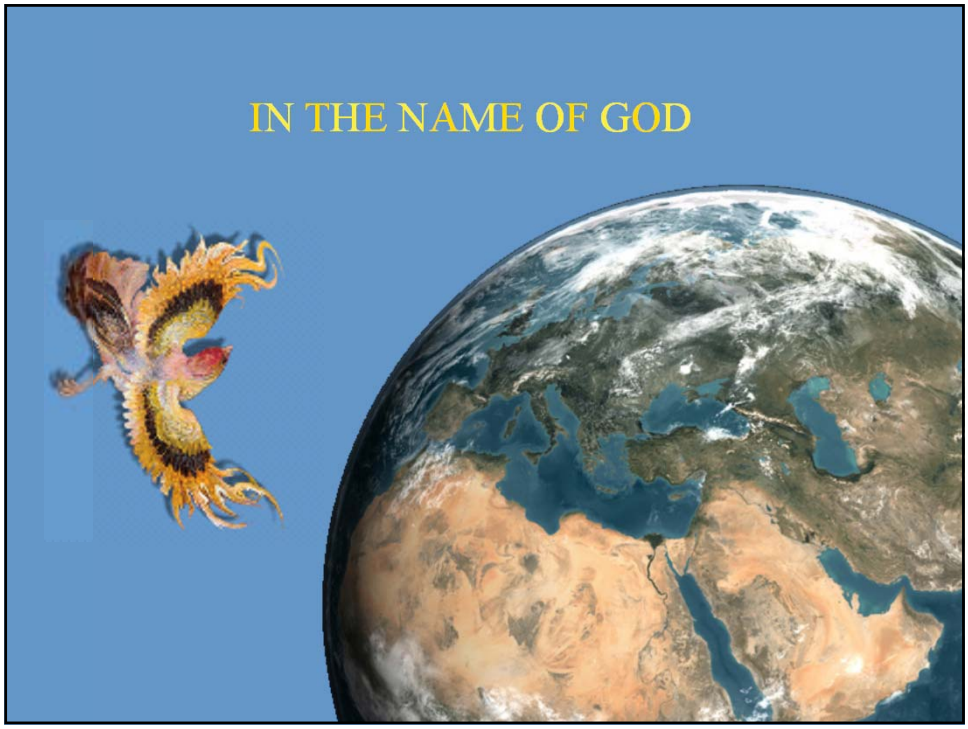




S. K. ALAVIPANAH

*Professor, Department of Remote Sensing, Faculty of Geography, University of Tehran, IRAN*

Email: salavipa@ut.ac.ir

K. GHAZANFARI

*Ph.D. Student, Georg-August University, Faculty of Philosophy, Inst. of Altiranistik Goettingen GERMANI*

Email: kghazan@uni-goettingen.de

B. KHAKBAZ

*B.Sc. Student, Department of Remote Sensing, Faculty of Geography, University of Tehran, IRAN*

Email: b.kh@live.com

**Definition of REMOTE SENSING:**

- **Broad definition :** acquiring of data without physical touching
- **Narrow definition:** non contact recording of information from the ultraviolet, ...

Remote: - Sensing, multispectral and ...
- Measurement, because high accurate level

Remote Sensing:

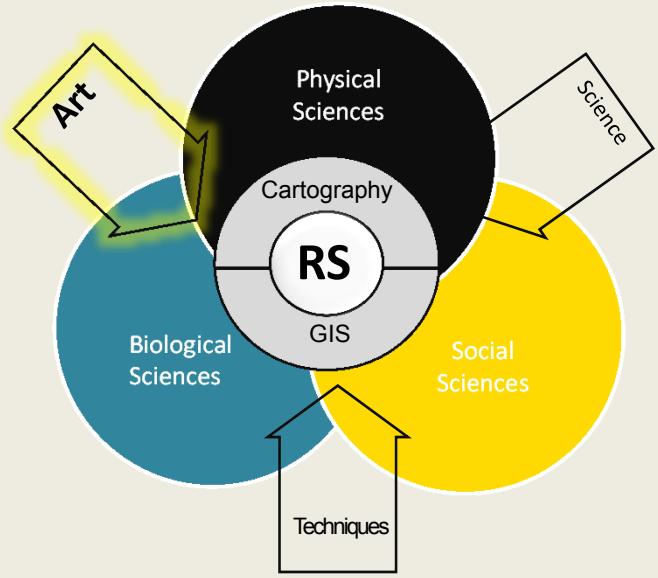
*Art?*
*Technology ?*
*Science?*
*Technological art?*
*Art of technology?*

***Remote Sensing is all ?***

*Remote Sensing Multi-Disciplinary*

**ART**: The process of image interpretation brings to bear not only Scientific knowledge, but all of the background that a person has obtained through ***a lifetime***.

Due to this some image analysis are much superior of other analysis.

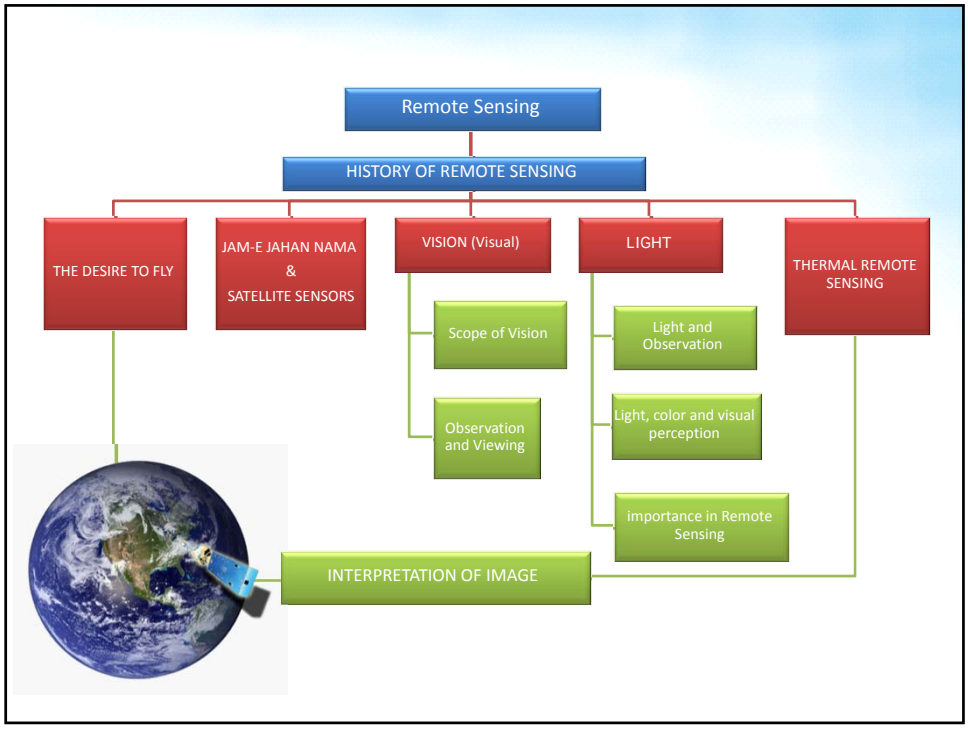


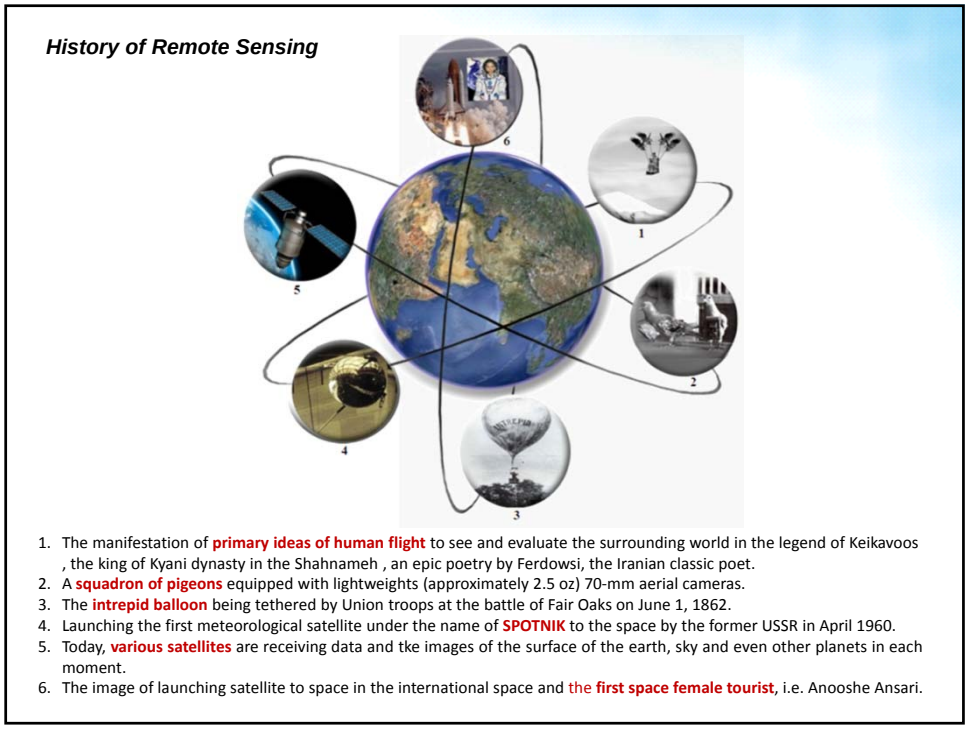
**Modern remote sensing** as the art and technology of obtaining information about objects from far distance has been started mainly from the launch of first Landsat on July 23, 1972. Due to very diverse applications remote sensing is getting more and more importance in several domains of Geosciences. This new branch of science, art and technology **has been studied in several technical aspects**. Not so many research work has been done on the role of art in remote sensing applications. In this work **the historical background of remote sensing** as a new aspect and also its integration with art is investigated. This innovative investigation is **about the used contexts of this science and art in poetical literature of Iran from 9th till 20th century.** The ancient treasury of the Persian poetry and literature **with a record of more than ten centuries with millions poems by thousands poets** like Ferdowsi, Mowlavi, Hafez, Khayam, Sadi etc, is full of scientific concepts of the present century.

Some of very fundamental aspects of remote sensing like exploitation of colors, the direction of view, the kind of sensor and the aspect of image interpretation etc are very useful concepts that have directly or indirectly portrayed in the poems of Iranian poets. In this work some of the most famous Iranian poets and their works were explored. And based on this research it can be claimed that these versifier used the concepts of remote sensing to explore and understand the world. In general we concluded that literature aspects of remote sensing may also improve a better understanding of image interpretation.

Purposes:

- To find out the relationship between scientific knowledge and background obtained through lifetime.
- Synthesize of literature, art, science and technology
- The role of literature and art in better understanding of RS.
- Resurrect the old Iranian myths, legends and stories.




1. The manifestation of **primary ideas of human flight** to see and evaluate the surrounding world in the legend of Keikavoos , the king of Kyani dynasty in the Shahnameh , an epic poetry by Ferdowsi, the Iranian classic poet.
2. A **squadron of pigeons** equipped with lightweights (approximately 2.5 oz) 70-mm aerial cameras.
3. The **intrepid balloon** being tethered by Union troops at the battle of Fair Oaks on June 1, 1862.
4. Launching the first meteorological satellite under the name of **SPOTNIK** to the space by the former USSR in April 1960.
5. Today, **various satellites** are receiving data and tke images of the surface of the earth, sky and even other planets in each moment.
6. The image of launching satellite to space in the international space and the **first space female tourist**, i.e. Anooshe Ansari.

## DESIRE TO FLY

**Employing pigeons in 1903** by Julius to acquire more information about the earth was an important and primary point for the development of Remote Sensing. This issue should not be considered the flight of a bird, but it can also be considered as the flight of idea that tries to lay down a new science in this field (Alavipanah, 2009). **Therefore, it should be emphasized that the real remote sensing has a root in flight.** The **study of the manifestations of the desire to fly in fanciful legends** and stories in learning the evolutionary course of Remote Sensing is of great significance, because this issue **shows the efforts made by human from the very beginning to know the phenomena and the surrounding environment** through seeing and sensing them from a long distance.

The existence evidences in historical and literary texts of different nations show that the ancient human was dreaming to fly by observng the birds. The importance and enthusiasm to fly was so great for humans such that they were expressing it within the framework of different fables and with the help of **symbolic figures such as the magic rug, the winged horse** and so on**. The legend of the starting flight has been expressed among various tribes differently.**


Perspolise, IRAN

**The oldest and most famous legend of flight among the Iranian people has taken place at the time of Keikavoos**, the King of Kiyani dynasty based on the leftover Pahlavi texts of Sassanid period and the **Shahnameh by Fredowsi**. In a book entitled" Dinkerd", it is mentioned that *"**Keikavoos prepared to dominate the sky and in his flight , he reached to a place which was the limit between light and darkness."*** In the tale of Kaikavoos in the Shahnameh, also, the same incident is mentioned and **the points included there indicate the attention of Ferdowsi towards Remote Sensing concepts.**


**FERDOWSI** the highly revered Persian poet
(935 - 1020) author of the Shāhnāmah (Great Book)

Ferdowsi believes that the purpose of Keykavoos wanted to find the responses to the following questions in addition to observing his own land over the sky.

*Then he (Kai Kaous) chose out four eagles strong of wing, and bound them unto the corners of this chariot.*
*And when it was done, Kai Kaous seated himself in the midst thereof with much pomp.*
*And the eagles, when they smelt the flesh, desired after it, and they flapped their wings and raised themselves, and raised the framework with them.*
*And they struggled sore, but they could not attain unto the meat; but ever as they struggled they bore aloft with them Kai Kaous and the throne whereon he sat.*
*And so long as their hunger lasted, they strove after the prey* Ferdowsi(10th-century A.D.)

*Kai Kaous's mind was dimmed that how far is from here(Earth) to the moon?*
*What is the nature of the sun and moon, how is the day(light) and night(dark)?*
*nor wherefore the planets roll. Who is art master of all the earth!?*
*What's the secret of sun and how is the roll and motion of the sun?*
*I heard that Kai Kaous up to sky and went to find the secret of heaven*
*and visit the sun and moon, and count the stars one by one…*

**Kai Kaous fliyth myth** (935–1020),
The famous Persian myth from Shahnameh

From Myth to Reality

**Felix Tournachon** (1820-1910),
The famous Parisian photographer

ز دانندگان بس بپرسید شاه — کزین خاک چند است تا چرخ ماه
چه دارد همی آفتاب از تو راز؟ — که چون گردد اندر نشیب و فراز؟
چگونه ست ماه و شب و روز چیست؟ — برین گردش چرخ سالار کیست؟
پراندیشه شد جان آن پادشاه — که تا چون شود بی پر اندر هوا
وُزانپس عقاب دلاور چهـــار — بیـــاورد، بر تخت بست استوار
ز روی زمین تخت برداشتنـــد — ز هامون به ابراندر افراشتنـــد
که تا ماه و خورشید را بنگرد — ستاره یکایک همی بشمرد

According to this fable, in the old ages, human not only had the desire to fly but also as seen in this tale, it has put this idea into practice. During the course of the story, the poet refers to many objectives of Remote Sensing and its abilities which are:

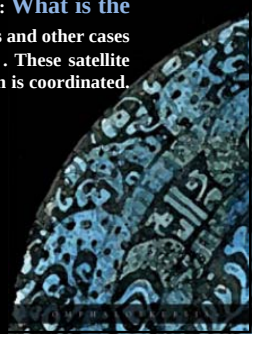
**1-The source of each data and Remote Sensing is expressed by putting this question: What is the secret of sun ? .Today , the source of all data being received from satellite sensors and other cases are of the type of passive of light distribution through electro magnetic spectrum . These satellite functions despite the existence of sun light and their motion round the earth and sun is coordinated. In other words, the first question is about sun and its secrets.**

**2-Sensing and evaluating the earth and the phenomena existing in it**

**3-Reviewing the sky , identifying and sensing other planets .**

**4-The quality of the phenomena of day and night**

**5-Even creator, master and ruler of this lofty heaven.**

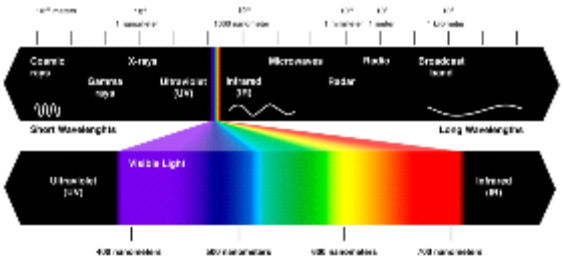


## VISION

As it was mentioned in the definition of Remote Sensing, it is to observe objects and phenomena but from a far distance. So **observance and in a word, seeing is the first condition for the materialization of Remote Sensing action.** Of course an observation and seeing whose concept is broader than seeing with an ordinary eye and with the help of the visible light. **In order to see and percent whatever we see, different processes and motivations such as light are involved.** The results of it such as receiving and interpreting the stimulants in eye and brain are linked with visual system and **the physical stimulants are their most simple part.**

## *The Scope of Vision*

Electromagnetic Spectrum




**Our eye is able to make a direct vision only within the narrow limit of visible light (0.4-0, 7 цm)** (Alavipanah, 2006). In fact, of the total E.M.spectrum, only we can see it in the ratio of one to thousands thousand billionth. In the following couplet, Sanaee, an Iranian classic poet, describes the limit of the vision of human eye vis-à-vis the total spectrum of electromagnetic radiated from sun like a particle:

> •*I can not know the fountain of the sun through a particle*
> *It is likely that there is not a particle of vision in my eye*
>
> Sanaei (11th-century A.D.)

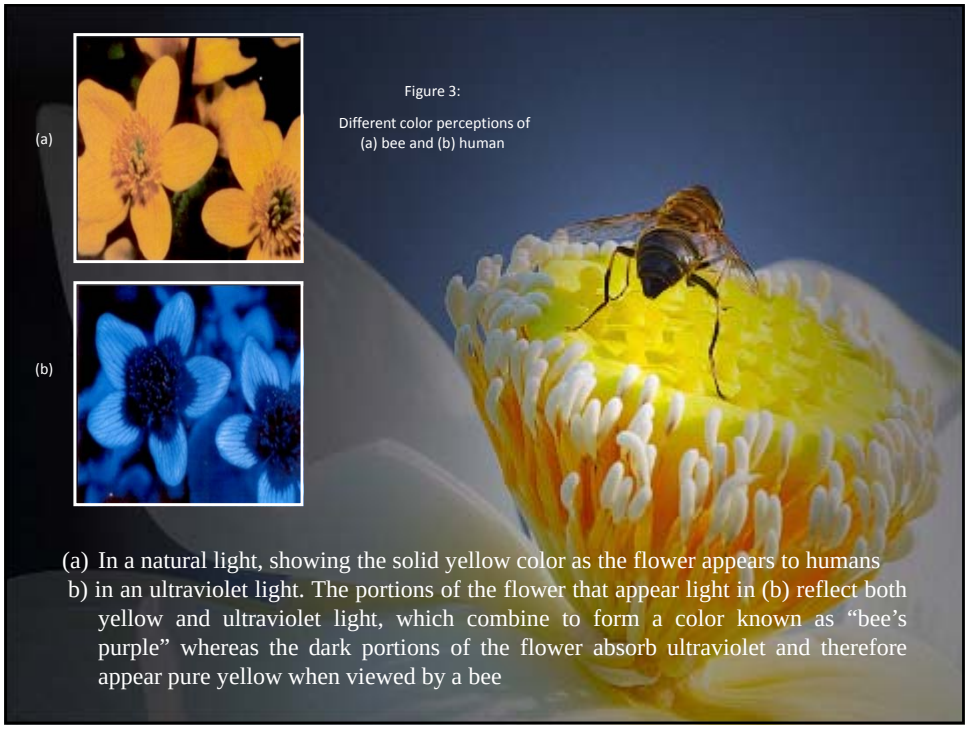



Figure 3:

Different color perceptions of (a) bee and (b) human

(a) In a natural light, showing the solid yellow color as the flower appears to humans b) in an ultraviolet light. The portions of the flower that appear light in (b) reflect both yellow and ultraviolet light, which combine to form a color known as "bee's purple" whereas the dark portions of the flower absorb ultraviolet and therefore appear pure yellow when viewed by a bee

**Human Scope of view of all Electromagnetic Spectrum:**

$$(\mu m)\ \frac{0.7-0.4}{10^{9}-10^{-6}} \cong 3^{*}\ 10^{-10}$$

What is the difference between human and bee?!

***We don't have the eagle eye and the special feather***
***So learn another way to see and another way to fly***

ما **چشم عقاب** و پر شهباز نداریم **دیدن دگر آموز** و پریدن دگر

آموز

## *Seeing and Viewing*

In the following couplet, Hafiz says that even observing the whole world (which is displayed in Jam-e Jam) will be useless without having a vision and knowledge of the perception of what we see:

***When you are not capable to be seen, do not seek link,***
***the Jam-e-Jam will not help with that when some one is in lack of insight***

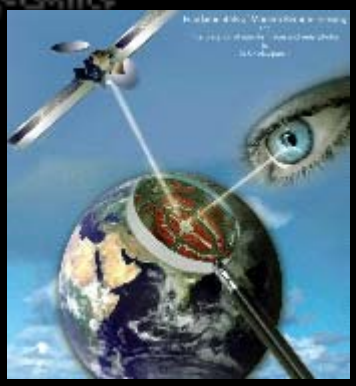
Hafez (14th-century A.D.)

In the following poem, Molavi (Rumi) states the result of the physical observance combined with knowledge and vision as follows:

***(whit which) you may behold colours other than these,***
***and may behold pearls instead of stones.***

Molavi Romi (13th-century A.D.)

## *Reflectance*



*•OH Cup-bearer, set my glass afire with the light of wine!*
*Oh minstrel, sing: The world fulfilleth my heart's desire!*
*Reflected within the goblet's ring,*
*I see the glow of my love's red cheek, and scan of wit,*
*ye who fail to seek The pleasures that wine alone can bring!*

Hafez (14th-century A.D.)

## *JAM-E JAHAN NAMA (atlas pane), AND SATELLITE SENSORS*

***The mirror of Alexander is an atlas pane, look at it***
***It will show you the status of the land of Dara King***

Hafez (14th-century A.D.)

Hafiz, the Iranian classic poet expresses the function of Jam-e Jam (Atlas Pane) well, such that each of the combinations of " World displaying mirror" and " World secret decoding" have their own specific and beautiful semantic value. The function of this 'world-displaying mirror' can be compared with the modern sensors being used for military and espionage objectives by humans.

Today, many satellites are in the orbit of the earth from hundred to ten thousands kilometer distance that take images from the earth and even other planets moment by moment and according to Khayyam, the mathematician and poet of the 5th Century, *"traverse from the mass of black mud to the culmination of Saturn"* and at the height of flight, they know no border or realm. Today,

**HAFEZ** Shirazi the great Persian poet
was born 1319 CE in Shiraz in South-Central Iran

the progress of the Remote Sensing of satellites is to the extent that the rate of the data resulting from one hour sensing by the satellites of the orbit of the earth is more than the rate of data being acquired by human from the start of its creation up to 1970's. (I.e. when being placed at the orbit of the satellites of land sources). According to Hafiz, this world displaying-mirror decodes the secrets of the earth and heavens


Manuscript of Divan of HAFEZ

## *THERMAL REMOTE SENSING AND THE HEAT SENSING*

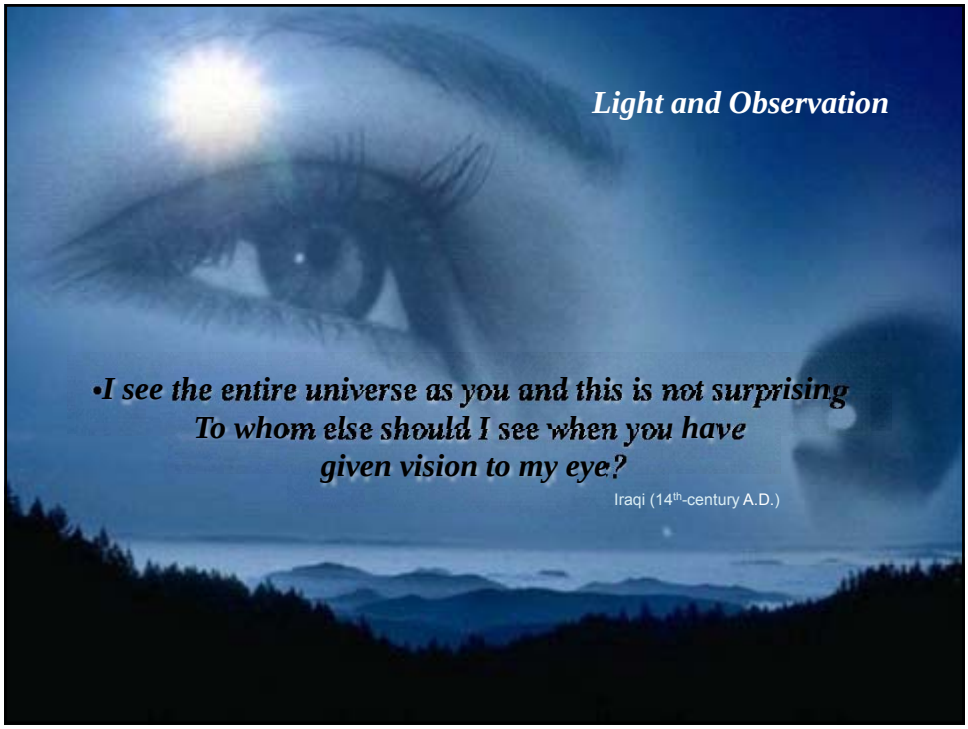
***Whoever is clear-sighted observes its light***
***The blind also enjoys its hotness***
***So the blind eye can understand based on hotness***
***That a weak sunray rose***
***But this hotness will open up the eye***
***To see the exact things being heard***

**MOWLANA RUMI** the great Persian poet
*(30 September 1207 – 17 December 1273)*

The concept of heat and feeling it is seen in the poems of many Iranian poets. In the following poem, Molana (Rumi) expresses the importance of heat and considers it a factor to percept the entity, receives data and without any need to light and act of seeing.

## Light

Light has opened an opening to humans towards the magnificent of the world of creation, its order and discipline. The greatest rate of the human knowledge has been acquired through light and seeing and today, more than any other time in the past, the human's data and findings and their transfer are done through light. Displaying the surrounding world, the light provides us with knowledge about phenomena, distance and color.




*Open the eye of heart to see the life*
*you may behold whatever is invisible*

Hatif esfahani (19th-century A.D.)

Seeing is one of the most surprising phenomena of the entity, because the simplest phenomenon, **which we observe, has a secret in it** (energy in the invisible spectrum of electromagnetic) and these hidden secret is the cradle of real science and arts of human.

*Each atom of your tender heart you bore,*
*You will see a sun smiling within the core.*

Hatif esfahani (19th-century A.D.)

The concept of the above couplet can be compatible with the issue of **the production of electromagnetic waves as a result of electron movement round the core of atom or proton.** Therefore, the sun in the second hemistich can mean the production of electromagnetic waves as a result of the nuclear fusion in sun**. Different parts of the electromagnetic spectrum radiating from sun have become the base of diverse sensors which are active in different parts of it.**

## *Light and Color*

It is an accepted and recognized scientific principle that human does not see the phenomena but sees its images. Seeing an image is the process of the light reflection and color is emerging out of light. For more than a thousand years, the India's astrologers have thought that sun's white light is composed of all colors (Jensen, 2000). Unfortunately, Aristotle's belief that all colors are created by mixing the black and white prevailed well into the seventeenth century (Wolinsky, 1999). Even Leonardo Da Vinci could not make up his mind, declaring on different occasions that there were primary colors- or eight. It took the genius of Sir Isaac Newton to put forth the correction concept of light and color.

***It dos not loose its color not only with seven water, but also by hundred fire;***
***What the wine did with the pious cloak***

Hafez (14th-century A.D.)

In the poems of the Iranian poets, there are many references to light and color. Rumi believes that the origin of color is light and a root in colorlessness. The mystical base of the word of Rumi is that world and in general, pluralism is created from the unity universe, so that the diversity of colors has roots in the unity of colors:

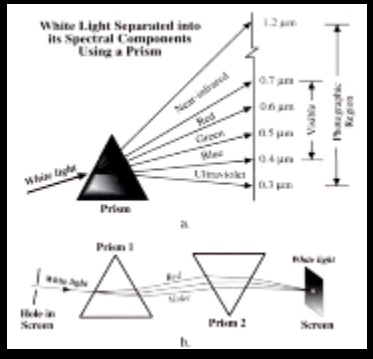
***The colorlessness is the base of colors;***
***as peace is the base of wars***

Molavi Romi (13th-century A.D.)

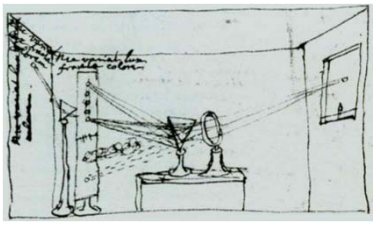
He is in the opinion that colorlessness is the based on the knowledge of color. In other words, for recognizing colors, he recommends the identification of colors or the same optics.

***There is away from many-coloredness to colorlessness:***
***Color is like the cloud, and colourlessness is a moon.***
***Whatsoever light and splendor you see in clouds,***
***know that is comes from the stars and the moon and the sun.***

Molavi Rumi (13th-century A.D.)



## Primary Colors



Mowlana Rumi
(1207 –1273)

From Poematic thoughts to Science

The genius Newton in 1672, made his "New Theory about light and colours " by his prism experiment. Ideas of Newton helped launch the era of modern optics.

In our research for finding the primary consepts of RS we found the primary colours 0f **(R, G, B)** in poems of Molavi about **400 years before newton** .He expresses the provability of color through hidden state of color at night (the lack of light). In another couplet, he states the existence of the source of light, its reflection and also the visual perception of color amazingly.

***You will be unable to see green, red and blue colour***
***until you could see more than these three lights***
***As these lights are hidden at night***
***so you observe that the seeing of color is from the light***
***It is not possible to see the color without the external light***
***Also the same applies to the color of inner imagination.***

Molavi Romi (13th-century A.D.)

***The superstructure of all were various glasses***
***the radiance of the sun existence fall on it***
***Each glass being yellow, red or dark-blue***
***The sun reflected in that glass the same color which was there***

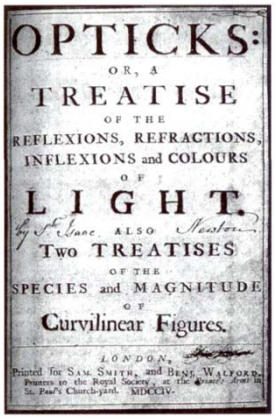
Jami (15th-century A.D.)

***You could not see the color, since there was no light at night***
***So you knew it with the contra-light***
***First is seeing the light and then there comes the color***
***you will know it based on contra-light immediately***

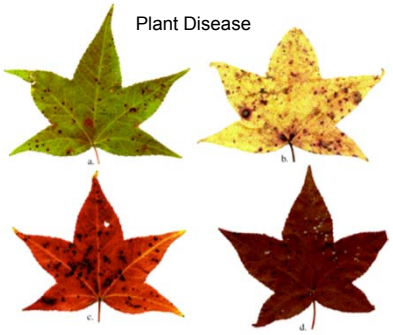
Molavi Romi (13th-century A.D.)

Moulana Rumi wrote MASNAVI in 1270

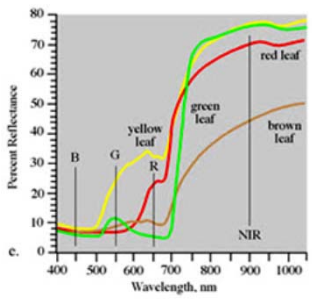
The manuscript of masnavi by rumi

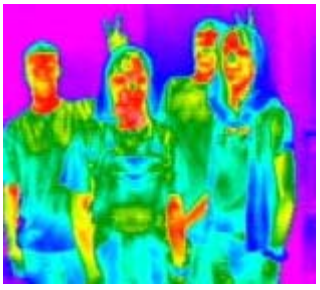



Sir Isaac Newton
published OPTICS in 1704.




*Without speaking about the love ,*
*The color of face informs from*
*the secret of heart*
Sadi Shirazi (13th-century A.D.)



Human thermal infrared picture

## THE PERCEPTION AND PROPER INTERPRETATION OF IMAGE

The perception of image in the part of the interpretation of aerial photos and satellite images are the most outstanding and artistic parts of Remote Sensing. Human is created such that he will be able to percept the realities of the entity. In other words, human is equipped with intellect by which he can percept his creator and the world. Though the human senses are limited and are not sufficient to percept the complex and immense world. Molavi (Rumi) expresses this limited capacity of senses as follows:

***The eye of sense-perceptions only likes the palm of the hand:***
***the palm that not power to do everything.***

Molavi Rumi (13th-century A.D.)

Sometimes the sensational limits do not let humans to have his perceptions abilities to their functions properly. In fact by making amendments in the perception powers, understanding the facts in human can be changed. According to Molavi (Rumi), the smallest factor can disturb the understanding and perception of human:

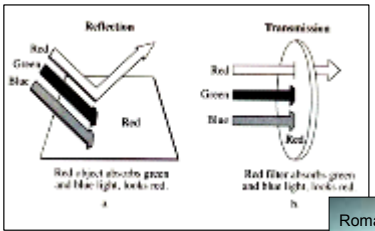
***(He said) "When thou layest one finger on an eye,***
***thou seest the world empty of the sun".***
***So that the (whole) world may be covered***
***(hidden from view) by a single point and***
***the sun be eclipsed by a splinter.***

Molavi Rumi (13th-century A.D.)

The light reaching our eye is a function of surface reflectance. The dependency due to illuminant color is removed through color constancy computation. We have a good solution to color constancy: the white page of this paper looks white whether viewed under blue sky, or under a yellow artificial light. However, the processes through which color constancy is achieved are not well understood: the mechanisms of human visual color constancy processing are not known (Graham .D. Inlayson). This is the same motif, which is referred to in this couplet by Molavi (Rumi) beautifully:

***You held a blue glass before your eye:***
***for that reason the world seemed to you to be blue.***

Molavi Rumi (13th-century A.D.)




Today we use from Anaglyph glasses in remote sensing and aerial photo's interpretation

Anaglyph Glasses

Romania
Red-Blue Glasses view

## Conclusion

In this paper, the history of Remote Sensing and the ideas of remote sensing in the ancient ages were discussed with a scientific and literary view based on some samples of the poems of Iranian poets.

**• The paradigms of remote sensing have been grown like many other sciences on the ground of ideas, beliefs, imaginations and efforts made by the past people to identify and assess the entity.**

**• Since for the sake of a proper recognition, gaining awareness and a deep understanding of primary concepts and ideas is inevitable, so that it will be proper to establish a logical link between the scientific and technological aspects of Remote Sensing and the literary-historical aspects as well.**

**• The rich treasury of the Persian literature will be useful to express and understand the concepts of this new science. This will not only reinforce the sensational and artistic aspects of Remote Sensing but also as a combination of science, art and technology can help us find a more deep insight into the core of the ideas of the past .**

**•The result of this study shows that ancient thoughts helped open the world to us and expound the scope of our understanding at every turn.**