearly pointed to a moon trigon rhythm in agronomic parameters of harvested crops, could be reproduced by Abele (1973, 1975). Graf (1997) was also able to observe correlations of moon trigon constellations with certain plants, but not with others. However, Lücke (1982) and Spieß (1994) found – according to their own conclusions – only a relatively weak correlation or no correlation at all of the moon's position in the zodiac with the size of harvests of various cultivars. But Kollerstrom and Staudenmaier (2001) carried out a modified statistical analysis of a sub-group of the data of Lücke and Spieß and obtained a significant effect for certain moon trigon constellations.

The measurements carried out in this work on shape changes in ripening mistletoe berries have no direct connection with the agronomic studies cited above. Because of the differing parameters measured in the present study, namely the geometric shape of mistletoe berries instead of agronomic crop yield and because of the completely different experimental design based on both investigation of harvesting rather than sowing dates and observation of mistletoe, a plant of no interest to agronomy but with many unusual botanical and spiritual-scientific features (cf. e.g. Ramm (1995) and Dorka (1997)), the results presented here cannot be used directly to support particular views on the agronomic effect of the moon (synodic versus sidereal). But in principle they do show that it is possible to make correlations between the moon's position in constellations of the zodiac and biological phenomena.

Prospects for further work

The results presented here again raise questions which lead further. For instance, for the time being it remains open as to whether the rhythm of mistletoe berries and moon trigons occurs to the same extent in other host trees (apple of the same or differing varieties; oak or other mistletoe hosts). Likewise the question remains as to a possible influence of solar activity.

It would also be interesting to know whether the shapes or optimal regions of efficacy of the constellations can be determined more precisely and whether between all constellations there occur zones of weaker effect or even neutrality. Moreover, answering these

Table 5 and Fig. 9 indicate that, in general, the empirically determined boundaries fit appreciably better to the boundaries of the constellations than to those of the signs. Thus the drop in the λ' values between the constellations Cancer and Leo at about 133° definitely occurs before the transition between the signs Leo and Virgo (150°). The same applies to the rise in the λ' values between the constellations Virgo and Libra. The empirically determined zero transition at 219° fits better to the course of the constellations than to that of the signs Libra/Scorpio (transition at 210°).

From this we assume that it is the position of the moon in front of the phenomenological constellations that is to be correlated with shape changes of mistletoe berries, whereas the equidistant signs are irrelevant.

The empirically determined transitions based on mistletoe berry shapes between the pairs of constellations Pisces/Aries (28°–29°) and Taurus/Gemini (84°– 90°) agree very well with the traditional constellation boundaries (Fig. 10); whereas for the transitions Scorpio/ Sagittarius (250°–270°) and Capricorn/Aquarius (315°–330°) there are large differences (cf. Fig. 10 and Table 5). Interestingly a feature of both transitions is that they are also phenomenological peculiarities.

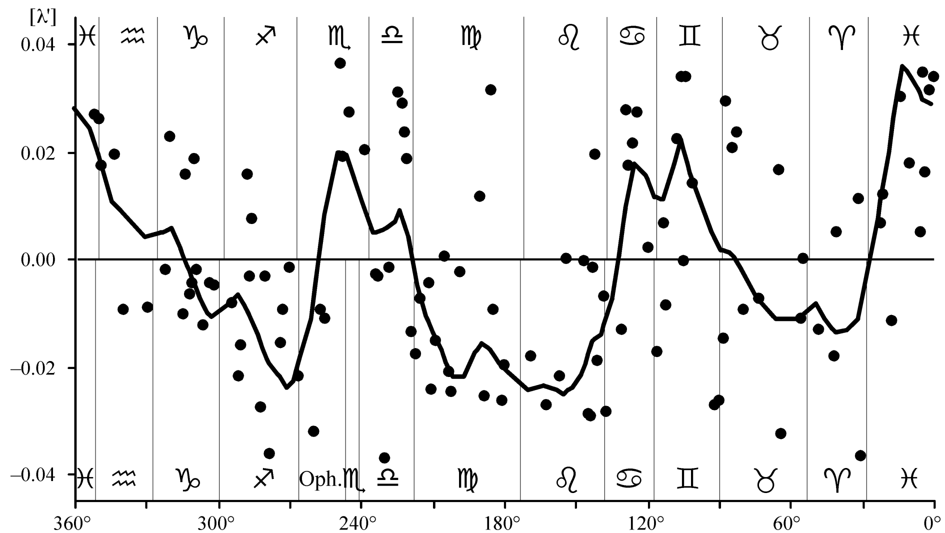

Figure 10. Points: trend-free shape parameter λ' of mistletoe berries (means only, extended y-axis) as a function of the position of the moon in the ecliptic (ecliptic length); solid bold line: locally weighted regression scatter plot smoothing (P=8%); vertical lines above: division and boundaries of the constellations according to Held (2001); vertical lines below: division and boundaries of the constellations according to Delporte (1930) (established by the International Astronomical Union); see Table 1 for key to the symbols of the constellations.

The upper end of the constellation Scorpio only just reaches the ecliptic; the greater part of this constellation being situated below the ecliptic (cf. Fig. 8). According to the International Astronomical Union, between Scorpio and Sagittarius in the region 247°–266° of the length of the ecliptic lies the additional constellation of Ophiuchus (cf. Fig. 10 below). This constellation, which was recognised in ancient times, is not normally included in the zodiac. Indeed, although it is represented in the earliest known star survey of Ptolemy (AD 161) it is assigned not to the zodiac but to the constellations of the northern hemisphere, despite the fact that its lowest star, even according to Ptolemy's own division, takes it significantly across the ecliptic.

The mistletoe berries from 258° moon position still seem to be under the influence of Scorpio (positive λ' values) and thereafter cross directly into the region of influence of Sagittarius (negative λ' values). According to the available data, no plateau of indifferent λ' values (≈ 0) can be distinguished that would point to a 'neutral zone' in the zodiac. The boundary of about 258° corresponds to the point on the ecliptic roughly equidistant from the brightest stars of the constellations Scorpio and Sagittarius (Fig. 8).

Likewise, the transition from Capricorn to Aquarius (315°–330°) should also be regarded as a special configuration of constellations, as Aquarius protrudes into Capricorn from above and – according to Delporte (1930) – almost reaches as far as the ecliptic (cf. Fig. 8). Thus for the mistletoe berries the transition from Capricorn to Aquarius already begins at 316° (cf. Table 5 and Figs. 8 & 10). This points to an influence of the constellation Aquarius which significantly stretches into the phenomenological constellation of Capricorn.

In Fig. 10 it is also noticeable that the smoothed curve (with 8% weighting) generally appears to be double-peaked. The question thus arises as to whether there could be a zone of weaker influence between all constellations.

Regions of optimal constellation effect

In contradistinction to the question of the *boundaries* of the constellations, one could ask what are the *optimal regions of influence* of the constellations. According to Fig. 10, in general these lie roughly in the middle of the constellations. Scorpion, Sagittarius, Capricorn and Aquarius appear to comprise a certain exception which may be connected with the unclarities in the boundaries of the constellations discussed above.

If we must pick out from within each element trigon (fire, earth, water, air) a constellation that is associated with the most pronounced shape changes, then for the element fire it would be the constellation Leo; for earth, Virgo and for water, Pisces. These constellations of the ecliptic have the greatest spreads on the celestial sphere and show the biggest swings within their respective trigons. Interestingly, these are the constellations that lie closest to the celestial equator. To this we add an indication of Steiner (1917) who saw the involvement of 'cosmic direction-streams' Pisces/Virgo as a project for a future 'healthy science'. Therefore, for reasons of symmetry, we would choose the constellation Aquarius for the element air, even if it does not appear to particularly stand out in the data set – which moreover could also be attributable to the below-average number of data points.

Conclusion and discussion

The two main questions investigated can be answered as follows:

1) In our view there is no evidence that as a result of unencoded determinations the measurements of the mistletoe berry shape parameter λ were falsified through unconscious manipulation.
2) Regarding the relationship of mistletoe berry shapes and the moon's position in the zodiac, the moon's position in front of the phenomenologically observable non-equidistant zodiacal constellations appears to be determining, whereas the moon's position in front of the equidistant zodiacal signs appears to be irrelevant.

The second finding accords (indirectly) with Steiner's spiritual-scientific investigations insofar as there is an entry in his notebook for his lecture of 3 November 1923 in which he presented a clear relationship of the mistletoe plant to various elementary beings (Groddeck 1972): 'Mistletoe has a relationship with the undines; they avoid the gnomes – banish them – its sap penetrates both the root system, expelling the gnomes, and the flowering system, driving out the fire spirits = it works as a chemical element permeated with light.' According to Steiner, both fire and earth elemental beings are driven away from mistletoe or avoided by it whereas it has a relationship with air and water beings. This corresponds with the polar behaviour of the mistletoe berries with the positions of the moon in front of the fire/earth and air/water trigons (cf. Fig. 5). In connection with this observation it is possible to formulate the question as to whether, according to the positions of the moon in front of fire/earth or air/water trigons, corresponding elemental beings unfold a more intensive activity on mistletoe plants – or perhaps even generally in the plant world.

In the context of the long-term shape changes of mistletoe berries in the course of their ripening process from autumn to winter, during which the λ value generally decreases, low λ values with the moon's position in front of fire and earth trigon constellations could be interpreted as a promotion of the ripening process, whereas high λ values with the moon's position in front of the air and water trigon constellations could be regarded as inhibiting the ripening process. Therefore, in the context of mistletoe's very slow development (Ramm 1995), its relationship to air and water beings could be helpful to it in delaying the ripening process of its berries as much as possible.

In comparison with the findings of Edwards (1986, 1992–8), which demonstrated a roughly fortnightly rhythm in λ values of plant and tree buds that he correlated with moon-planet relationships, mistletoe berries appear to be connected not with the planets – other than the moon – but primarily with the zodiac. Whether this is to do with the special nature of the mistletoe plant or with the fact that we investigated berries instead of buds cannot be answered at this moment. Support for the former proposition is that mistletoe 'as a plant beheld by the seer is very different from other plants. In particular it reveals to a certain extent an astral body which as with animal bodies penetrates the mistletoe' (Steiner 1908). This astral body – atypical for a plant – could mediate contact with the sphere of the fixed stars and thus with the zodiac beyond the sphere of the planets.

The theory of the trigon aspect in the zodiac and its connection with the classical elements (fire, earth, water, air) is generally attributed by historians to Hellenic culture (Gundel