

The Sparkling Droplet

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(Original title: Der funkelnde Tropfen. Merkurstab special suppl. English by A. R. Meuss, FIL, MTA)

As this material is presented to mark a special occasion, I hope I may be permitted to start with some personal comments.

Having decided to study medicine, I chose to go to Freiburg University. I had found out that a group of students was actively working out of Anthro-posophy there, and Domach was in easy reach of Freiburg. What I did not know, though perhaps I might have had some idea - I had not been to a Waldorf school and had found Anthroposophy at the age of 17 - was that now in the Summer of 1932 I was to meet a group of people in Freiburg who were to remain friends for life. Thus, we entered into the new field of anthroposophical medicine which demanded responsible attitudes, and this continued to strengthen the bonds and bring constant renewal.

Gisbert Husemann, 25 at the time, was the senior and main initiator of the extremely active group. The main task was a systematic study of Rudolf Steiner's basic works and lectures on the theory of knowledge and medicine. Considering the mass of material presented in the lecture theaters, eurythmy and speech exercises helped us not to become too intellectual. No relevant secondary anthroposophical literature being available at the time, we had to probe the mysteries of nature for ourselves. Seeing deadly nightshade plants of more than a man's height on the Kaiserstuhl hill, for instance, we were able for the first time to see why this medicinal plant with its many actions must be poisonous, with the flowering impulse coming in much too early, penetrating the whole shoot system prematurely and filling it with astrality. The strange shift in shoot development, with the harmony between vertical and spiral tendencies upset, became a real experience to us.

We'll all be grateful to this day that the senior students managed to get special permission for us to visit the metal ore mines of the Schauinsland mountain, which is also known as the "ore box." We had often stood on the top and seen the whole range of the Swiss Alps magically illumined. Now, we experienced the opposite extreme when we saw the long veins of lead glance and zinc blend with their accompanying quartz veins in deep-down clefts. We needed to connect intensely with these medicinal substances produced by mother earth, going beyond abstract chemical formulas. But the high points were the courses given under the personal supervision of Dr. Ita Wegman at the Clinic in Arlesheim at the end of every semester.

There, we worked above all on the courses given for medical students and junior physicians. We were also given an introduction to eurythmy therapy by Dr. Kirchner-Bockholt and made our first attempts at painting with Dr. Hauschka-Stavenhagen, which provided us with a basis for understanding art therapies and, later, prescribing them.

Within the medical group, I took courage and gave my first talks on the Golden Section and the significance of the pentagram in the human organism (we had already worked with the pentagram in eurythmy). After all, the very

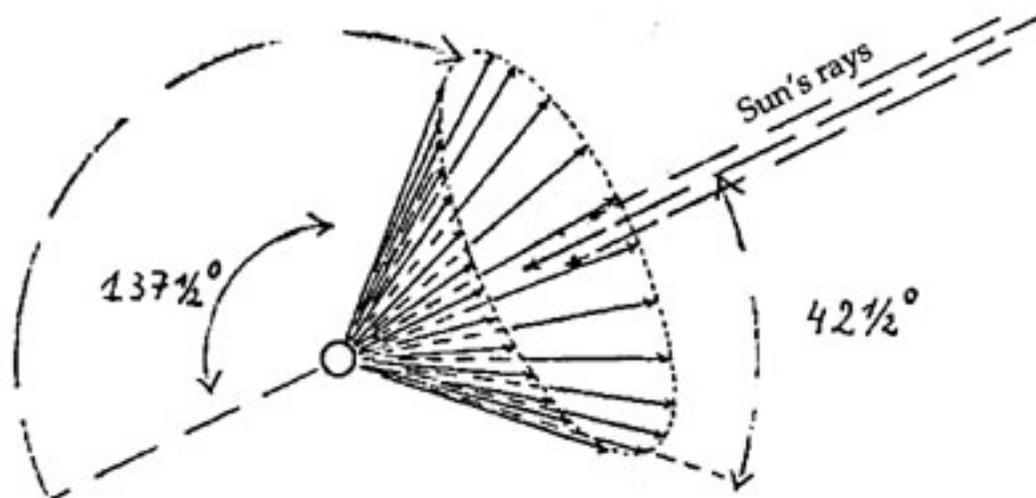


Figure 1. Refraction and reflection in a droplet of water. Fan-like color cone seen in dew drops and raindrops. Slightly amended from the author's book on Northern lights, lightning and rainbow,(4) with kind permission of the publishers.

first thing I had done in Freiburg had been to go to the University library where at last I got hold of a copy of a book by Prof. A. Zeising.(1) As a boy, I had known of its existence from forays into my father's bookcase. To my surprise I found that the word "eurythmy" had existed as early as the 19th Century.

Zeising's discovery is not given the recognition it deserves. He found that the Golden Section was the key to the human form sought by so many artists. Anatomically, this is a truly Goethean approach that enables us to see every part in the light of a greater, ideal whole. This is a classical example of taking the purely analytical method, in which things are taken apart, a method that also has its justification but takes us away from the spiritual and creative aspect, and being able and compelled to bring in a different, holistic approach. Then, the image of man that sustains us will not be wholly lost. On the other hand, realization that the human form is wholly organized and differentiated in the "divine proportion" can make us aware of this as a direct expression of the work of creative etheric powers. The life body as "architect of the physical body" (R. Steiner) has five main currents running through it that combine in a pentagram. "These five currents lie hidden in the human being; the healthy ether body presents in such a way that they are its skeletal structure, as it were."(2) The pentagram is the archetypal form of the Golden Section, an important bridge linking the study of physical objects with an approach in which the etheric aspects are considered at the level of images.

It is only recently that I heard from Hermann Ehret, author of the newly-published biography of hmanuel Hermann Fichte, that Prof. Adolf Zeising was among the friends of this eminent, spiritually-oriented son of the philosopher, Johann Gottlieb Fichte. He was one of the individuals in the forgotten

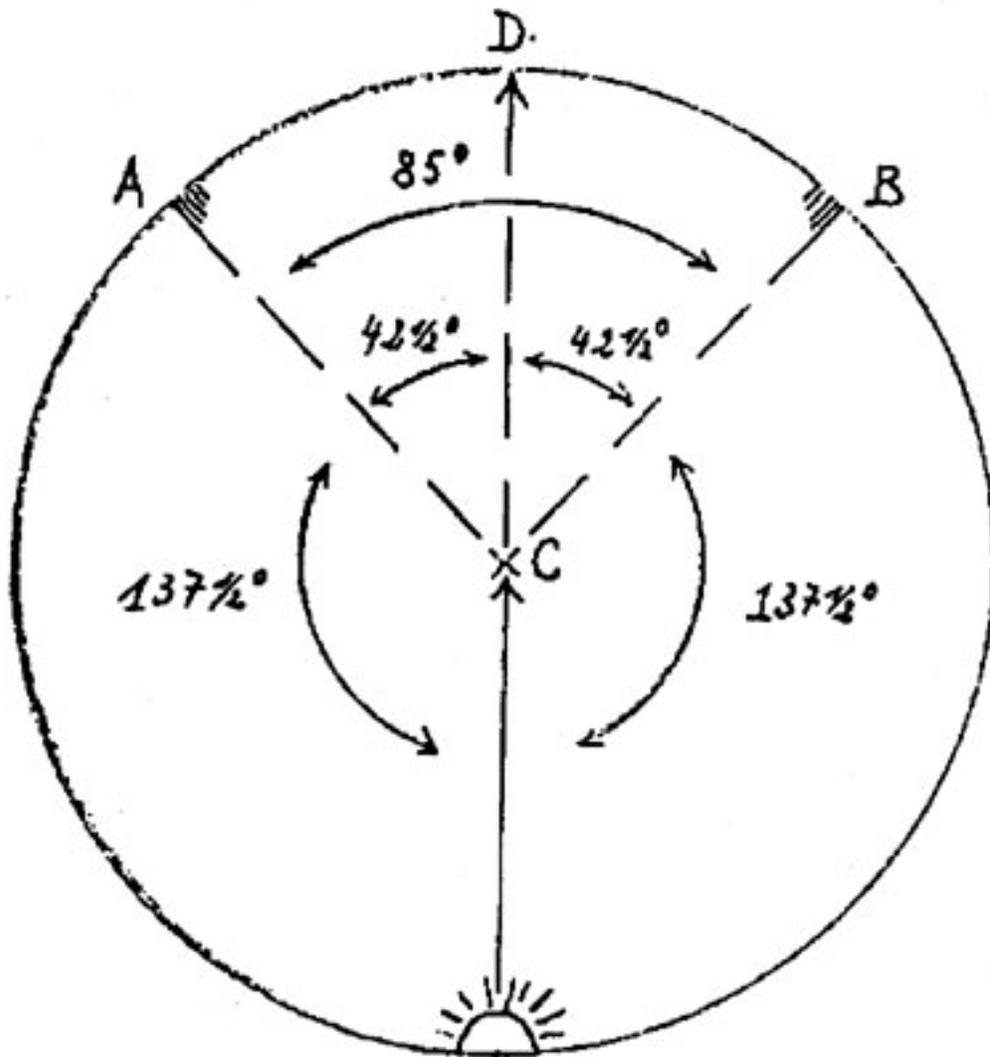


Figure 2. Angles in rainbow seen from C and projected on to horizon at sunrise and sundown. D marks the center of the arc, exactly opposite to the sun, A and B the points where the rainbow meets the horizon. The 85° angle between CA and CB subtends the arc of the rainbow.

stream of German cultural life who sought to preserve Goetheanism when darkness fell in 1840 so that it might live on until the age of light would come. Their writings had been "buried" (R. Steiner).

The question as to the nature of the Golden Section as it presents in the realms of nature, in the planetary system and in the human organism has occupied the writer's mind throughout life. With a certain inner inevitability, it ultimately led to the question of the measure of the rainbow. The answer will be pursued in what follows.

In the 4th lecture of his *Course for Young Doctors*,⁽³⁾ Rudolf Steiner gave a meditation that encourages us to consider the threefold plant and trace the three fundamental processes known as Sal, Mercury and Sulfur. These create a link between medicinal plant and threefold human organism.

As we consider the mercurial processes that mediate the polarity between light-related flowering impulses and earth-related root powers, we discover a connection with the morning hours. The meditator is asked to pay special attention to the dew drops that line the margins of leaves like bead necklaces, catching the light of the sun. The observer has to find exactly the right position relative to the incoming ray of the sun if the glitter is to change into the enchanting sparkle of all the colors of the rainbow, bringing to mind the pure colors of precious stones. Often, the whole color spectrum will shimmer in the carpet of tiny droplets covering the surface of the leaf.

Every drop is a reflection on the small scale of the macrocosmic world and its spherical bodies. In terms of physics, it reflects part of the light which is passing through it in the form of a circular cone of color, which is due to diffraction, refraction and reflection (Fig. 1). This delicate "light flower" holds all the colors of the spectrum. Deviation from the central sun ray is always approx. 42 degrees. The observer, his back to the sun, must be within this angle, looking at the droplet from the left, the right or from above if his pupil is to capture the play of colors.

Here, we see on a small scale a process that happens thousands of times as a rainbow is created. When the tremendous abundance of streaming raindrops crosses the stream of light from the sun, millions of those color cones combine to form a flowing sea of color in the atmosphere. The human eye takes from this the great arc of color that rests in itself in majesty. A kind of reversal occurs, creating a "macrocosmic" counter image of the small droplet flower which is its polar opposite. If this reversal of rays reaching the human eye were visible to us, a half cone of color would appear, its tip touching the eye. Every human being sees only his own rainbow, which belongs to him, and this shows the special relationship we have to this marvelous natural phenomenon.(4)

The relationship to the colors that develop in tiny droplets can also be seen in the proportions of the rainbow on the macrocosmic scale. From the center of the arc, which is always directly opposite to the sun, every point on the outermost red margin is at an angle of 42 degrees to the central line. If the sun is relatively high up in the sky, we do not, of course, see the whole semicircle but only part of it. The fact that the rainbow only appears in its full glory at sunrise and sunset reveals its special relationship to the hours of morning and evening. What follows must, therefore, have its beginning in these ideal moments. Fig. 2 shows the points on the 360 degree horizon where the rainbow meets the earth at sunrise or sunset. The observer would be at the center C. The proportions are the same as for the small color cone seen with the droplet (Fig. 1). The arc is 85 degrees. The angles from the sun to the points where the rainbow meets the earth are $137 \frac{1}{2}$ degrees each. Is this chance, or does it reflect a higher order indicating a relationship to the universe as a whole?

Phenomenologically, the rainbow may be seen to play a mediating role in many natural processes. It appears between light and darkness, needing both the cloud which obscures and the brightening blue sky. Belonging to the 6 hours of morning and evening, it is essentially connected with the sun when it is in the East or the West.

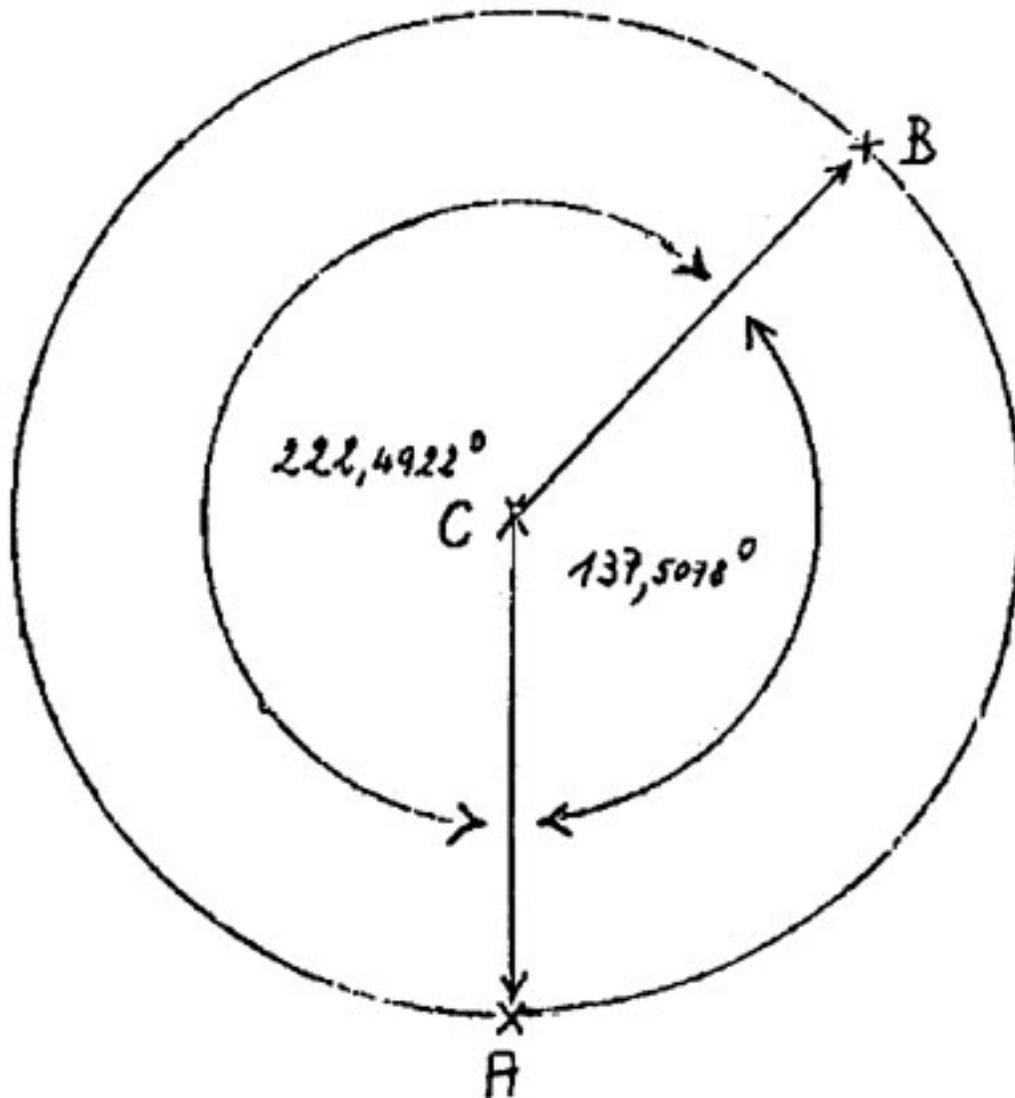


Figure 3. Zeising's division of the circumference of a circle in the proportions of the Golden Section.

The chapter on northern lights, lightning and the rainbow(2) shows in detail how the harmonious sequence of colors and the whole mysterious phenomenon of the rainbow hold a middle position between the vehemence of lightning striking the earth and the evanescence of the northern lights. These arise in the hours of noon and midnight respectively and relate specifically to Summer and Winter. This takes us to the threefold light organism of the earth, where the flashing belt of tropical thunderstorms is connected with the northern light crowns in the polar regions through the two semicircular bands of color that span the globe at dawn and dusk. The day-side of their mercurial zones is the home of all the rainbows; these vanish as the sun rises higher towards noon.

The next step was to see if a relationship exists between the rainbow and the unique ratio of the Golden Section. We know that however much this is divided, every part retains its proportional relationship to the whole. In abstract mathematical terms and relating to a line

segment, this means that on asymmetrical division, the smaller part (the minor) shows the same proportional relationship to the greater part (the major) as the latter does to

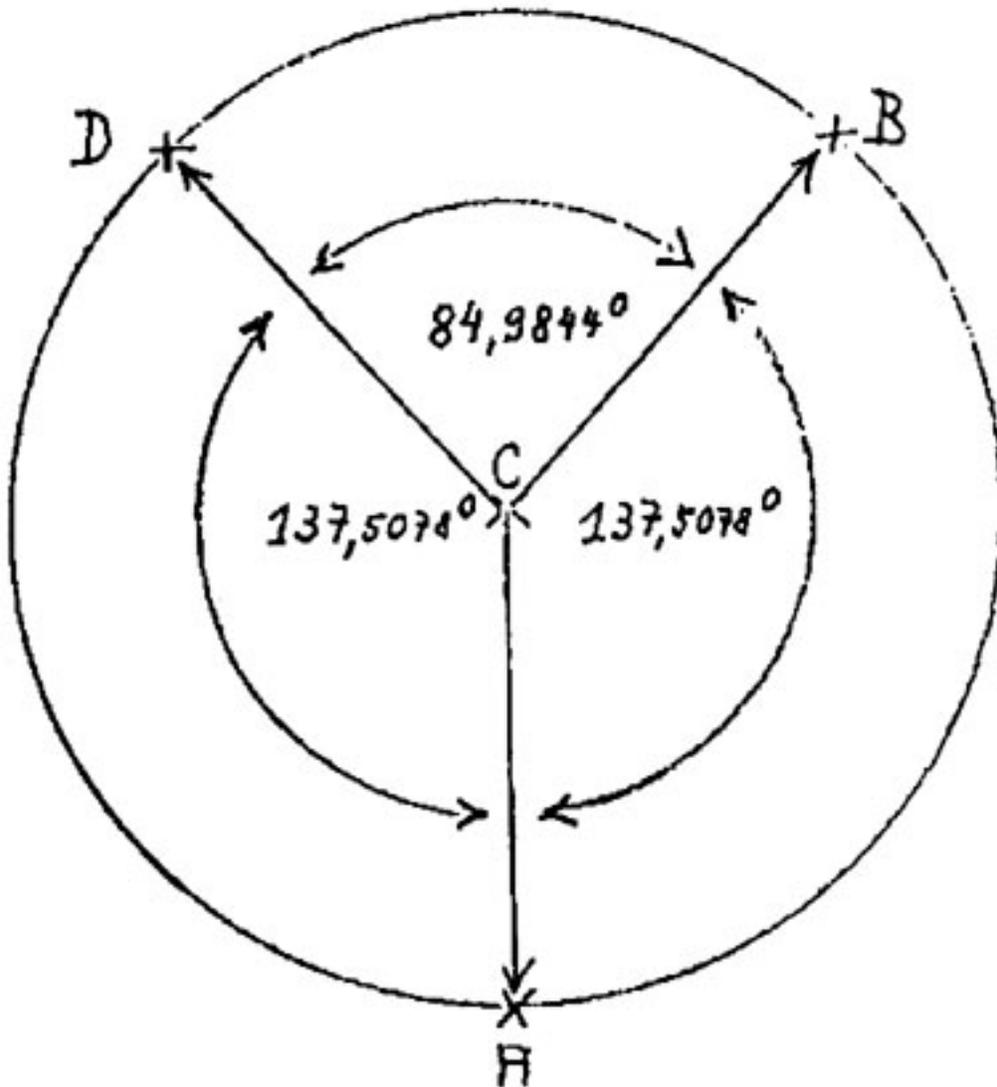


Figure 4. Further proportional division of the major in Figure 3 gives a new minor of 84.9844 degrees. (7)

the whole, undivided segment. The same relationship may be seen in areas and in angles. Works of art - buildings, sculptures, paintings - created in these proportions always look harmonious and well balanced.

In the natural world, we find the Golden Section in the arrangement of the leaves on the stems of many plants, i.e. in the mercurial region of the shoot. Zeising was the first to point this out. Even in Goethe's day, botanists had noted that the spiral sequence of leaves moving up the stem and their rhythm involves specific angles that are always greater than 90 degrees. At the Sorbonne in Paris, the Bravais brothers measured the angles of divergence in hundreds of plants and found the average to be 137 degrees 30 degrees 48 degrees This seemed a chance result, requiring no further discussion.

Two German botanists, Braun and Schimper, studied the spirals and rhythmic arrangements of scales on the cones of coniferous trees. They found a geometric sequence of "leaf cycles" which governed all kinds of different plant species. If phyllotaxis was in the $\frac{3}{8}$ cycle, for instance, the denominator of the fraction tells us that eight leaves make a cycle, with only the ninth leaf pointing in the same direction as the first. The numerator indicates that the leaf spiral goes three times round the stem. The whole fraction shows that the next leaf on the stem will never appear after one eighth (i.e. 45 degree) or two eighths (90 degree) but only after three eighths of 360 degree (= 135 degree) around the circle. This holds true for the cress family (Cruciferae), for example.

The complete Schimper-Braun series is $\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{3}{8}, \frac{5}{13}, \frac{8}{21}, \frac{13}{34}$, etc. It remains valid to this day as the main series in phyllotaxis. As medical students, we gained much satisfaction from seeing it in the botany book we had to use for our studies. With the $\frac{2}{5}$ divergence, seen mainly in the rose family, the angle is 2×72 degree = 144 degree, with the $\frac{5}{13}$ divergence (dandelion, daisy, mullein) 138 degree 28'. The angles in the series, which is like a "spiritual thread" going through the whole plant world, moves around an irrational figure that appears to be the ideal. It is 137 degree 30' 28". Zeising realized "that this angle is no more and no less than the minor of the circumference of a circle divided according to the law we are considering; this embraces... 137.5078 degree and, thus, differs only minimally, by about 20", from theirs" (the angle found by the Bravais brothers, WB). He wrote:

The laws of phyllotaxis may thus also be put as follows:

- 1) The number of turns in a leaf cycle always relates to the number of leaves as minor to whole;
- 2) The same proportion is seen between the angle of divergence for two consecutive leaves and the whole stem circumference;
- 3) In their number of leaves per cycle, the different plant species present a regular series relative to each other, with every less complex one showing the minor:major relationship to the next higher in order of complexity, thus uniting with it in a proportionally-ordered whole, and being part of a continuous scale of proportional stages with all that precede and follow it.(5)

Zeising put an end to a scientific dispute when he made his fundamental discovery. Until then, German botanists had accused those at the Sorbonne of having fallen into mathematical and intellectual abstraction. The scientists at the University of Paris, on the other hand, felt that the cyclic system used by the Germans was a hypothesis, rounding up to whole numbers, with romantic overtones, relating to angles that were within the range of the variation seen in the sphere of life and its sources of error. The Golden Section provided the bridge that united the two factions. With its inner mercurial quality it proved a peacemaker. Zeising went on to explain:

To grasp and understand the truth and living reality of the natural world, we must above all find a law that offers the transition from one opposite to the other and allows us to see that the law itself is the source-spring of freedom, with deviation from it merely a consequence and further effect of a law that takes manifold forms. This requirement is, however, met in a better way by our law than by any other. As has been shown in the general part of this book, the forms arising from it range from those showing strict regularity to those that

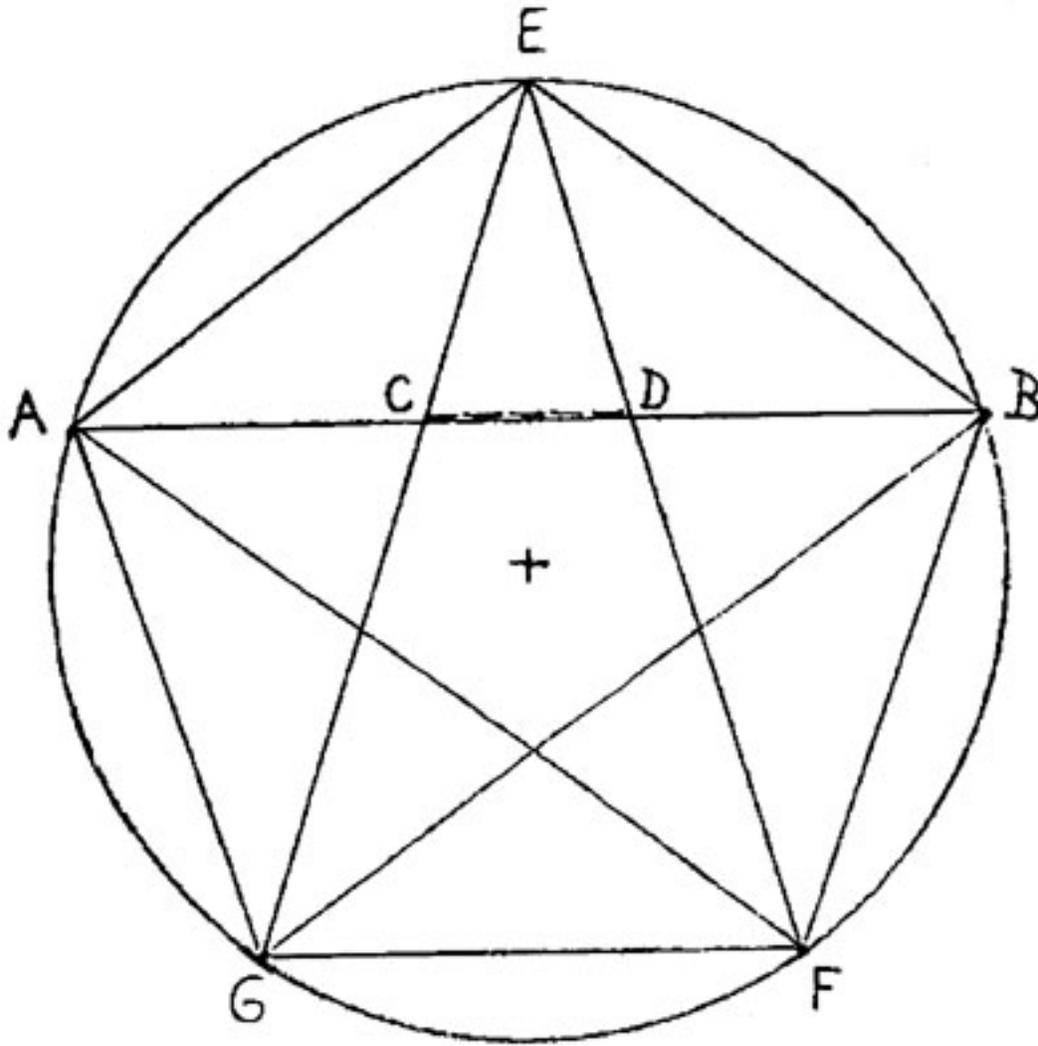


Figure 5. The proportions of the rainbow within the pentagram. Side AE of the large pentagon relates to the diagonal AB as minor to major. The diagonal EF divides AB at D in the Golden Section. The resulting major AD, equal in length to side AE of the large pentagon, is equally divided by the third diagonal EG, creating the new minor CD. This corresponds to the size of the rainbow if diagonal AB represents the horizon shown as a straight line.

show free expression. The law reconciles the idea of unity and uniformity on one hand with that of variety and manifoldness on the other, taking us from the realm of the finite into that of infinity, where it bases itself on the firm measure of a whole that has definite limits and by an infinitely subtle division of the whole which is capable of being continued to infinity, shows that within this finite element, infinity, too, is to be found.

The discovery of the Golden Section function in the sphere of the plant shoot thus shone like a ray of light in the midst of the darkness of the 19th Century, a presage of the age of light that was to come.

To illustrate his approach, Zeising produced two drawings, among other things, in which the 360 degree of the circumference are divided to show the main angle of the leaf sequences. In Figure 3, the 136.5078 degree angle ABC represents the minor relative to the circumference; it is the angle of divergence the plant

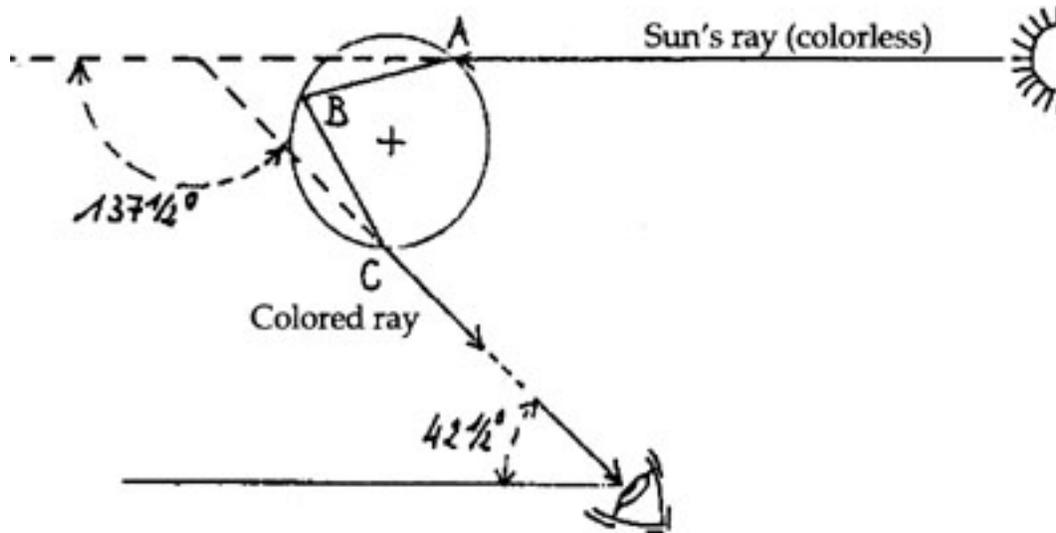


Figure 6. Trajectory of light ray and its processing, in terms of physics, in a droplet of water. Entering at A, the ray is diffracted and refracted, and then reflected as in a mirror at B, emerging as a colored ray at C. K has gone through a total angle of 137.5°.

seeks to achieve in its phyllotaxis. The larger residual angle of 222.4922 degree is the major. If the leaf spiral goes in the opposite direction around the stem (Figure 4), the leaf at D, which follows A, is, again, at an angle which is in the Golden Section relationship. It is in the nature of the Section, however, that as soon as the minor is positioned within the major, this is, in turn, divided in the same proportion, with no need for tedious construction. The new third 85 degree angle DCB is the minor of 222 degree.

Readers will have realized that the proportions that determine the rainbow are also appearing in the plant world. Figures 3 and 4 show a distinct relationship to Figure 2. Zeising actually produced the key to the rainbow more than 130 years ago, though he was not aware of this. Think of a leaf growing towards the rising sun on its shoot. The next leaf, feeling its way around the horizon, as it were, seeks the point, in its angle of divergence, where the rainbow meets the earth. We might also say it grows into the world around it following the laws that are reflected a thousand times in the beads of dew which adorn the leaf.

The same proportions appear if we consider the circumference or horizon as a straight line AB and divide this so that AC and CD are in the Golden Section ratio (Figure 5). The smallest new minor section CD would mark the measure of the rainbow. This division occurs at the intersections of every diagonal in the pentagram. The intersections recreate the original pentagon in inverted form, the length of its sides corresponding to the diameter of the rainbow.

The rainbow develops when opposite extremes come together in the elements. In width and height, it is a mercurial, natural mediator; its proportions relative to the periphery are indissolubly bound up with the laws of the "divine proportion."

This can be seen very clearly if we progress from a study of the whole to that of its parts and look up, for example, to a droplet at the uppermost periphery of the rainbow. The sunbeam striking the drop and entering into it at point A (Fig. 6) is reflected at point B at the back of the droplet, emerging as a colored ray at C. It is refracted by a total of 137 degree 30', i.e. the minor of the circumference, as it meets the eye. The eye, on its part, must be looking up at an angle of 42 degree 30'. The same applies in suitably-adapted form to every one of the millions of water droplets that make up the rainbow, changing all the time as they fall. The sea of color we spoke of is filled with the laws that govern the Golden Section. As the mystery of the proportions shown by this natural phenomenon, which is complete in itself, is revealed, the observer experiences, at first unconsciously, the balancing quality of its archetypal function, which harmonizes and relates all parts to the whole in accord with this. The rainbow was, therefore, rightly felt to be a sign the divine spirit made shining out in the sphere of the elements when the devastating floods had receded, a symbol of reconciliation and peace for mankind.

In conclusion, let us consider the meditation we spoke of earlier. Rudolf Steiner created the word *Blaettermorgen* (leafy morning) for it, which relates to the whole secret of mantric texts. Light is processed in every dew drop as it is in a raindrop. Quietly observing the play of colors, we unconsciously experience the same laws in the interplay of the elements that also govern etheric activity in the plant, letting leaf slowly follow leaf up the stem in rhythmic sequence.

This unique interaction between circumference and center, the fleeting play of light created by the sun and the organic forms created in life, stirs the human heart and mind at its very depths. It addresses the same laws in the meditator that out of the ether body organize him in terms of the pentagram. The sensual and moral feeling corresponding to the "leafy morning" loosens the body of creative etheric powers. It prepares the way for new faculties of imaginative thinking, taking hold of the secrets of nature. "We must find ourselves again and again in the rhythm of nature if we want to gain living rather than dead knowledge.... If you thus direct your constant attention to these wonderful secrets of nature, you enliven your medical knowledge in a practical way."(8)

A German proverb says that the morning hour has gold on its lips. Perhaps the Golden Section has been given that name for good reason. The sun is the cosmic source of the metallic gold process, in the 6th lecture of the Course for Young Doctors, Rudolf Steiner referred to its mercurial harmonizing function. In the planetary system, where the Golden Section is one of the constituent principles, the sun creates the balance between spirit and matter by virtue of its position which goes beyond all physical phenomena. "Because of this, the sun is a cosmic body both maintaining order in the planetary system and establishing order among the forces that enter into our material system." This cosmic heart function may be seen as reflecting the activity of the Spirits of Wisdom who endowed the developing human being with an ether body during the Old Sun stage of earth evolution, thus raising him to the plant level of existence. In the cosmic intelligence and the activity of the *Kyriotetes*, we get a sense of the original source of the process that relates the part to the whole, a process we can perceive wherever the "divine proportion" presents itself.

References

1 Zeising A. Neue Lehre iwn den Proportional des menschlichen Koerpers, aus einem bisher unerkant gebliebenen, die ganze Natur und Kunst durchdringenden morphologischen Grundgesetze entwickelt und mit einer vollstaendigen historischen Uebersicht der bisherigen

Systeme begleitet (a new science of the proportions of the human body, developed from a basic morphologic law that has so far gone unrecognized and is to be found throughout the natural world and in art, with a complete historical review of existing systems). Leipzig: Rudolph Weigel 1854.

2 Steiner R. Occult Signs and Symbols. Lecture given in Stuttgart on 13 Sept. 1907. Tr. S. Kurland. New York: Anthroposophical Press 1972.

3 Steiner R. Course for Young Doctors. (GA 316). Lecture of 5 January 1924. Revised by G. Kamow. Spring Valley: Mercury Press 1994.

4 Buehler W. Nordlicht, Blitz und Regenbogen. (Northern lights, lightning and rainbow) Chapter on Man and Rainbow. Domach: Verlag am Goetheanum.

5 Zeising. Loc.cit. p. 365 & 371.

6 Ibid, Fig. 117, p. 340.

7 Ibid, Fig. 118, p. 340.

8 Steiner R. Course. Loc. cit.