

Exploring the scientific and symphonic secrets of the universe

A Summary of The Planets, A Musical Odyssey of Evolution, Environment and Exploration – an RCIScience talk by Dr. Matt Russo, Dr. Alan Jackson, Sara Mazrouei and the Hart House Orchestra

By Alyssa Murdoch

What do music and planetary science have in common? It was this intriguing theme that attracted a full house of music and science lovers to a very special event on Sunday, October 29th, co-hosted by RCIScience and the Hart House Orchestra. In a unique and awe-inspiring performance, the orchestra performed Gustav Holst's *The Planets*, an ode to the evocative beauty of the night skies. For those of you who have never been to the Hart House Great Hall (I hadn't) – picture a Hogwarts-style room, complete with a dark timbered ceiling, enormous stained glass windows, bronze chandeliers, seventy-four stately shields, and a gilded inscription wrapped around the entire perimeter. Adding to the event's palpable air of mystery, planetary images were projected onto a large screen in the middle of the hall, blocking our direct view of the 'Wizard of Oz' orchestra that played behind.

Following the first performance of the afternoon, *Mars*, we were taken on a journey to the moon by planetary geologist Sara Mazrouei. Sara explained how the moon's surface acts as a time capsule, preserving everything from meteorite impact sites to Neil Armstrong's footprints. Her team studies the moon using thermal imagery taken from the Lunar Reconnaissance Orbiter, a robotic spacecraft that has been active since 2009. Using these lunar images, she is able to determine the age of crater impact sites based on their relative 'rockiness', with young craters being visibly 'rockier'. From there, she can determine the frequency of meteorite impacts over time, and whether there is evidence of change. Now, you may be wondering how useful it is to know how often the moon gets hit by space debris. As it turns out, very useful! Sara explained that for every meteorite that hits the moon, another *twenty* hit the earth. And following her painstaking research, we now know that the impact rate is steadily increasing.



Photo: The Hart House Orchestra performing Gustav Holst's *The Planets*, Hart House Great Hall

After another cosmic interlude, Dr. Alan Jackson regaled us with some tales of planetary detective work. His research mainly focuses on giant celestial impacts: imagine massive objects soaring through space, colliding violently, and the cacophony of swirling debris left in their wake. For an example close to home, recent theories suggest that the moon likely formed due to a giant impact on primitive Earth. The impact 'culprit' would have been about the size of Mars, ejecting chunks of our planet into its orbit and beyond. Other giant impacts may be responsible for a massive crater discovered at Mars' north pole, and for the unique iron-rich composition of Mercury. Overall, Dr. Jackson provided a compelling case for the integral role of giant impacts in forming and shaping our cosmic landscape.

Photo (from left to right):
Event speakers Sara
Mazrouei, Dr. Alan Jackson,
and Dr. Matt Russo.



It was the final speaker of the afternoon, Dr. Matt Russo, that took us full circle and succinctly bridged the gap between planetary science and music. Dr. Russo wears many hats, including astrophysicist, science educator, and musician. It is hard to adequately describe what happened at this point in the event, but I will do my best (or you can watch first-hand [here](#)). He started with a question for the audience: What makes music *musical*? The answer, it turns out, is a mixture of mathematical ratios that happen to be pleasing to the ear. But here comes the mind-bending part: many of these ratios are naturally found in the orbital patterns of distant solar systems, or within the light waves of Saturn's rings, and can therefore be transformed into other-worldly melodies for us to enjoy. Dr. Russo was inspired to merge his two passions when he first heard of Trappist 1, a recently discovered solar system that harbours seven Earth-sized planets. While most media attention focused on Trappist 1's potential for habitation, Dr. Russo was taken by an unusual feature of this new world – something called a resonant chain pattern. Simply put, as the planets orbit around the Trappist 1 star, they move in almost perfect whole number ratios to each other and incidentally form those consonant mathematical ratios commonly found in music. Put to music, the movements of the Trappist 1 planets sound melodious yet ethereal, not unlike many of the harmonies found in Holst's rendition of the outer world. You can check out the Trappist 1 creation, as well as several other planetary-inspired pieces [here](#).

It is easy to understand why astronomy is one of the oldest sciences practiced worldwide. We have a universal reverence for the stars that can be felt deeply on a clear night, away from the city lights. Despite the major advances made by modern astrophysics, the cosmos remains the ultimate unknown frontier, inspiring a wide range of human emotions from wonder to beauty to fear. *The Planets* beautifully captures this range, highlighting our timeless desire to ponder the outer world and our place within it. While music and science may have some measurable, obvious overlap, it is hard to ignore the feeling that there may be something deeper, something more elusive about their relationship. As I left Hart House that day, I was reminded how there are some experiences so indescribable in this world, that perhaps our best hope in expressing them is through another, equally unexplainable thing.

About the Author



Alyssa Murdoch is an Aquatic Biologist researching the effects of human stressors on northern fish. She has previously worked as an environmental consultant, government biologist, and academic research assistant. She holds a Master of Science degree from the University of Waterloo, and is currently a PhD candidate at York University.