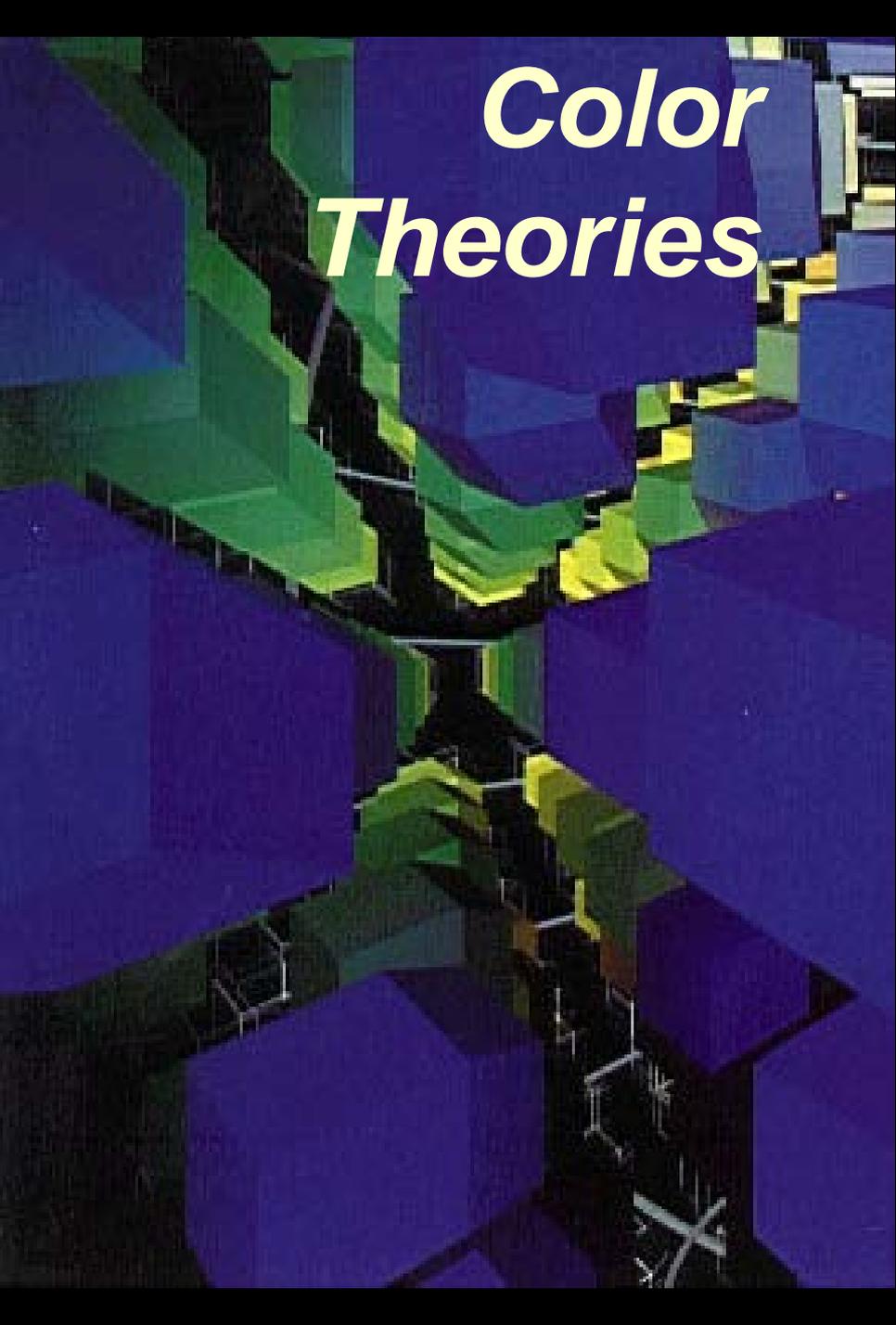


*Color Theorists*  
*Ancient to 1800*

An abstract 3D geometric composition of various colored blocks (blue, green, yellow) arranged in a complex, layered structure. The blocks are of different sizes and orientations, creating a sense of depth and perspective. The colors are vibrant and saturated. The overall composition is dense and intricate, with many overlapping surfaces and edges.

# ***Color Theories***

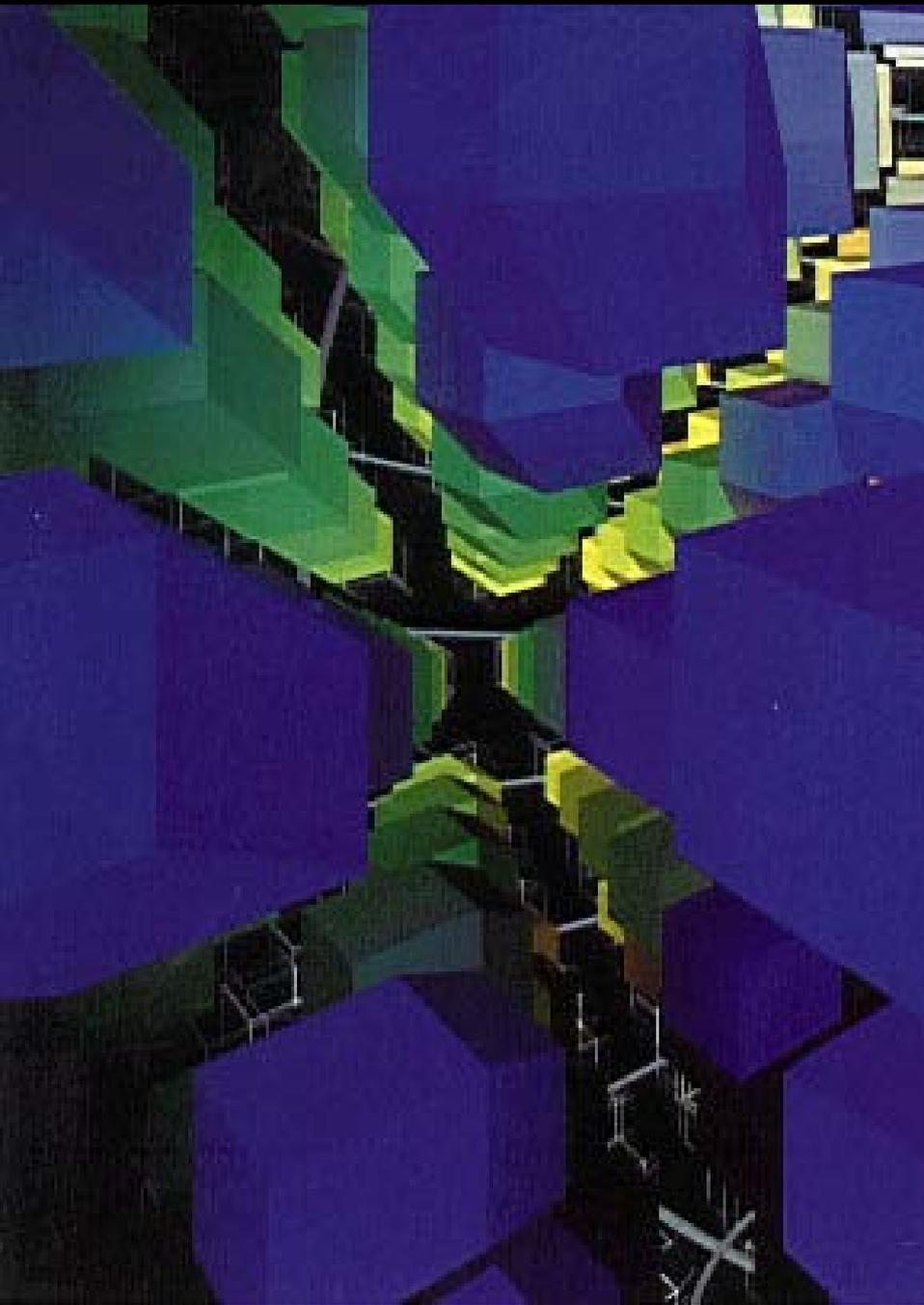
***Theories attempt to  
answer questions —***

- ***Such as  
...what IS color?***
- ***...what are the fundamental  
colors?***
- ***....how does color work?***
- ***...how can I organize,  
model, or specify colors?***
- ***...how does color  
perception happen?***
- ***...how can I anticipate what  
colors will do together?***
- ***...how can I predictably  
harmonize colors?***



***Color  
theorists—  
who are they?***

- ***Philosophers***
- ***Scientists***
- ***Artists***
  
- ***Each theorist asks questions from a different point of view... with a different emphasis and aim.***



***For each Color Theorist, consider:***

***What is he/she trying to explain or accomplish?***

***Who are major contributors or influences?***

***When presented?***

***What insights and/or models did they contribute?***

***Who benefited...who was influenced?***



# *Color Theories*

- *See*
- *[www.ColorSystem.com](http://www.ColorSystem.com)*

home  
English  
Français  
Deutsch

# virtual colour museum



library

Grupo Argentino del Color



send us interesting  
colour-links with  
your comment

## echo productions

- [Franciscus Aguile](#)
- [Robert Fludd](#)
- [Athanasius Kirc](#)
- [Richard Walle](#)
- [Isaac Newton](#)
- [Tobias Mayer](#)
- [Moses Harris](#)
- [Johann Heinrich La](#)
- [Ignaz Schiffermü](#)
- [James Sowerb](#)
- [Johann Wolfgang](#)
- [Goethe](#)
- [Philipp Otto Rur](#)
- [Charles Hayte](#)
- [Michel Eugène Ch](#)
- [George Field](#)
- [James Clerck Ma](#)
- [Hermann von Helr](#)
- [William Benso](#)
- [Wilhelm von Bez](#)
- [Wilhelm Wund](#)



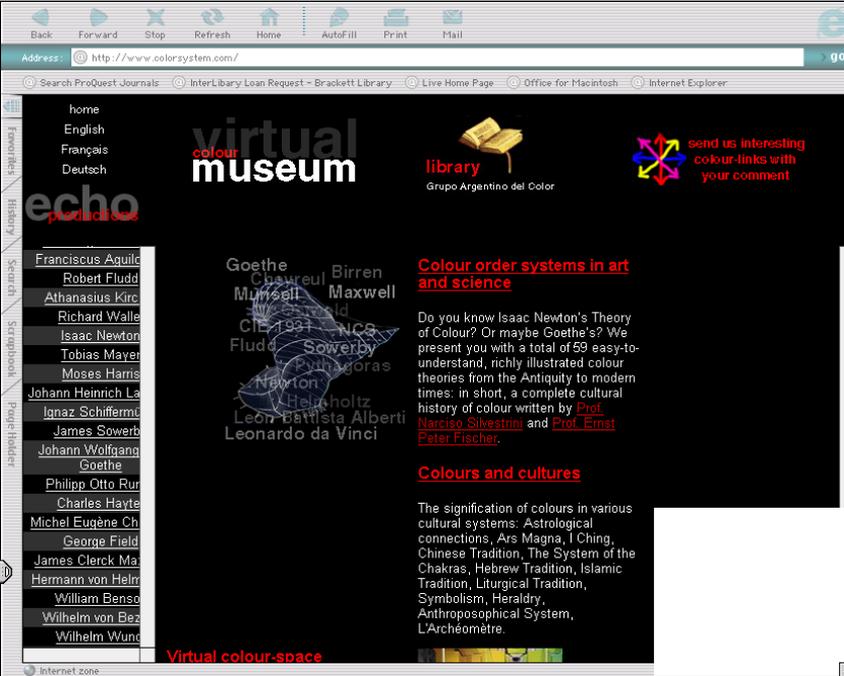
### Colour order systems in art and science

Do you know Isaac Newton's Theory of Colour? Or maybe Goethe's? We present you with a total of 59 easy-to-understand, richly illustrated colour theories from the Antiquity to modern times: in short, a complete cultural history of colour written by [Prof. Narciso Silvestrini](#) and [Prof. Ernst Peter Fischer](#).

### Colours and cultures

The signification of colours in various cultural systems: Astrological connections, Ars Magna, I Ching, Chinese Tradition, The System of the Chakras, Hebrew Tradition, Islamic Tradition, Liturgical Tradition, Symbolism, Heraldry, Anthroposophical System, L'Archéomètre.

Virtual colour-space

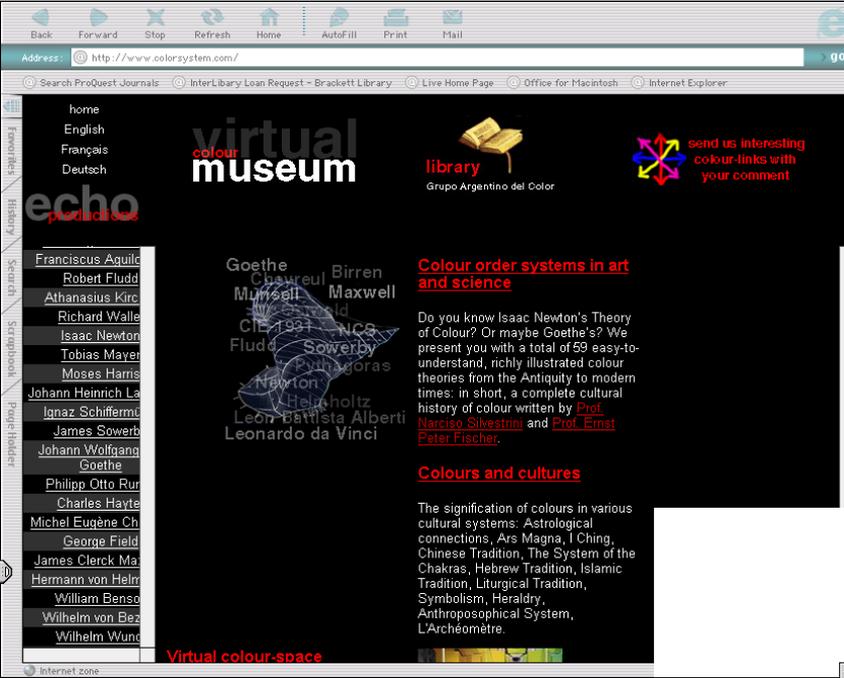


# Color Theorists

- [www.ColorSystem.com](http://www.ColorSystem.com)
- **59 color theories**
- **Cultural differences in color meanings.**
- **Various color models**  
(some interactive 3D)

Pythagoras,  
Aristotle,  
Plato  
Robert Grosseteste,  
Leon Battista Alberti,  
Leonardo da Vinci  
Aron Sigfrid Forsius  
Franciscus Aguilonius  
Robert Fludd  
Athanasius Kircher  
Richard Waller  
Isaac Newton  
Tobias Mayer  
Moses Harris  
Johann Heinrich Lambert  
Ignaz Schiffermüller  
James Sowerby  
Johann Wolfgang von  
Goethe  
Philipp Otto Runge  
Charles Hayter

Michel Eugène  
Chevreul  
George Field  
James Clerck Maxwell  
Hermann von Helmholtz  
William Benson  
Wilhelm von Bezold  
Wilhelm Wundt  
Ewald Hering  
Charles Blanc  
Nicholas Ogden Rood  
Charles Lacouture  
Alois Höfler  
Hermann Ebbinghaus  
Robert Ridgway  
Albert Henry Munsell  
Wilhelm Ostwald  
Michel Jacobs  
Max Becke  
Arthur Pope  
Edwin G. Boring



# Color Theories

- [www.ColorSystem.com](http://www.ColorSystem.com)
- **59 color theories**
- **Cultural differences in color meanings.**
- **Various color models (some interactive 3D)**

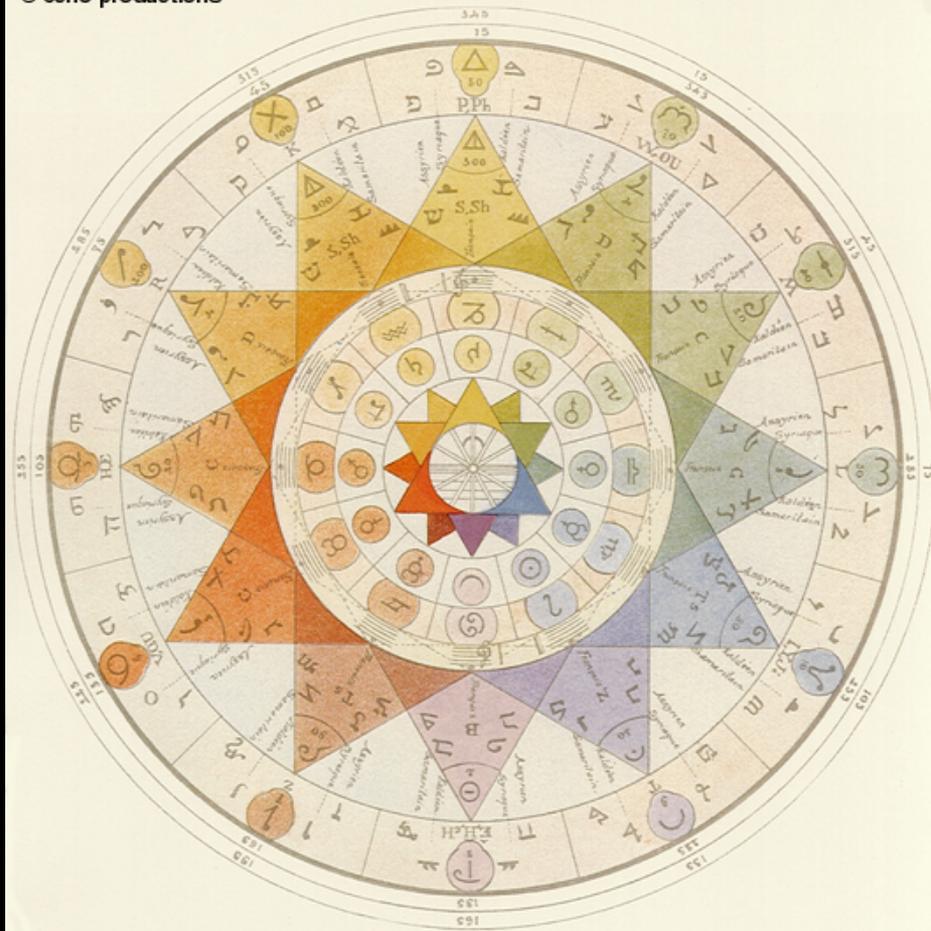
Islamic Tradition  
 Liturgical Tradition  
 Symbolism  
 Heraldry  
 The Anthroposophical System  
 L'Archéomètre

Astrological Connections  
 Ars magna  
 I Ching  
 Chinese Tradition  
 The System of the Chakras  
 Hebrew Tradition

# How long has this been going on?

- A very long time.
- Color has been an interest of virtually every culture for as long as we have recorded history.
  - Hindu Upanishads
  - Greek philosophers
  - Arab physicists

© echo productions



Adanque | A | 1 | 1/2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100

# *Who are major contributors?*

- *Aristotle— 384BC -- 322BC*
- *Leonardo—c. 1500 (published 1651 Treatise on Painting)*
- *Newton—c. 1700*
- *Goethe—1810 Theory of Colors*
- *Chevreul—mid-1800s*
- *Rood—1895 Modern Chromatics*
- *Munsell—1905 Color Notation*
- *Ostwald —early 20<sup>th</sup> c.*

# ***Art/Design Color-theorists***

- ***Faber Birren***
- ***Joseph Albers***
- ***Johannes Itten***

## *early observations on color and culture*

- *We see only the colors we know about.*
- *We make fine distinctions in hues/colors that are important to us.*
- *Our ideas determine what we are capable of perceiving.*
- *Each culture passes on its color awareness and discoveries to subsequent cultures.*

## *early observations*

- *We see only the colors we know about.*
- *We make fine distinctions in hues/colors that are important to us.*
- *For instance:*
- *Inuit cultures (Eskimos) have no separate terms for blue and green, but over 20 terms for various whites.*
- *Natives of Amazon rain forest have many terms for greens.*

# ***Culture and color: simple to complex***

“The domain of colour terms has been of particular interest to anthropologists, who have discovered intriguing differences in the number of special words for colours used from culture to culture” (Berlin and Kay, 1969).

*Some cultures have only two terms, and numbers range from this minimum to over twenty.*

<http://www.umanitoba.ca/anthropology/courses/122/module2/richness.html>

The number of colors that a culture recognizes (i.e. has names for) is often an indicator of the general development/maturity of that culture.

## *Each culture “discovers” hues in a similar order*

“Furthermore, there is a surprising regularity in the actual selection of the specific terms.

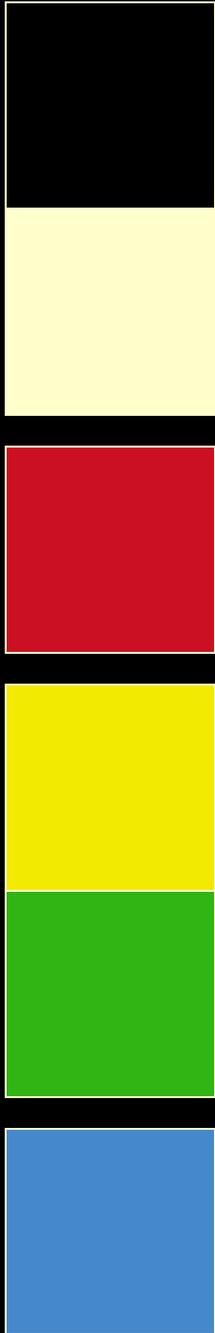
When only two color terms are used, they are **invariably** “black” and “white.”

**A third term will always be “red.”**

The fourth and fifth colours recognized will be “yellow” and “green,”

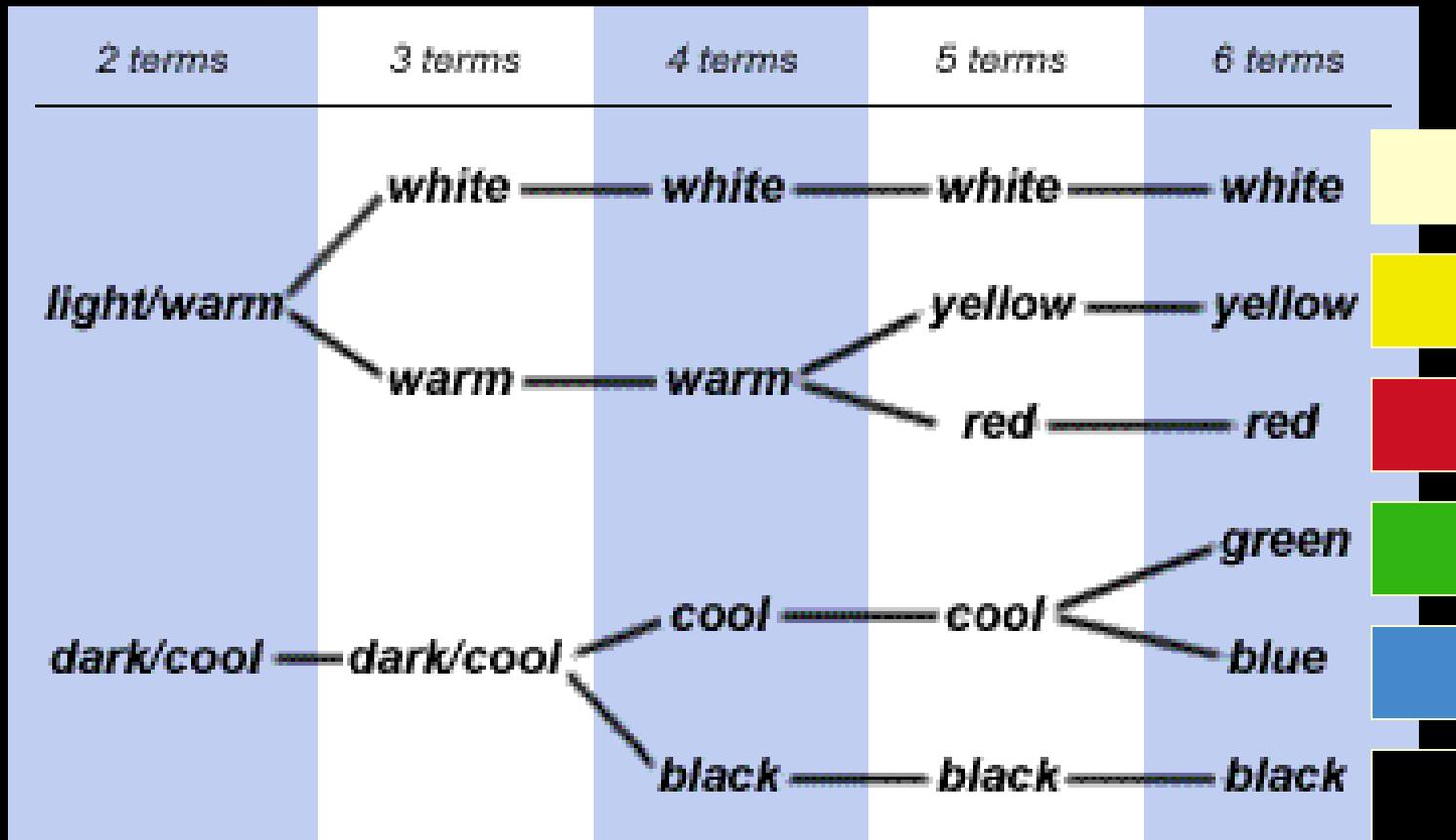
the sixth, “blue.”

<http://www.umanitoba.ca/anthropology/courses/122/module2/richness.html>



# Tracing Historical Color: Naming color

“Most of the evidence comes from color naming studies conducted by anthropologists and cognitive psychologists across different languages. The anthropological data (called the **World Color Survey**) records the names assigned to Munsell color samples by 2700 native speaking respondents in 110 different language cultures.”



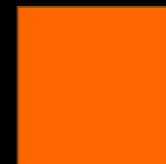
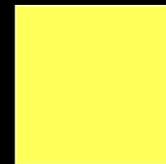
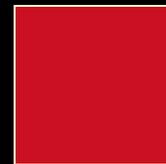
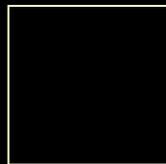
# *Historical Color: Basic and Binary Colors*

“According to this scheme, **there are two kinds of colors and color words:**

(1) **basic colors**, which cannot be reduced to any other color name or color mixture, and which are the six unique colors (red, green, yellow, blue, white and black), and

(2) **binary colors**, which are mixtures of two basic colors or color words ("red+yellow" for orange, "red+black" for brown).

The hypothesis is that **languages develop basic terms through opposing contrasts and binary terms through overlap or combination.** The scheme is largely validated by stages in the development of modern English:”



# *Culture and color*

“...in the least-evolved languages values — **light and dark** — **take precedence over hues**.... (e.g. Aristotle’s color hypothesis)

...our visual mechanisms seem to be able to reconstitute the whole range of colour-perceptions on the basis of a severely limited set of stimuli (red, green, blue and dark/light) just as colour-vocabularies seem to work with a very limited set of ‘basic’ or ‘primary’ terms.

...the idea of fundamental colours has been far from universal.” (i.e. “primaries” are *not* obvious to everyone)

# Colorblind Greeks?

During early cultures... **“the concept of “color” as a perceptual attribute does not really exist.**

For example, the **ancient Greeks defined color as a material attribute**, so other material qualities or physical changes were also identified with color names — especially “black” or “white”.

Color words also denoted **surface qualities** (“black” was due to roughness),  
**optical quality** (“white” translucence),  
**reflectivity** (a “white” mirror),  
**color intensity or chroma** (a “white red” was an intense red),  
**physical composition** (“blue” was associated with air, “black” with earth),  
or **chemical origin** (pigments made by a similar method of manufacture, regardless of hue).

Indeed, **Greek color words appear so haphazardly in ancient texts that the 19th century philologist W.E. Gladstone concluded that the Greeks were colorblind!”**

# *Culture and color*

Additional colours will be added in a regular order as well.

This pattern is clearly evident in **English**, which has **only five** of its own terms: **black, white, red, yellow, and green.**



All the other special words we use for colour are either loans from French, e.g., "bleu," (blue) or terms that refer to objects, such as Pink or Rose, which are both flowers.

...or Burgundy (a wine)

... or Orange (a fruit)

# *Culture and color*

Cross-cultural differences in the number of colour terms and the regularities in their variation defy adequate explanation.

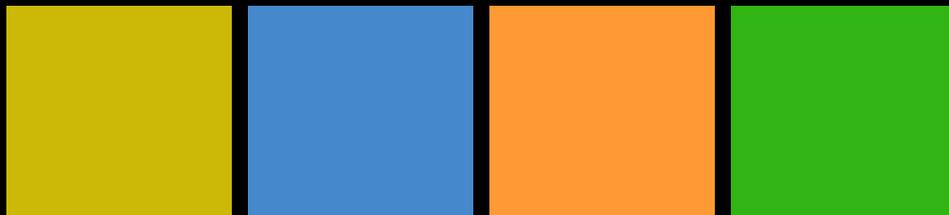
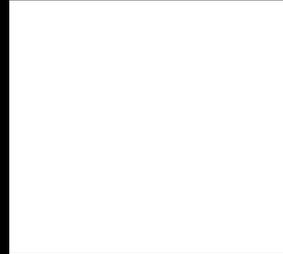
It is clear that different colour taxonomies are **not correlated with differences in perception**, i.e., people who classify everything as black and white have quite adequate colour vision.

There is a *correlation between the number of terms and technological development*, but it is too weak to suggest a definite regularity.

<http://www.umanitoba.ca/anthropology/courses/122/module2/richness.html>

# *The first colors*

- *White and Black == Light and Dark*
- *Red = blood*
- *Yellow, green, blue, orange, and brown...*
- *Nature and immediate experiences made the first colors significant and familiar -- and so we named them.*



# Homer, the Iliad, & color awareness

*(lived sometime between 1200bc 850b.c.e...if he actually existed)*

- *“The British statesman W.E.Gladstone, in his essay ‘Homer’s perceptions and use of colour’, concluded that the poet’s colour-system was ‘founded upon light and upon darkness’, that the organ of colour ‘was but partially developed among the Greeks of his age’ and that it had not developed much further by the time of Aristotle”*
- *“(however...)We know now that language cannot be interpreted as a direct index of perception...”*  
— Gage/Color & Culture p.11

# *Alcmaeon of Croton*

(early 5th c. BC)

*“...the earliest written Greek records of color, in the poetry of Alcmaeon, dwell on the antithesis between black and white, or darkness and light...this antithesis provided the armature of the more developed theories of Empedocles and Democritus”*

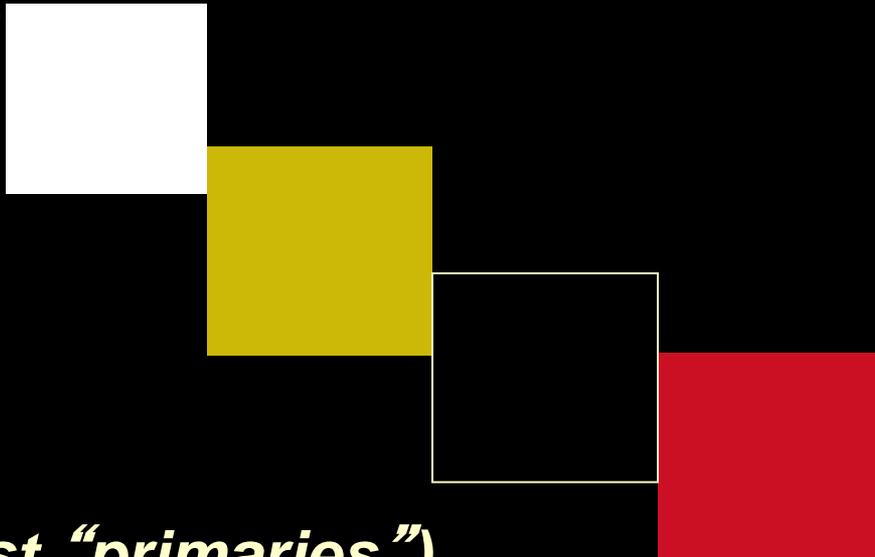
— Gage/*Color & Culture* p.11

# *Pythagoras*

- *Greek mathematician.*
- *Approx. 500 B.C.*
- *Proposed that color exists on the surface of objects and is activated by a hot emission from our eyes.*

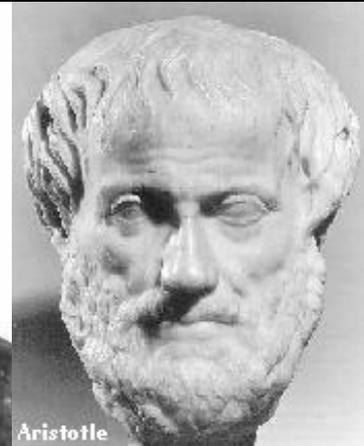
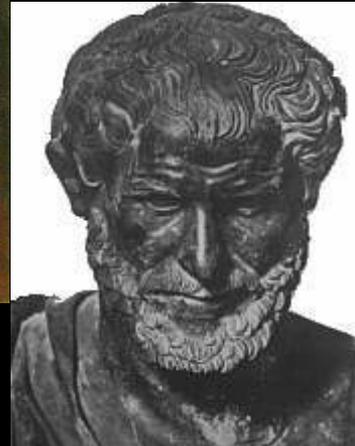
# ***Empedocles***

- ***Greek, 440 B.C.***
- ***Energy flows from both our eyes and from the surface of the object to produce the color sensation.***
- ***He associated basic colors with each of the fundamental elements acknowledged by the ancient Greeks –***
- ***Fire – white***
- ***Air – yellow***
- ***Water – black***
- ***Earth – red***
- ***(these are the first “primaries”)***



# Aristotle

- **384BC -- 322BC**
- **Greek philosopher, scientist, physician.**



*Rembrandt's Aristotle Contemplating a Bust of Homer*



# Aristotle

*One of the greatest figures in the history of Western thought, Aristotle was born in Stagira, Macedonia.*

*In 367 BC, he went to Athens, where he was associated with Plato's Academy until Plato's death in 347 BC.*

*In 342 BC he was invited by Philip of Macedon to educate his young son, Alexander (later to be "the Great").*





# Plato - Aristotle

**Plato's ideal plane contrasts with Aristotle's emphasis on the particulars, the observed, experienced, empirical reality.**

**Plato thus points upward to those lofty ideas – with Leonardo as the model. Aristotle points downward to the earthly reality that we observe.**

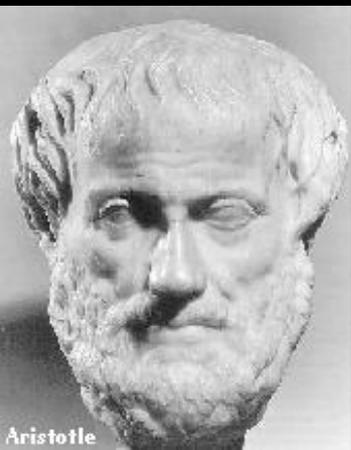
**Michelangelo and Raphael look on.**





# Aristotle

- *De Coloribus*
- *Aristotle tried to explain what causes different colors—where do colors come from?*
- *Color comes from varying combinations of “sunlight and firelight, and of air and water”*
- *“Darkness is due to privation of light.”*
- *All variations in color are the result of varied proportions of darkness and light.*

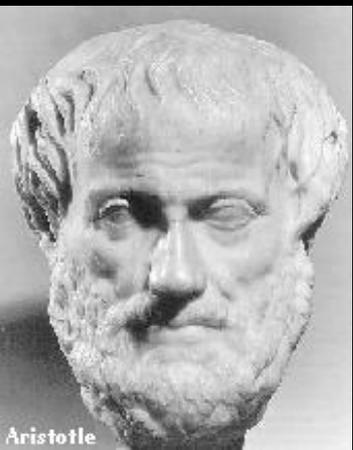


Aristotle

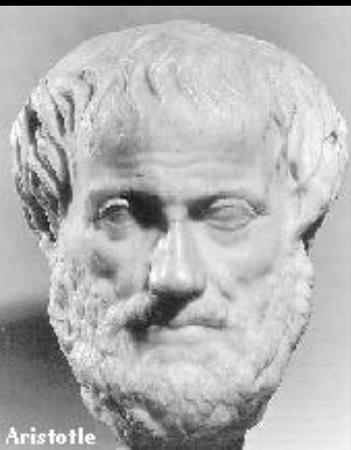


# Aristotle

- .. *what causes different colors—where do colors come from?*
- To the ancient Greeks, the “world is understood as an organic entity, with its colours arising from the continually observed struggle between the darkness of the night and the light of day.”
- “Any system of colours must therefore range from white through to black ..., the simplest possibility is ... the straight line.”



Aristotle



Aristotle



BIANCO



GIALLO



ROSSO



VIOLETTO



VERDE



BLU



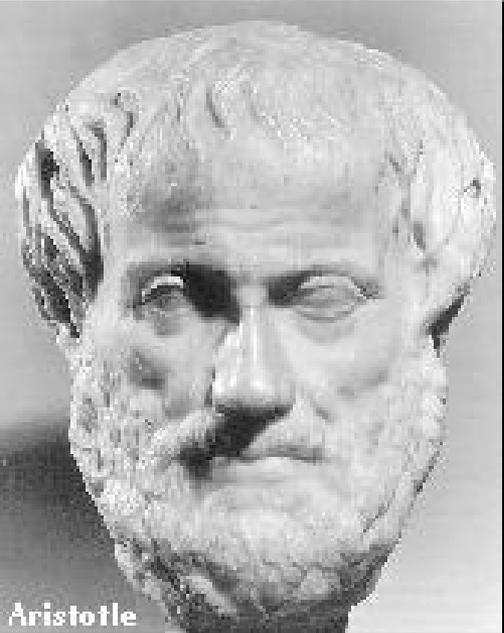
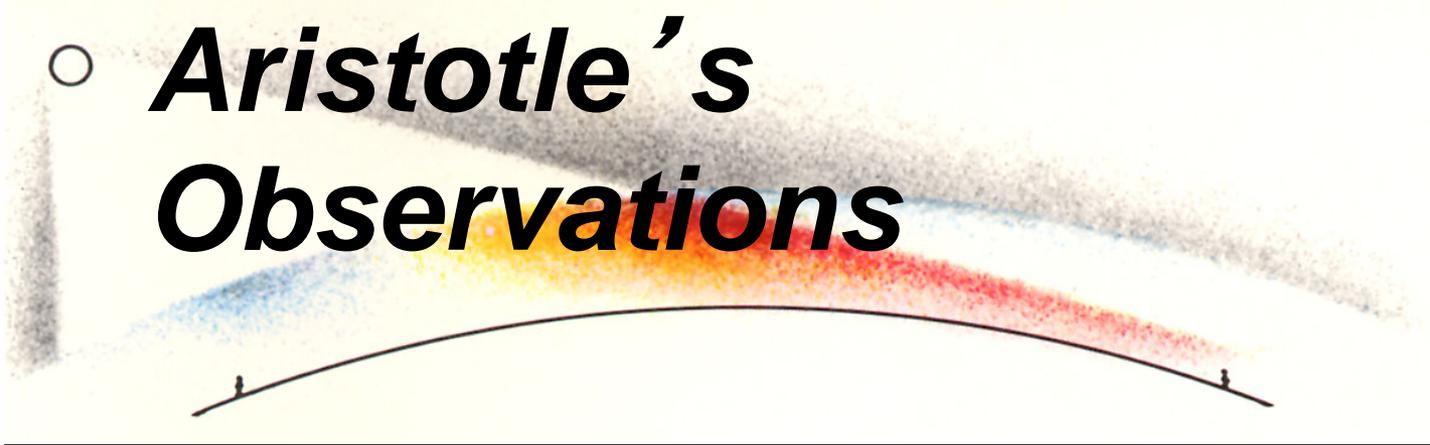
NERO

# *Aristotle*

- “Aristotle’s linear sequence of colours” can be observed during the course of the day: the **white** light of noon becomes tinged with **yellow**, and changes gradually to orange, and then to **red**. After sunset, this evening red becomes a purple **violet**, changing to a night sky which appears as dark **blue**. In between, **green** light can sometimes be seen.”



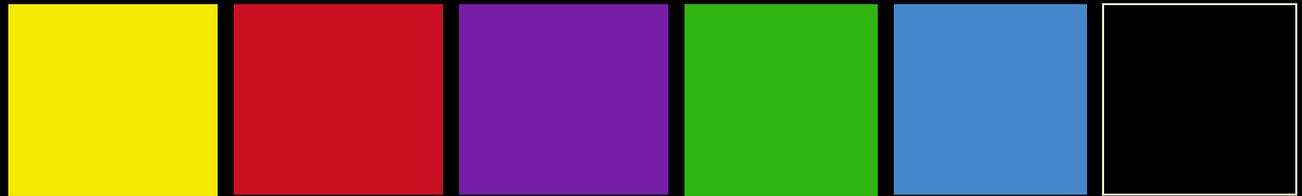
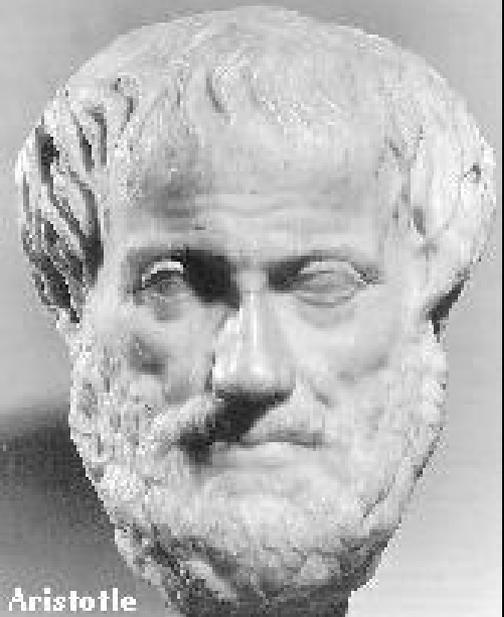
# ○ **Aristotle's Observations**



- ***He learned by looking at phenomena and considering what he observed.***
- ***He watched the changing colors of the sky throughout the day.***
- ***At noon, the sun is yellow.***
- ***Later, orange, then red...***
- ***...the sunset becomes green and dark blue...***

# *Aristotle's Primaries*

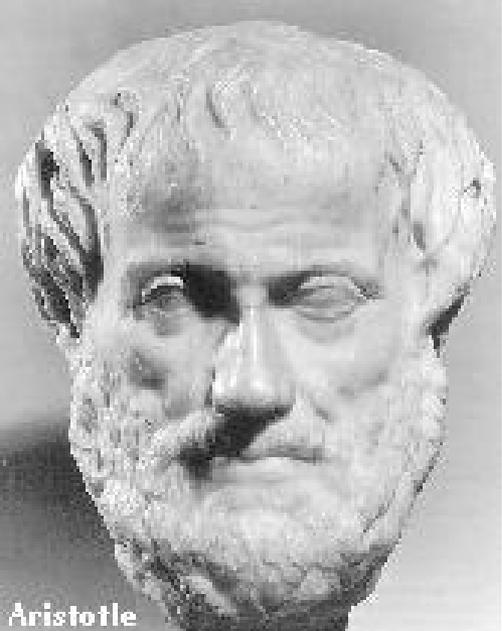
- *White, yellow, red, violet,  
green, blue, and black*





# Aristotle

- ***Greek philosopher, 384-322 B.C.***
- ***Dominated color theory until the Middle Ages***
- ***All colors are actually subtle mixtures of black and white.***
- ***Color is a phenomenon of light (right!)***
- ***Light produces White***
- ***Darkness produces Black***
- ***All the rest is a mixture of light and dark.***



Aristotle

# ***1800 years later...The Italian Renaissance***

- ***The medieval church discouraged any source of knowledge other than scripture – so pagans such as Plato, Aristotle, Homer, etc. were effectively buried for a thousand years.***
- ***Then long lost and disdained writings of the ancient Greek thinkers were reconsidered...maybe scripture doesn't exclude thinking.***
- ***Insights and methods of learning by observation were recovered...***
- ***...so, the renaissance (re-birth)!***



# ***Leone Battista Alberti*** ***(1404-1472)***

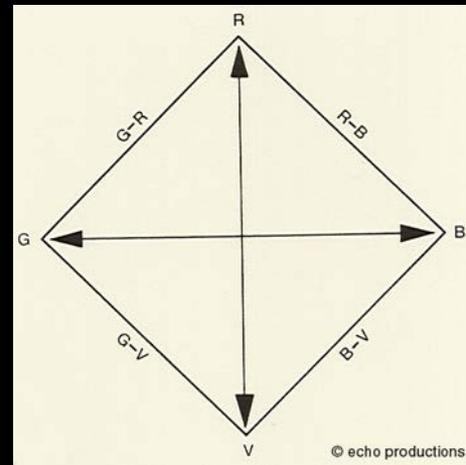
- ***Italian Architect & Painter***
- **Alberti receives an education for religion in different Italian cities.**
- **he is a painter, a musician, a poet, an architect, and above all, a humanist.**
- **His interests are philosophy, art theory and ancient times.**
- **In 1453, he publishes his treaty about painting. In it, he encodes and publishes Brunelleschi's technical discoveries.**





# ***Leone Battista Alberti*** ***(1404-1472)***

***Also compared colors to the four “elements” (recall Empedocles):***  
***red-fire;***  
***blue-air;***  
***green-water;***  
***yellow-earth (later, changed to gray for earth)***





# ***Leone Battista Alberti*** ***(1404-1472)***

- ***+ Said that color perception is dependant upon light***
- ***+ Rejected Aristotle's notion of color as mixtures of black and white.***
- ***+ Distinguished chromatic hues (red, yellow, green & blue) from achromatic neutrals (black, white, & gray)***
- ***+ Arranged a color square as his model.***



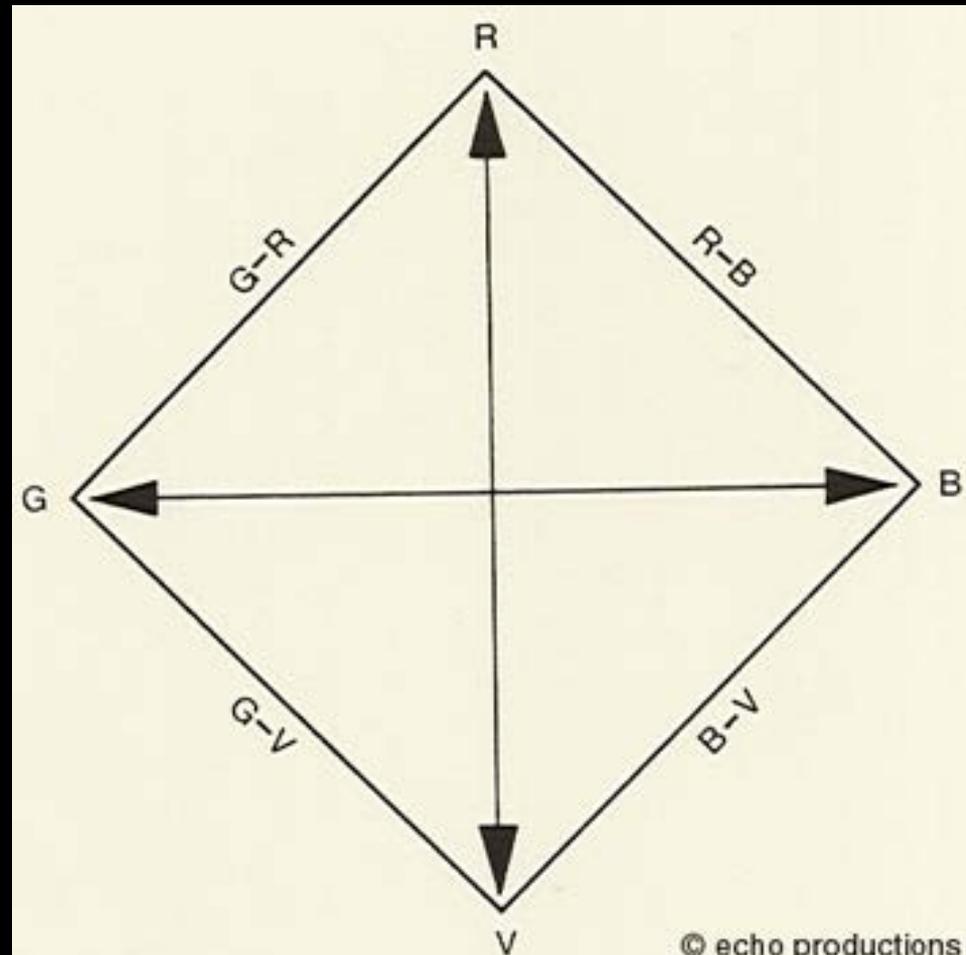


# Leone Battista Alberti (1404-1472)

- + Arranged a color square as his **Color Model**.
- His system aimed to aid mixing colors.



yellow (giallo. G),  
green (verde. V),  
blue (blu. B),  
red (rosso. R)





# ***Leone Battista Alberti*** **(1404-1472)**

- From Tuscan romanesque, he adopts the *bicolor harmony* and the pointed arch.



**Basilica of  
St. Andrea-  
Andrew**

Mantua

**Santa Maria  
Novella**

Florence  
(across from  
the train  
station)





# ***Leonardo da Vinci***

***Italian painter, inventor, etc.  
(1475-1564)***

***published 1651 Treatise on Painting***

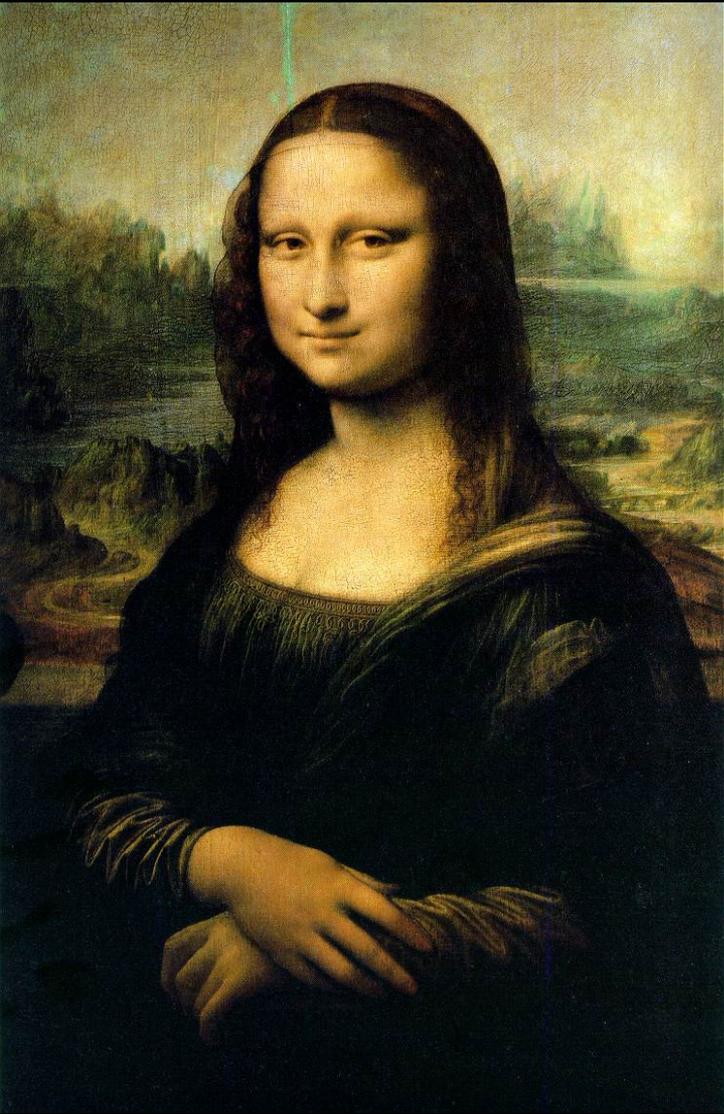
***Studied and observed color  
phenomena in nature.***

***“colors will appear what they are  
not, according to the ground which  
surrounds them.”***

***(simultaneous contrast)***

- ***Basic colors: White, yellow, green,  
blue, red, and black.***





# **Leonardo**

***Sought to identify the building block colors—the primaries.***

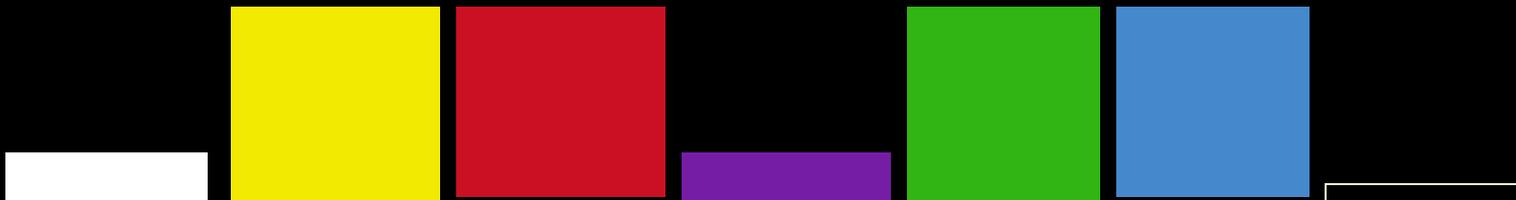
***Wrote Treatise on Painting (1651)***

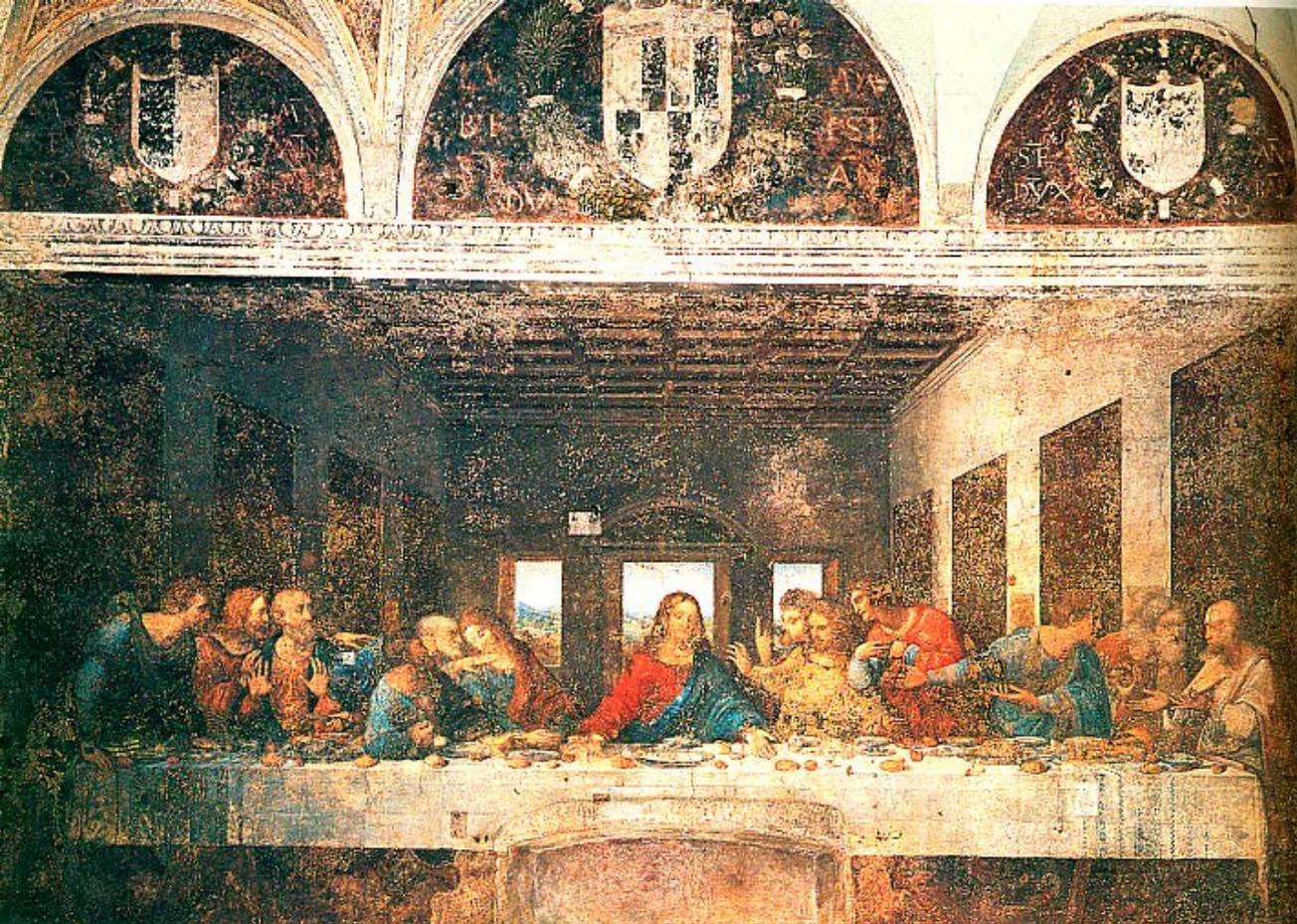
***Concluded that the main colors (in order of importance) were white (light), yellow (earth), green (water), blue (air), red (fire) and black (darkness).***



# *The Medieval Primaries*

- *Leonardo & Alberti agreed on four primary hues: Yellow, green, blue & red*



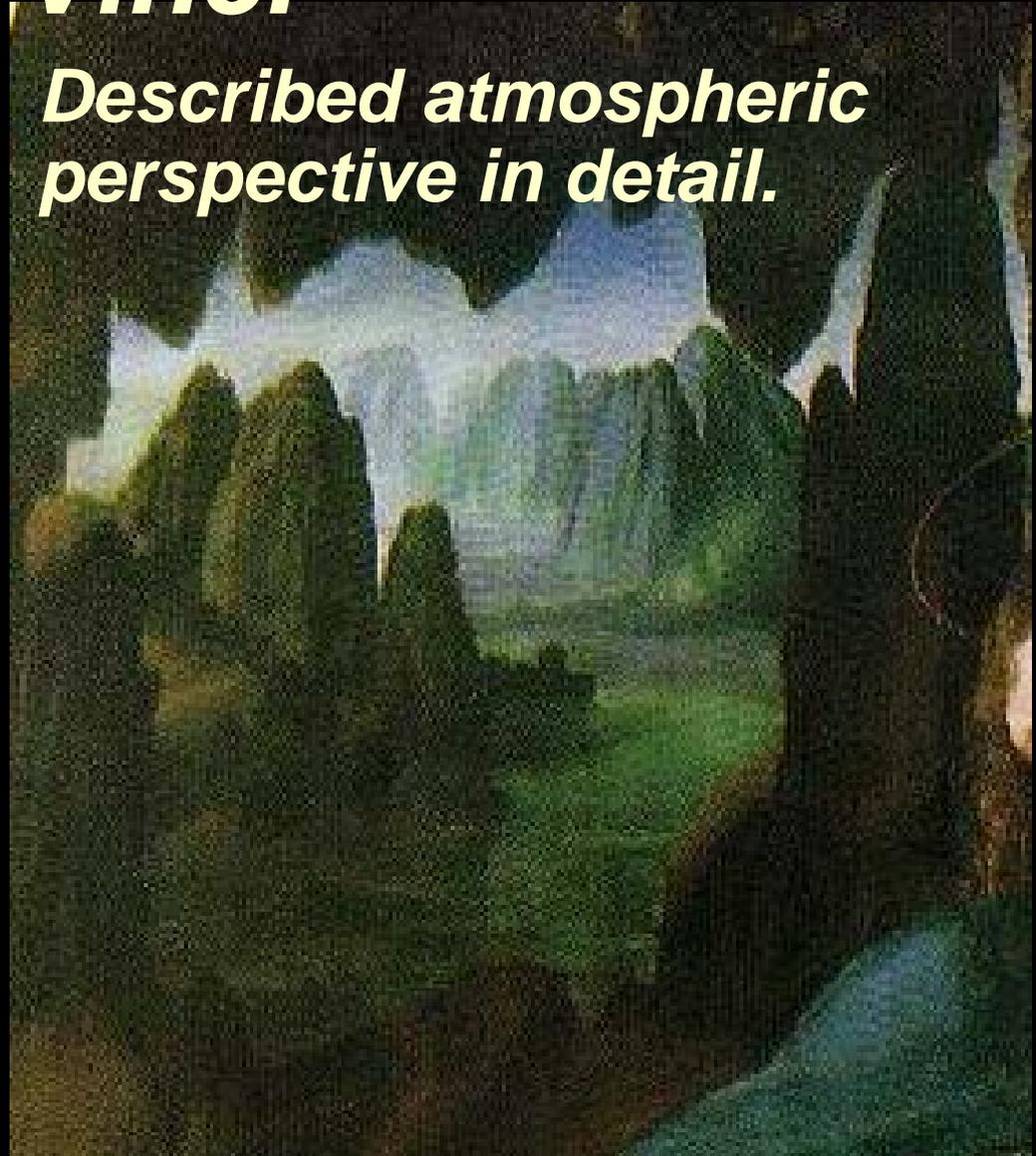


# ***Leonardo da Vinci***

- ***Recognized and described **complementary** relationships:  
“...each color is more distinctly seen when opposed to its  
contrary, than to any other similar to it.”***
- ***That is, complementary colors enhance one another.***
- ***The greatest contrast is between complementary colors.***

# Leonardo da Vinci

- *Described atmospheric perspective in detail.*



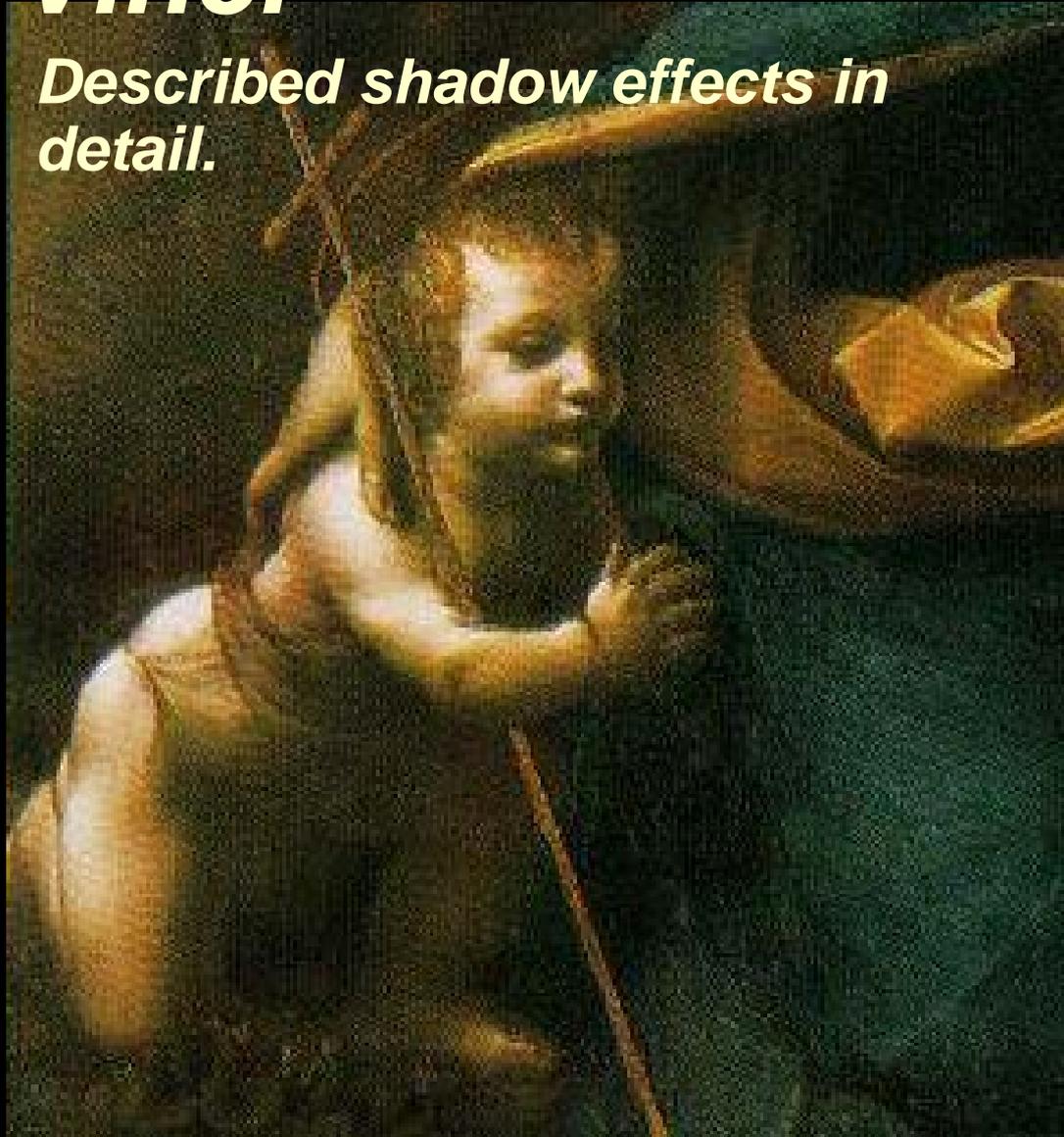
“He paints a broader range of luminance than he really sees. Such skillful use of light and dark paints to define three-dimensional shape became known as *chiaroscuro*, a style of shading that dominates tone (brightness) more than color.”

<http://webexhibits.org/colorart/vinci.html>



# Leonardo da Vinci

*Described shadow effects in detail.*





# Leonardo da Vinci

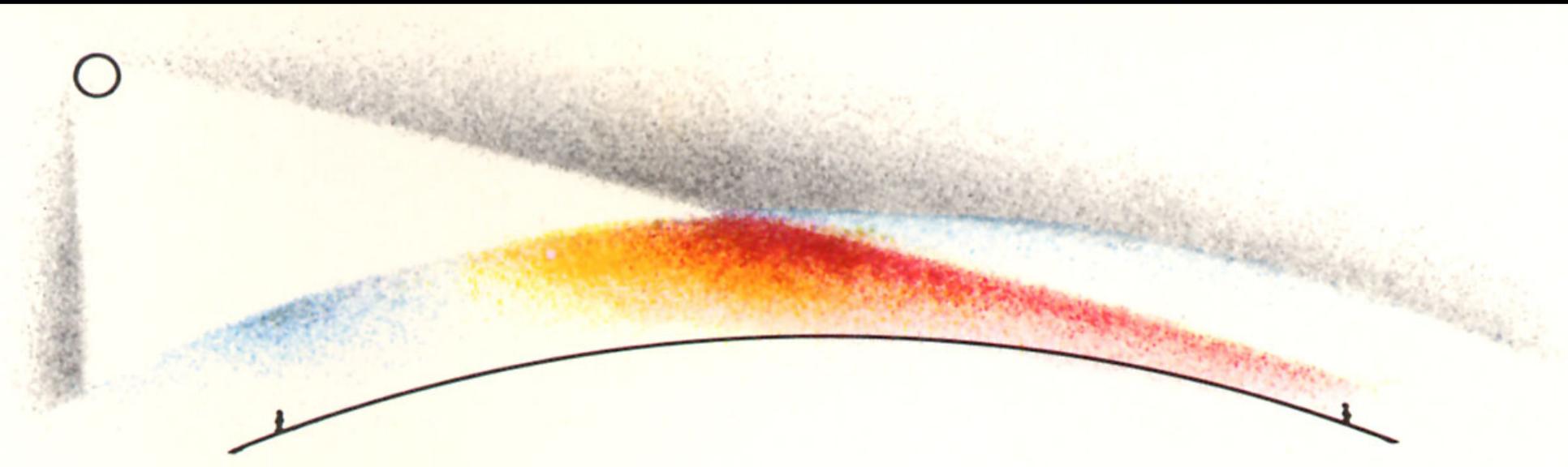
*Leonardo's notebooks included much advice to painters.*

“I would remind you O Painter! To dress your figures in the lightest colors you can, since, if you put them in dark colors, they will be in too slight relief and inconspicuous from a distance. And this is because the shadows of all objects are dark. And if you make a dress dark there is little variety between the lights and shadows, while in light colors there will be greater variety.”

<http://webexhibits.org/colorart/vinci.html>

# *Leonardo da Vinci-sky blue*

- *Bothered to ask 'Why is the sky blue?'*
- *Why do we see blue in the day time and stars at night?*



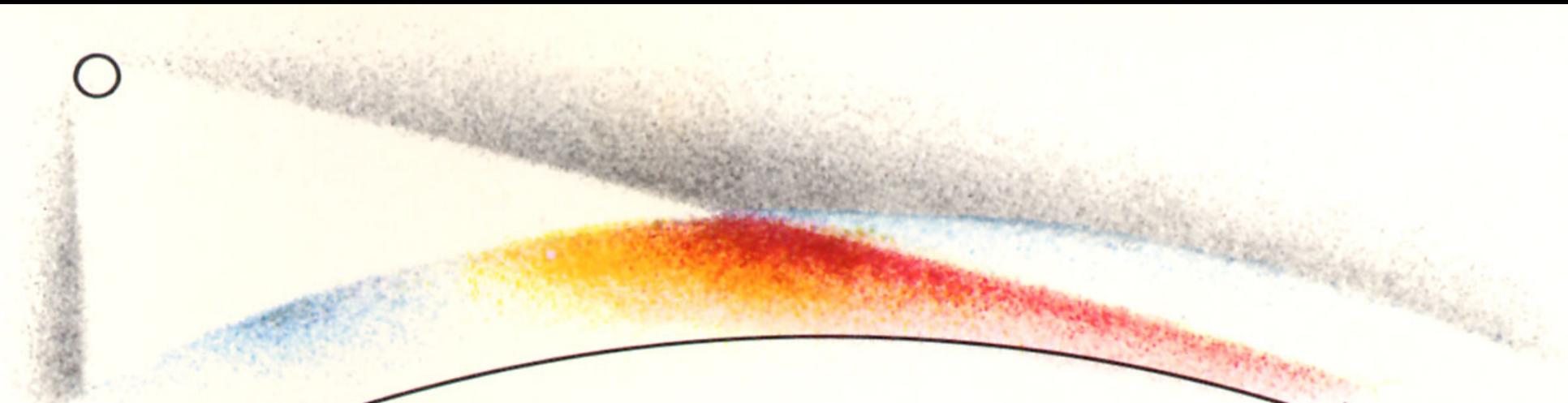
# ***Leonardo-sky blue***

- ***He considered fog and smoke...and how light scatters and objects fade in fog and smoke.***



# *Leonardo-sky blue*

- *He concludes...*
- *Moisture in the atmosphere refracts and diffuses brilliant sunlight—resulting in blue and grayness.*



# *Leonardo da Vinci - sky blue*



- *“I say that the blueness we see in the atmosphere is not intrinsic color, but is **caused by warm vapour** evaporated in minute insensible atoms on which the solar rays fall, rendering them luminous against the infinite darkness of the fiery sphere which lies beyond and includes it..”*

- *Leonardo's Ginevra di Benci is fundamentally a tonal study – a tonalist painting driven primarily by value relationships.*
- *If we remove the chromatic color (right side), little is lost.*



- **Note: If you visit Leonardo's Ginevra di Benci at Washington D.C.'s National Gallery...**

- **...be sure to walk behind it.**







- He inspired both his contemporaries and later generations of philosophers, leading them to form what we know today as *continental rationalism*, a philosophical position in 17th and 18th century Europe. Thus, Descartes was a key figure in the *Enlightenment*.

# **Rene Descarte**

- ***Cogito ergo sum = “I think, therefore I am”***



# ***Next time....***

## ***Sir Isaac Newton***

***1642-1727***

- ***British physicist and mathematician.***
- ***Major founder of current theories of color and light.***
- ***Identified seven spectral hues – red, orange, yellow, green, blue, indigo, & violet***
- ***Concluded that all other colors are mixtures of these spectral hues.***
- ***Recognized that white (light) is made up of all spectral hues.***
- ***“looped” the first widely known color wheel — a model of hue relationships.***

