

## Combustion via Art

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## Introduction

Combustion, a chemical reaction between substances, usually including oxygen and usually accompanied by the generation of heat and light in the form of flame. The rate or speed at which the reactants combine is high, in part because of the nature of the chemical reaction itself and in part because more energy is generated than can escape into the surrounding medium, with the result that the temperature of the reactants is raised to accelerate the reaction even more. A familiar example is a lighted match. When a match is struck, friction heats the head to a temperature at which the chemicals react and generate more heat than can escape into the air, and they burn with a flame. If a wind blows away the heat or the chemicals are moist and friction does not raise the temperature sufficiently, the match goes out. Properly ignited, the heat from the flame raises the temperature of a nearby layer of the matchstick and of oxygen in the air adjacent to it, and the wood and oxygen react in a combustion reaction. When equilibrium between the total heat energies of the reactants and the total heat energies of the products (including the actual heat and light emitted) is reached, combustion stops. Flames have a definable composition and a complex structure; they are said to be multiform and are capable of existing at quite low temperatures, as well as at extremely high temperatures. The emission of light in the flame results from the presence of excited particles and, usually, of charged atoms and molecules and of electrons.

In the following combustion is presented via artworks. Figure 1 demonstrates practical application of combustion to burners used in domestic and outdoors gas stoves. The regular burner and its flame are shown on the top of the Figures. Due to the arrangement of the holes in the burner that are turning outside, the flame is also turning outside. In 1990 the first author developed an efficient gas burner in which the holes are turning to the center of the burner and are located at some angle with respect to the radius of the burner. In this year, the largest manufacturer of camping equipment in Israel launched the market with a new product, the Roto flame Camping Cooker. The burner and its flame are shown at the bottom of Figure 1 where its flame is concentrated and rotating.

The stove based on it has the following characteristics: 1) Thermal efficiency is higher by 20-25% than regular burners. 2) Boiling of water is accelerated considerably. 3) Due to rotation of the flame, mixing with air is better, thus reducing air pollution. The Polish surrealist artist Jacek Yerka (b.1952) painted



**Figure 1:** Combustion is presented via artworks.

Figure 2 entitled “Eruption” that demonstrates combustion inside a big hole of a mountain. The Belgian surrealist artist Rene Magritte (1898-1967) painted.



**Figure 2:** Eruption.

Figure 3 entitled “The Discovery of Fire”.



**Figure 3:** The Discovery of Fire.

Figure 4 (right-hand-side) entitled “The Discovery of Fire”. In order to emphasize the effect of combustion in artwork the authors changed the colour from yellow to red in Figure 4 (left-hand-side).



**Figure 4:** The Discovery of Fire.

Figure 5 is a surrealistic artwork, “The Fire”, painted by Giuseppe Arcimboldo (c.1530-1593), Mannerism Italian painter.



**Figure 5:** “The Fire”.

Figure 6 entitled “Whaaam” demonstrates combustion due to firing of the enemy by an aircraft. Roy Lichtenstein (1923-1997), an American pop artist, painted it. Rudolph Ackerman (1764-1834) an Anglo-German bookseller, inventor and lithographer painted.



**Figure 6:** Whaaam.

Figure 7 entitled “Fire in London”.



**Figure 7:** Fire in London.

Figure 8 entitled “Funky Fire” demonstrates a surrealistic fire giving an impression of a terrible combustion.



**Figure 8:** Funky Fire.

Figure 9 demonstrates a surrealistic “Atomic Bomb Tree” artwork associated with fire.



**Figure 9:** Atomic Bomb Tree.

Figure 10 is another surrealistic artwork of fire entitled “Sacred Fire of Pele, Goddess of Hawaii Volcano” that is



**Figure 10:** Sacred Fire of Pele, Goddess of Hawaii Volcano.

In Figure 11 an interesting surrealistic folding fire is presented where our demonstrations are terminated by the impressive art work of Magritte.



**Figure 11:** Art work of Magritte.

Figure 12 entitled “The Gradation of Fire”.



**Figure 12:** The Gradation of Fire.

## Conclusion

The authors believe that the artistic demonstrations of combustion give to this phenomenon a wider view and it becomes more attractive to the viewer.