Antoine Laurent de Lavoisier on Respiration

Antoine Laurent de Lavoisier, who is considered to be the father of modern chemistry and one of the first to execute and exploit quantitative research through his experiments. He was open minded, studied mathematics and in accordance to his father's wishes pursued the study of Law, which influenced his interest in politics greatly.

Let's begin by imagining a dinner party in Lavoisier's house.

Marie-Anne, Lavoisier's wife, had a special presence in the party. She was a clever and intelligent woman and she was taught many scientific facts by her husband. Lavoisier married her when she was just thirteen years old. She organized special events in her home inviting friends and colleagues of her husband. In such a dinner, one of Lavoisier's colleagues was very interested to learn about this young woman's accomplishments. He was Armand Seguin.

"Your husband informed me that you have translated from English to French, two treatises opposing Lavoisier's new theory! Is that correct?, he asked. "Yes, it is" She said proudly. Two treatises opposed the new theory of my husband, the caloric theory of combustion. This theory replaced the prevailing theory of the phlogiston.

"You must be a great help to your husband, I heard that you even studied the text of the 'human respiration experiment"! "Yes I did, but I haven't fully understood the details of the experiment," admitted Marie- Anne and Lavoisier interrupted her. "Let me explain, my dear. I devised an experiment that illustrates how metabolism is linked with respiration. A test person was employed in the experiment to inhale atmospheric air by means of a full- face mask during the experiment. The mask was designed to collect the exhaled air into a flask containing alkali liquid. The carbon dioxide in the flask initiated a chemical reaction in which an indissoluble alkali carbonate was generated", he explained eagerly.

"Oh well that is fascinating. But how you could reach a conclusion from this experiment?" She asked. "Well, the experiment was contacted in two different ways. First with a person at rest and second with a person at work We found that the person at work produces more carbon dioxide than the other at rest, which means that the person at work uses more oxygen in respiration and during the combustion process", said Lavoisier in such a manner as if Marie-Anne was one of the best researchers in France.

Seguin said in a polite manner and with a very friendly voice trying not to disturb the argument: Antoine could I add something in all these important scientific facts you are presenting?" Lavoisier signalized that he could ender to the discussion

"It's fascinating actually, as the exhaled air can be observed inside the flask as lots of bubbles! And the produced chemical alkali carbonate, that precipitates during the process and accumulates on the flask bottom", said Armand excitedly.

Marie- Anne with the curiosity tinted on her face and with a vibrating voice because of the interest of the discussion said. "Oh I would love to observe this process!"

"We shall show it to you my darling in our laboratory," Lavoisier confirmed her.

The next day, they demonstrated the experiment in the laboratory, much to Marie- Anne's delight! Actually, they implemented the experiment using the same test -person and experimental devices, but varying the circumstances that the person was subjected to. Firstly the person was at rest, and secondly he/she was at work".

Lavoisier started to refer to his inferences from the experiment. "I assumed that the purpose of the human respiration process was to produce heat rather than to supply oxygen for the body. Consequently, I compared the output of the exhaled gases to the inhaled ones, in addition to the person's temperature." Armand continued "Animals combusted organic material by the means of inhaled oxygen".

This experiment was vital for the scientific world to understand how oxygen is related to res-

piration and to the heat production in animals' bodies. Calorimeters, in general, measure the heat developed by chemical reactions. For example, Lavoisier and Laplace's ice calorimeter, a sophisticated device to determine the quantity of heat developed by an animal, or which was found latent in solid bodies. The heat was used to melt down ice, and the amount of water originating from the process was, in turn, equivalent to the amount of heat originating from the chemical reaction.

Laplace and Lavoisier had already documented that animals turn organic substances into heat. The next step was to determine how much heat could be developed by any substance, the heat being measured in calorimeters by burning the substance in question to ashes. The heat that is developed in addition to the heat supplied to the reaction is the physical calorific value.

Lavoisier's final fate was cruel. During the French revolution he was sentenced to death for his political and economic views. Prior to being executed, he asked the judge for permission to complete his scientific research, first. He was guillotined for these accusations in Paris on the 8th of May 1794, fifty years old, and sadly the world lost one of the greatest scientists and researchers.

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