

# Photons, the Rainbow, and G~d's Covenant

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**"ויאמר א-להים, זאת אות הברית אשר אני נותן ביני וביניכם ובין כל נפש חיה אשר איתכם לדורות עולם. את קשתי נתתי בענן והייתה לאות ברית ביני ובין הארץ. והיה, בענני ענן על הארץ ונראתה הקשת בענן, וזכרתי את בריתי אשר ביני וביניכם ובין כל נפש חיה בכל בשר, ולא יהיה עוד המים למבול ושחת כל בשר"**

**“My rainbow placed in the cloud will be the sign of this covenant that I am establishing with all living creatures forever that there will never again be flood waters to destroy all creatures”**

# Why a rainbow ?

## SIMPLE EXPLANATION

Since rain is the common forerunner of a flood, a heavy rain might scare people into thinking that there will again be a flood. A rainbow that accompanies the rain will assure people of G-d's covenant that this rain will not be the origin of another flood that destroys all living creatures.

# Why a rainbow ?

## DEEPER EXPLANATION

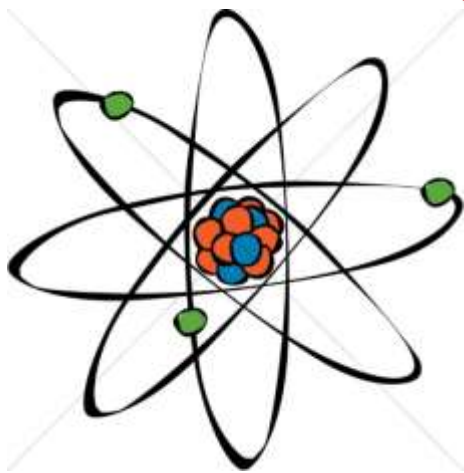
Science has shown that the rainbow has a unique feature that makes it the ideal symbol of G~d's covenant of stability and permanence in nature:

**NO MORE FLOOD.**

# PERMANENCE AND STABILITY

## Why not a mountain ?

Heavy earth-moving equipment can level mountains.



## Why not atoms ?

- Electrons
- Protons
- Neutrons

## Why not protons or neutrons?

Protons and neutrons also consist of smaller particles called quarks.

# PERMANENCE AND STABILITY

Are there particles that cannot be split into smaller particles and are permanent and stable?

## ELEMENTARY PARTICLES

electrons, quarks, gluons,  
neutrinos, gravitons, photons

# PHOTONS

A photon is a particle of light.

Previously it was thought that light is a wave phenomenon.

Max Planck (1900) and Albert Einstein (1905) showed that light really consists of a stream of particles which they called photons, from the Greek word for “light”.

# UNIQUE FEATURE OF PHOTONS

Five of the six elementary particles cannot be detected without special scientific instruments. But photons can be seen by the naked human eye without the need for any instruments.

## CONCLUSION

Light is therefore the ideal sign of G~d's covenant for the stability of the world.

**WHY A RAINBOW ?  
WHY NOT THE SUN ?**



# PHOTONS

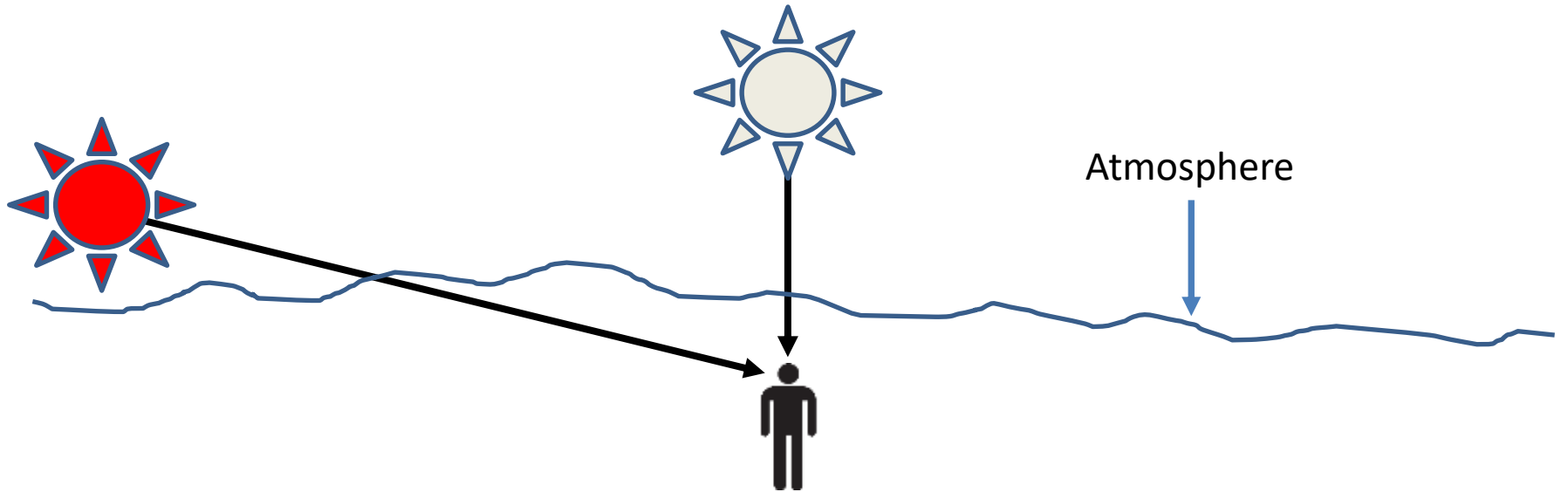
Photons have varying energies.  
We interpret this as the color of the photon.  
The most energetic photons are blue,  
the least energetic photons are red.

**SUNLIGHT is a mixture of photons of all colors, making the sun look white.**

# THE COLOR OF THE SUN

As sunlight passes through the atmosphere on its way to the surface of the earth, photons are scattered out of the sunlight.

Blue photons are scattered most.



The sun changes color at various times in the day.  
The sun is not suitable as a sign for stability and permanence.

Is there any situation in which one sees a stream of photons of **only one color** ?

# THE RAINBOW

Drops of rainwater act as prisms that separate the different colors of sunlight into the rainbow.



# CONCLUSION

The rainbow is a perfect symbol of the stability and permanence of nature and of G~d's covenant.

Note that this covenant is not just between G~d and the Jews or between G~d and mankind, but between G~d and all creatures on earth.