



knowledge to grow



## Soil Microbial Respiration

Unless you're already familiar with the concept of living soil, the understanding that soil breathes can seem a bit abstract or even downright absurd. In reality, there are actually several gases that are permeating into and seeping out of soil in continuous cycles.<sup>1,2</sup> In the context of soil health, when discussing soil respiration, what is actually being acknowledged are the microbial respiration cycles that are occurring in soil, hence the term soil microbial respiration (SMR).

To be exact, SMR is the process by which microorganisms in soil, such as bacteria and fungi, eat dead plant material and convert organic matter into carbon dioxide (CO<sub>2</sub>) and other gases as a part of their metabolism.<sup>2,3</sup> Their metabolic processes release energy that is used by the microorganisms for growth and reproduction. We are able to measure the amount of CO<sub>2</sub> gas exchange taking place and use it as an indicator of the vitality of the soil bacteria helping to mineralize nutrients for plants.

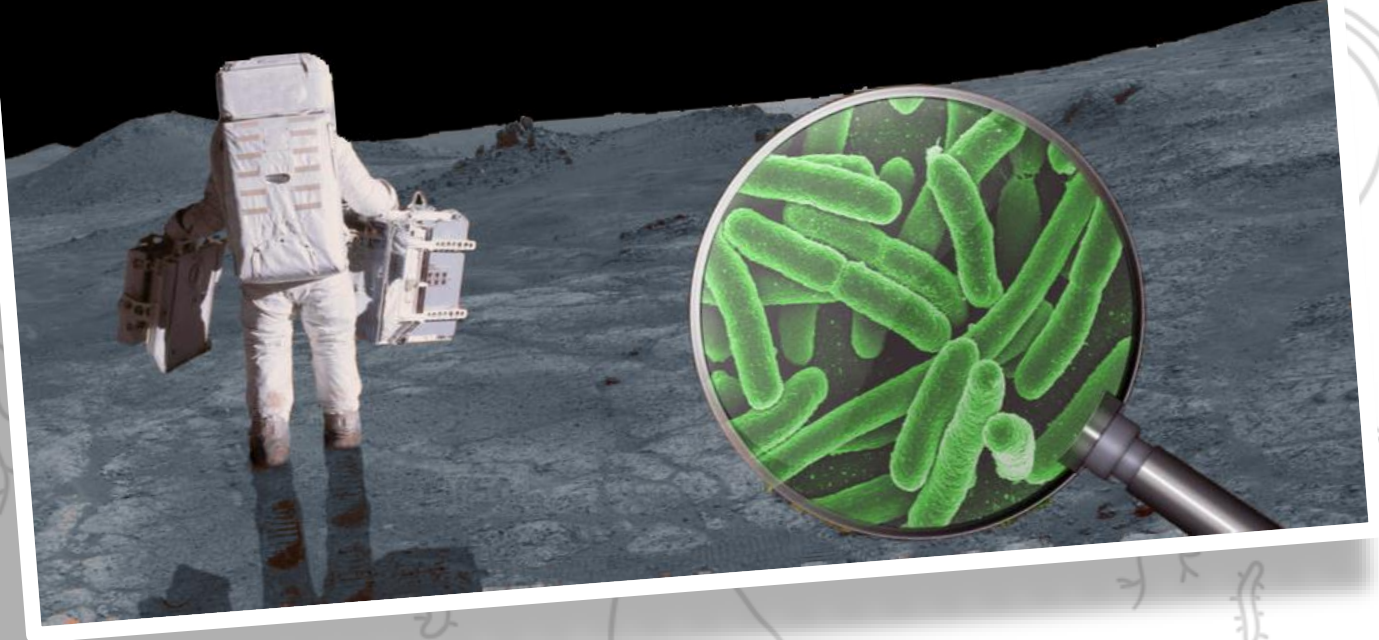
SMR is also an important component of the global carbon cycle and plays a role in regulating the amount of CO<sub>2</sub> in the atmosphere.<sup>2</sup> The carbon cycle is the way that carbon, which is a critical element for life, moves through the earth's ecosystems. When plants grow, they take in CO<sub>2</sub> from the air and when they die, microorganisms turn the organic matter back into CO<sub>2</sub> that is released back into the soil and into the atmosphere.<sup>2,3</sup> The cycle helps to regulate the amount of gas in the atmosphere, which is important for maintaining a healthy environment for all living things.<sup>2</sup>

Healthy soil is full of microorganisms that are simply going about their minute to minute life cycles but having a tremendous influence on the world around them. When the microorganisms are healthy, they will eat and reproduce at a greater rate, which means they will release more CO<sub>2</sub> and other gases into the soil. The cycle helps to promote healthier plant growth.



### Soil Science Fun Fact!

Astronauts from Apollo 12 collected a number of scientific parts from the surface of the moon that had been sent years earlier to test safe moon landings as part of the Surveyor Program. One item they brought home to Earth was a camera. Scientists were surprised to discover a colony of bacteria inside the camera. NASA is still unsure if the bacteria sneaked into the camera after it returned to Earth, or if the bacteria was somehow able to survive for 2.5 years on the moon. That means that if bacteria breathe and the moon has no atmosphere, then those bacteria must have held their breath for all that time!



#### References:

1. Gregorich, E.G., et al. (Eds.). Soil and Environmental Science Dictionary. Canadian Society of Soil Science. CRC Press, 2001.
2. Weil, Ray R., and Brady, Nyle C. The Nature and Properties of Soils, Fifteenth Edition. Pearson Education, 2017
3. Lowenfels, Jeff. Teaming With Fungi. Timber Press. 2017