January 21, 2012 - 4:35am **BY JASON BROWN**

Last month I was invited to a workshop on mathematics and the arts in Banff. I have a math and music lecture about mysteries surrounding the Beatles' songs that I take on the road, and Banff was to be my third stop in a month.

A little tired, I was dropped off by bus at the Banff International Research Station, a think-tank for the mathematical sciences.

I walked into the dining room that evening, and was greeted by the comforting site of many researchers, all looking vaguely like the cast of The Big Bang Theory.

The mathematician sitting opposite me began to regale me on his area of expertise, all the while peeling a banana from the bottom. And from a scan of the room, I doubted that there were any mirrors in the dorms. It's going to be an interesting week, I thought.

And indeed it was. Each day was filled with the most fascinating lectures on the crossroads between mathematics and the arts, with cutting-edge research. One of the most fascinating brought me back to my summer trip to the Netherlands.

The researchers were describing their investigation of detecting forgeries of art masters. Most decisions on the authenticity of artwork is based on a variety of factors, judged primarily by art experts.

They compare style, use of colour and paints and brushwork. They compare content and intensity. Yet in the end, it is quite subjective, with discrepancies among the experts.

It was reminiscent to me of trying to judge a musical chord just by listening. Surely some math can help?

Yep, in fact, that is exactly what the mathematicians spoke about. After cajoling the Van Gogh Museum curators, they received whole slew of high-resolution scanned images of a variety of paintings (101 in total).

Some were authentic Van Goghs, some were forgeries and a number were possibly authentic.

What can be done with such data? Well, there is a mathematics area called wavelet analysis that can decompose long strings o numbers, such as those that come from an image, into different levels — a coarse level that shows the broader picture, and a finer one for details.

As an example, if you have the numbers 33, 31, 33, 33,14,14,15,15, then it's really on the broad scale just like four 33s and fou 15s, with the detail being the small amount each number bounces up or down from these.

Wavelets have all sorts of applications, such as storing and classifying fingerprints. One of the founders of the whole area of wavelets, Ingrid Daubechies, was there at the workshop, and meeting her was like meeting mathematical royalty. But I digress.

What wavelets excel at is describing both the broad and detailed parts of data, discovering and quantifying what may not be visible to the naked eye.

And the brilliant observation made by the researchers was that you can best tell a forgery from an original by looking not at fac and other details in a painting, but at large patches in the background, where the artist would likely paint freely, in his or her style, while a forger would be more deliberate.

And the math was quite successful at detecting forgeries among the Van Gogh set, by considering the numbers in the details o the brush strokes. The researchers even mused that perhaps some of the supposedly authentic Van Goghs may not be quite that!

*Jason I. Brown is a professor of mathematics at Dalhousie University in Halifax.*

*out the uthor*

***By JASON BROWN***