

RAINBOW, COLOURS AND SCIENCE MYTHOLOGY

Virve Sarapik

1. Introduction

Rainbow as an extraordinary and attractive natural phenomenon has fascinated human beings throughout ages. However, the cognitive representation the human mind has created concerning it, has been variable to a high degree in different periods.

Usually the interpretation of the rainbow by an ordinary Estonian is as follows: *"Rainbow is seven colours in the sky. It is a phenomenon which makes its appearance when it is raining at the same time when the sun is shining."* The answers can undoubtedly vary to some extent, sometimes there can be a longer explanation about refraction and reflection of the sunbeams in the raindrops, but in outline they are similar. To the people of today the rainbow seems to be without exception a source of positive emotions and an experience gladdening the heart, a symbol of beauty and singularity.

It is quite apparent that the ordinary imagination of the rainbow is fused with the imagination of spectrum.

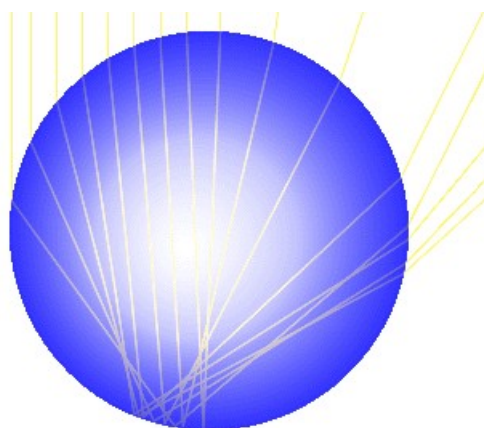
2. Etymology

The etymology of the Estonian word *vikerkaar* - 'rainbow' is rather ambiguous. Word *viker* has several derivation possibilities, it could have originated from the following meanings: from 'multi-coloured', 'scythe' or 'thunder', as its name is in Livonian - a cognate language to Estonian - *pit'kiz kor* 'thunder bow'.

In other Balto-Finnic languages the rainbow is usually connected with rain: Finnish, Ingrian and Karelian *sateenkaari*, Izhorian *vihmakarDo*.

The connection with rain seems to be dominate in Germanic languages as well: German *Regenbogen*, Swedish *regnbåge*, Old Norse *regnbogi*, Danish *regnbue*. Widespread is the connection with heaven - German dialectal *Himmelring*, French *arc-en-ciel*. In Latin there are several different expressions denoting rainbow: *arcus pluvius* 'rainbow', *arcus caelestis* 'bow of the heaven or gods', *arcus coloratus* 'coloured bow'. One can also refer to the Greek word ἶρις. In Greek mythology Iris was the daughter of Thaumas and Electra, the sister of harpies and a messenger of Olympian gods. Since Hesiodos she has been represented both as a goddess of rainbow and its impersonation. At the same time the rainbow could be the belt of Iris and a footpath between heaven and earth. The original meaning of the word *iris* is 'path, band'.

Interesting is also the Latvian word for rainbow - *varavīksne*, meaning literally 'copperelm'. So is the Estonian word *vikerkaar* compared with other languages rather curious. It is not quite clear if the meaning of the word *viker* 'multicoloured' is secondary, derived from rainbow or vice versa, but nevertheless it is an unique word referring probably to the colours of rainbow.



3. Mythology

One of the most interesting mythological presentations of rainbow is the Eddic Bifröst (or Bilröst, Bilfröst). In the Younger Edda it is described as a tricoloured bridge to Asgard, very skillfully built by the gods. The colours are not mentioned, but the bridge is very strong and destroyable only by the sons of Muspel, the giants of fire as it happened in *Völuspá*. Bifröst was kept guard by Heimdall, one of the Aesir, 'who casts bright rays'. In the Younger Edda there is also a remark, that the Bifröst appears red as there is a burning fire on it to show the way to Asgard (*Gylfaginning* XIII, XV).

The most wellknown rainbow representation in the European cultural area is the version in the Bible, where the rainbow is the sign of the covenant between Jehovah and Noah: *I do set my bow in the cloud; and it shall be for a token of a covenant between me and the earth* (Genesis 9.13). The Old Testament treatment of the rainbow is ambiguous denoting both Gods wrath and mercy. In the Old Testament there is likewise found an image of Jehovah's bow with which he sends arrows to the earth to punish the misdoers. It can be explained by the earlier Hebrew mythological motifs, where the rainbow was connected with bow and the arrows with lightning.

In the New Testament the rainbow appears in a new relation. It is a symbol of the covenant between God and people which has expanded to Christ as an establisher of the new covenant. *And he that sat was to look upon like a jasper and a sardine stone: and there was a rainbow round about the throne, in sight like unto an emerald* (Revelation 4.3). Still, in the Bible there is found no reference to the colours of rainbow or to the number of them. Apparently with these apocalyptic motifs the rather popular role of the rainbow in the late Gothic painting can be explained. In Romanesque art it is possible to associate the rainbow with mandorla or halo surrounding the body of God or a saint. In Gothic art Christ is depicted sitting on the rainbow in scenes of Last Judgement as *Maiestas Domini*, it is the Lord's throne.

3.1. Older representations of rainbow in different mythologies can be divided into animate and inanimate ones. From the latter the already mentioned image of bridge and path of gods, which binds heaven, the ulterior or gods' world and this, the human world, is rather common everywhere (e.g. Greece, Japan, Indonesia, India, Mesopotamia). The heroes of Polynesian and Hawaiian myths take by it the souls of the dead to paradise, in Indonesia it is the bridge of soul boats. In the myths of Finno-Ugric and other Nordic nations many features supposedly attributed to the rainbow have been melted with the image of the Milky Way, supported largely by their similar outward appearance. Last but not least, the folk legends grounded on Christianity depict the rainbow as a bridge by what the dead will raise to the Heaven on doomsday, with an angel sitting on it calling them with a trumpet. Underfoot of the wicked dead the bridge will break down. So the rainbow as a bridge has near always been connected with the other world, the realm of gods and dead.

The image of rainbow as a bow, with what (thunder)god sends down arrows and rain, is rather widespread as well. Besides already above-mentioned images in the Old Testament there are data about it by the Arabs and several African tribes. Rainbow was the bow of Indra. Among the Balto-Finnic nations the similar image is referred to by the Estonian dialectal (Saaremaa) word for rainbow *ammukaar*, and Finnish and Karelian idiomatic *ukon kaari* (Ukko as a mythical impersonation of a god of thunder).

Further the rainbow was considered to be somebody's belt or robe. It occurs among other cultures in the Slavonic and German folk-beliefs. In Albania the rainbow was a belt of the goddess of beauty and a later Catholic Saint Prence (or Prende), who's name is derived from the word *perëndi* meaning 'heaven'. Swallows who were harnessed to her carriage drew it over the vault of heaven. Concept of the rainbow as a belt of a mother of the heavens is known likewise by the Livonians.

In the late German folk-beliefs there was popular the connection of the rainbow with hidden treasures. The ends of the rainbow showed its location or could drop gold coins themselves.

3.2. From the animated imaginations one of the most essential ones was a serpent as a simile of the rainbow - *the rainbow snake* or *the rainbow serpent*. The most typical area of occurrence of that mythical figure is throughout the Australian continent, but similar legends are known likewise in equatorial Africa and in Brazil. It is an important figure in initiation and rainmaking rites, carrying often a dangerous and destructive character (Eliade 1989).

Rather close to the latter is the image of the water-drinking rainbow, found in myths of almost every part of the world. According to it, the rainbow draws the water up to the sky, from where it falls down to the earth again. The water could be drawn from everywhere, from rivers, lakes and wells. It is always accompanied with a danger to grab together with the water fish and all kind of other stuff, including human beings. At Siebenbürger in Germany e.g. the rainbow has drawn up a curious shepherd boy with the whole flock of sheep and in Livonia a fisherman with his boat (Hwb. d. Aberggl.; Loorits 1926)

3.3. As to rainbow beliefs in Estonia, they are broadly speaking not very original and similar to the above-mentioned themes. General is the imagination of the water-drinking rainbow which can draw up the people too, when they are under the bow (H II 10,55 (4) < VJg). Still, there are not so many records in archives about drawing up the fish and people as in Livonia. The belief is common to the other Balto-Finnic nations.

Secondly is common the prohibition to point one's finger at the rainbow, as at the result of this, the finger will fall away, mortify or rot. It is analogically not allowed with the other heaven phenomena and quite known also by the other nations. Image of the rainbow as a belt is not so common in Estonia as it is in Livonia, but still known, especially as a belt of God (e.g. EKS 4 1,220 (6) < Vng).

In addition there is the above-mentioned connection with the bow in Estonian islands and analogical similes by the Finnish, Livonian, Lapp, Mordvinian and other Finno-Ugric nations.

4. Rainbow colours

On the grounds of the preceding, it is interesting to mention that almost all rainbow beliefs are inspired by its shape - the large arc - and not by its colours (except to some extent the Younger Edda's one where the colours are not mentioned). Seven colours, which are fixed in consciousness of a modern man one can't find anywhere. There are even rhymes for children to acquire the names of these seven colours more easily: in English *Richard Of York Gave Battle In Vain = red, orange, yellow, green, blue, indigo, violet* (McLaren 1985). The Estonian analog is more sporadic e.g. *Peremees ootab kitselt raha sulane tema liha* 'Master waits money from goat, man its meat'.

However there are several references to the colours of the rainbow as a mean of weather forecast. Most common are the colours red and green, e.g. *Kui vikerkaar punane, ei tule vihma, kui roheline siis sajab* (RKM II 245,106 (41) < Vagivere) - 'When the rainbow is red, it will not rain, when green, it will rain'. Or: *Mida selgem vikerkaare punane karv on, seda enam tuult* (H IV 8,647 (38) < Pal) - 'The clearer the red colour of the rainbow, the more wind'. However, one can find an opposite or different meaning to nearly every colour - so, seemingly such forecasting was not very fixed.

A couple of Estonian riddles are referring to the colours of the rainbow, as generally the connection between an object and its colour is much more common to the riddles. The most characteristic ones are:

(I) *Punane puuder, sinine siider, ripub rikka mehe räasta all* (< Jõe) or in Finnish *Sininen siirto, punainen puurto, keskellä kamarin kattoa* (Korhola 1961). This riddle is hardly translatable, but

broadly speaking, the rainbow is described here through two colours, red and blue.

(II) *Üle ilma pihelgas* (Eisen 1913:1110) 'The rowan-tree over the world'.

(III) *Seitse linti üle ilma seotud?* (Eisen 1920:215, E 46993 (5) < Saarde) 'Seven ribbons bound over the world'.

4.1. The first type is widely spread in Finland and Ingria, likewise in other Balto-Finnic languages and probably originates from Finnish. Still, it is possible to find parallels in other languages, where the simile of the rainbow contains limited number of colours, two or even one. E.g. Russian riddle *Krasnoje koromysloje tsherez reku povislo* refers to colour red (Mitrofanova 1968:330) or Irish: *Whom do I see (coming) toward me through the sea but the sunny gewgaw, the red-coated man with a red thread in his shirt.* (Hull-Taylor "A collection of Irish Riddles": 201).

Further it is possible to find connections with some clichés of the old Estonian alliterative folk songs:

*Pilve tõuseb soost sinine,
soost sinine, maast punane,*

*Ei saja sinine pilve,
sajab sauekarvaline.
Mis seal pilvete seessa?*

*Vikerkaar pilvete seessa.
Mis seal vikerkaare vahella?
Hani vikerkaaride vahella.
(VK VI:1, 10 A "Kulla põlemine")*

('A blue cloud is rising from the bog,
from the bog blue, from the earth red,
It's not raining from the blue cloud,
it's raining from the claycoloured.
What's there in the clouds?
There is a rainbow in the clouds.
What's there between the rainbow?
There's a goose between the rainbow.')

Or further:

*Pilvel on puhas purje,
purjel on hani punane,
hanil on saba sinine,
(ERIA I:1, 165, 2 "Pilves veepisarad")*

('A pure sail is on a cloud,
a red goose is on the sail,
the goose has a blue tail')

This type of folk song has contaminated with several other types allowing to treat hypothetically the similes, with a maiden sitting on the edge of the cloud, or the goose replaced with a woman, as rainbow metaphors. While in Estonian folk songs the cliché *hani punane, saba sinine* ('red goose,

blue tail') is denoting rainbow, then in Finnish and Karelian songs the analogical widespread cliché is *veno punainen* 'red boat':

*Pilvess' on vesipisaret,
Pisariss' on loajat lammit,
Lammiss' on veno punaset*
(SKVR I:1,216; Koski 1983:72)

(In the cloud there are drops of water,
In the drops there are wide pools,
In the pools there are red boats')

Hypothesis on the grounds of the preceding could be the proposition, that for the Estonian, Finnish and other neighbouring nations there were only two significant colours connected with the rainbow - red and blue. Still such conclusion could be precipitate, as the use of red and blue is rather frequent in other clichés of alliterative folk-songs. As a rule the combination is used to emphasize (colour)differences between beings or things and to refer to extraordinary phenomena.

4.2. Interesting connections are coming out likewise with the riddle *Üle ilma pihelgas* ('The rowan-tree over the world'), the typical Finnish version from it being *Pitkä vitsa pihlajainen yli meren ulottuu*. Finnish folklorist Uno Harva has referred to an Estonian Swedish variant (the Estonian Swedes lived in the western part and on several islands of Estonia from 13th century to 1944, their selfname was *aibofolket*): *Iwe wärde raunträ* in connection with the Finnish deity Rauni. According to Agricola Rauni was the wife of the thundergod Ukko, known also by Swedish Lapps under the name of Ravdna and the rowan-tree (*raudna* in Swedish Lappish) was dedicated to her. Harva supposed, that the rowan-tree could be a code-name, euphemism for the rainbow and *rauni* meant originally both rowan and rainbow. Later from it there developed the personification of the rainbow as the wife of the thunder god (Harva 1948). Without considering the essential role the rowan-tree has had in folk-beliefs one may refer to its protective properties against the thunder (e.g. Hwb. d. Aberg. sub *rot*). Analogical properties were attributed to other things with red details. So, one can suppose the holiness of the rowan-tree was to some extent derived from its red berries. One can also refer to the Old Norse word *rauda* 'red' (Islandic *raudr*, Lithuanian *raūdas*, Sanskrit *rudhir*). The Estonian word *raud* 'iron' is derived from it, as rust is also red. Likewise, the name of the deity Rauni could be derived from the Old Norse *rauda*. One can again recall the connection of red and rainbow in the Balto-Finnic folk songs and suppose, that the rainbow and rowan-tree were linked by the red colour.

4.3. The third riddle - *Seitse linti üle ilma seotud?* 'Seven ribbons bound over the world' refers quite clearly to a later origin, as the number seven wasn't earlier linked with rainbow in no way.

5. Science

The well-known modern conception of the cause of rainbow - the refraction and reflection of sunbeams in the raindrops - was first apparently grounded by René Descartes (1596-1650) in 1637. The common understanding of the seven colours of the rainbow descends still from another source - it departs from Sir Isaac Newton's famous prism experiments. In his *Optics*, published in 1704, Newton described seven prismatic colours. From that claim is derived the common "scientific truth" mixing completely the concepts of rainbow and spectrum, caused partly by Newton himself, as he subsequently said that the rainbow consists of seven homogeneous gleams. The reason for exactly seven primary colours of spectrum is quite a sophisticated theme (McLaren 1985; Parkhurst, Feller

1982; Schweizer 1982). The first one seems to be the desire to find analogy with the musical scale. The idea didn't belong to Newton, as synaesthetical concepts were expressed already by Aristotle in his *De sensu et sensibili* and in *De anima*. The idea of seven principal colours originates likewise from Aristotle (*De sensu*: IV, 442). From that paragraph, however, it is not quite clear, is the number of colours inspired by some kind of Pythagorean symbolism of numbers or not. Aristotle derived all other colours from the two, black and white, which belonged to his linear colour concepts. It was not based on the hues but on the brightness of colours. The concept of seven principal colours was very persistent throughout the Middle Ages and found support especially from all kinds of mystical and alchemical theories. It found full observance in Renaissance colour theories, e.g. Girolamo Cardano (*De gemmis et coloribus* 1563), Cennino Cennini (*Il libro dell'arte* ca 1400) and especially in the magnificent system of Gian Paolo Lomazzo (*Trattato dell'arte della pittura* 1584; *Idea del tempio della pittura* 1590), who was inspired by many other authorities, especially by Cornelius Agrippa (Gavel 1979; Kemp 1990). He linked together under the seven-based-system the planets, humors, temperaments, famous Renaissance artists, animals, plants, metals etc. The 18th century natural philosophical doctrine of harmonious relationships, grounded on Johannes Kepler's *Harmonices mundi* (1619), is in some degree also based on the system of seven.

Aristotle's concept of rainbow is presented in his another book, in *Meteorologica*. In its third part there is a discussion about the colours of the rainbow and the proposition: "*The rainbow has three colours, and these three and no others*" (*Meteorologica* III, 2. 371-372; 4. 374-375). These three primaries are not manufactured by painters, and they are named by Aristotle as *ἰσχυρῆς* 'violet, purple', translated also as 'blue', *πράσινος* 'green' and *ῥυθρός* 'red'. Sometimes there can be seen the fourth colour - *ξανθός* 'yellow, orange-yellow'- but it is not a primary one. The question of these names is of course complicated by the often polysemantic character of the Greek colour terms.

Homer described the rainbow only with one colour - purple (*Iliad* 17.547) - an interesting parallel recalling the rainbow riddles of Balto-Finnic folklore. Xenophanes mentioned three: 'purple', 'yellow' and 'crimson'. The Aristotelian three-coloured rainbow doctrine was so impressive, that it dominated throughout the Middle Ages. The one and main reason for that was doubtlessly the possibility to connect it with the Trinity. This concept was supported by several authors as Albertus Magnus and Thomas Aquinas; Jacob Böhme (1575-1624) and Emanuel Swedenborg (1688-1772) gave explanation of three colours inclining more to the symbolic and mystic point of view. Still, from the 6th or 7th century there began the parallel development of the four-colour rainbow theory. Its main conceptual bases was the connection of the colours with the four elements (earth, air, water, fire), humours, seasons etc. The idea of linking the colours and elements was already followed by the Greek philosophers (Empedocles as the first known, but mentioned also by Plato and Aristotle). The rainbow colours were probably associated with the elements by Arabs and the main authority was here Ibn al-Haitam or Alhazen (965-1038): *De aspectibus* or *Perspectiva*. In European tradition the same trend was followed by the Dominican Theodoric of Freiberg in his treatise on the rainbow from ca 1310. From the Renaissance authors there is known the Leon Battista Alberti's reference to the four colours of the rainbow (*De pictura* 1435) which are linked with the four elements (Gavel 1979).

So it seems obvious, that the honour of "discovering" the seven-colour rainbow belongs to Newton. It's a typical example of secondary mythology still very common in the cognitive representation in the human consciousness. Such firm doctrine is represented e.g. even in Brockhaus Enzyklopädie (Band 24 1992; sub *Regenbogen*: Ein bunter Haupt-Regenbogen hat von innen nach aussen die Farbfolge Violett, Indigo, Blau, Grün, Gelb, Orange, Rot (sieben sprichwörtliche Regenbogenfarben)).

A good compendium to the preceding and a remote Estonian echo of the history of discovering the seven-colour rainbow could be the following description from 1890ies, reflecting the knowledge one could get from a last century village school in Estonia: *The sun is running so fast around itself that it overshadows the seven colours it has, but when there is a rain cloud near the sun, it draws these seven colours in its water vapour into sight. The sun is as a wheel of a spinning wheel that has 7 spokes, each spoke of different colour, but the fast running of the wheel doesn't allow to see the colours.* (E 54367 (21) < Tori: *Janseni seletus koolis vikerkaarest. Päev oma väga kiire jooksuga enese ümber varjab omas vee aurus 7 värvilist karva aga kui vihma pilv päeva vastu se tõmbab omas vee auurus 7 värvilist karva nähtavale. Päike on kui vokki rattas kel 7 kodarast iga kodaras isi värvi aga ruttuline ratta jooks ei lase värvisi näha*)

or:

The rainbow is an odd thing created by God. Nobody believes that it appears when the sun is shining on the cloud, so that the raindrops falling down change themselves to seven-coloured ones in the sun (H II 65,628 (11) < Jüri: *Vikerkaar arvatakse üks iseäralik Jumalast loodud asi olema. Seda ei usu keegi et ta siis nähtavale tuleb kui päike vihma pilve peale paistab, et maha sadavad vihma piisad ennast päikese paistel seitsme karvaliseks muudavad*).

Literature

- Ariste, Paul 1979. *Vadja mõistatusi*. Tallinn.
- Christiansen, Reidar Th. 1965. Myth, metaphor, and simile. *Myth*, Thomas A. Sebeok, ed. Bloomington, London, pp. , 64-80.
- Edda Snorra Sturlusonar* 1848. Copenhagen.
- Eisen, M. J. 1913. *Eesti mõistatused*. Tartu.
- Eisen, M. J. 1919. *Eesti mütoloogia*. Tartu.
- Eisen, M. J. 1920. *Mõista, mõista, mis see on*. Tartu.
- Eisen, M. J. 1927. *Eesti vana usk*. Tartu.
- Eliade, M.(ed.) 1989. *The Encyclopedia of Religion*. Vol 12. New York.
- Erffa, H. M. V. (ed.) 1989. *Ikonologie der Genesis*. Band I. München.
- ERIA: Tedre, Ü. (ed.) 1969, 1970, 1971, 1974. *Eesti rahvalaulud*. Antoloogia. I - IV. Tallinn.
- Gavel, Jonas 1979. *Colour. A study of its position in the art theory of the quattro- and cinquecento*. Stockholm.
- Harva, Uno 1948. *Suomalaisten muinaisusko*. Porvoo, Helsinki.
- Hwb. d. Aberggl.: Hoffmann-Krayer, E. 1935. *Handwörterbuch des Deutsches Aberglaubens*. Band VII, sub *Regenbogen*. Berlin, Leipzig.
- Irwin, Eleanor 1974. *Colour terms in Greek poetry*. Toronto.
- Kemp, M. 1990. *The science of art*. Optical themes in western art from Brunelleschi to Seurat. New Haven, London.
- Kirschbaum, E. 1971. *Lexikon der christlichen ikonographie*. Band III.
- Korhola, Leena 1961. *Suomalaisista sateenkaariarvoituksista*. Kalevalanseuran vuosikirja 41. Porvoo, Helsinki.
- Koski, Mauno 1983. *Värien nimitykset suomessa ja lähisukukielissä*. Savonlinna.
- Loorits, O. 1949, 1951. *Grundzüge des estnischen Volksglaubens*. I, II. Lund.
- Loorits, O. 1926. *Liivi rahva usund*. I. Tartu.
- MacAdam, David L. 1970. *Sources of color science*. Cambridge, London.
- McLaren, K. 1985. Newton's Indigo. *Color Research and Application*, Vol 10, 4, 225-229.
- Newton, Isaac 1704 (reprint 1952). *Optics*. New York.

Parkhurst, Charles & Feller, Robert L. 1982. Who invented the color wheel? *Color Research and Application*, Vol 7, 3, 217-230.

Räsänen, Martti 1948. Sateenkaaren nimityksistä ja uskomuksista. *Kalevalanseuran vuosikirja* 27/28, 158-175.

Schellbach, Ingrid 1959. Das Wogulische Rätsel. *Ural-Altäische Bibliothek*, VIII. Wiesbaden.

Schweizer, Paul D. 1982. John Constable, rainbow science, and English color theory. *The Art Bulletin*, Vol 64, 3, 424-445.

SKVR I: Hurt, Jakob. 1904. *Setukeste laulud*. I. Helsinki.

Mitrofanova, V. V. (ed.) 1968. *Zagadki*. Leningrad.

VK III: *Vana Kannel III*, 1938. Kuusalu vanad rahvalaulud. Toim. H. Tampere. Tartu.

VK VI: *Vana Kannel VI:1, VI:2*. 1989. Haljala regilaulud. Tallinn.

Haussig, H. W. (hrsg.) 1973. *Wörterbuch der Mythologie*. Band II. Stuttgart.

In this article manuscript folklore collections from the folklore archives of the Estonian Literary Museum have been used.