



Cinzia Casiraghi (left) and Sara Lowes collaborated to create the *Graphene Suite*.

Q&A Cinzia Casiraghi & Sara Lowes

Maestros of graphene

Composer Sara Lowes has teamed up with materials scientist Cinzia Casiraghi at the University of Manchester, UK. The result, Lowes' six-part *Graphene Suite*, premieres next week at the *Graphene Week 2015* conference in Manchester, part of the European Union's decade-long, €1-billion (US\$1.1-billion) *Graphene Flagship* research programme. Lowes and Casiraghi talk crotchets, carbon chemistry and the commonalities between women in science and women in music.

How did you come to work together?

SL: The idea came from Brighter Sound, a cultural organization in Manchester that wanted to explore the common ground between the creative processes in music and in science, particularly graphene. To be given something I know nothing about and to use that to create a piece is fascinating. The brief was for a female musician to do this, because composition is a hugely male-dominated profession.

CC: That is one of the similarities between science and composition: there are not enough good role models for women. The issues are the same, whether it is in science, music or any other field. I am a member of the University of Manchester school of chemistry's Athena SWAN committee, which supports women in science, so I was very keen to collaborate with Sara.

Was it difficult to span the cultures of music and science?

SL: Composing music is like science in that you start with an idea and ask, 'I wonder what would happen if...?' Cinzia and I met for the first time in summer 2014. She talked about her job, we met her colleagues in the chemistry and physics departments, and she showed me around a clean room. I had never been in a university science department before, and I kept feeling frustrated that people outside science do not know anything about it. Science is part of everything around us; it is part of our world.

CC: Collaboration is an important part of my research, which is often multidisciplinary. And although I work on graphene now, I come from a completely different scientific

Graphene Suite
25–28 June 2015,
Manchester, UK.
<http://go.nature.com/5damsw>

background — nuclear engineering — so it is quite natural for me to find connections between fields that you might think do not have anything in common. Collaboration helps us to see problems from different points of view, to find solutions or develop projects in a new direction.

Do you ever worry that graphene will not live up to expectations?

CC: Yes. I started my research career on carbon nanostructures, and I saw a couple of those — nanotubes and fullerenes — just dying along the way. But graphene is a little bit different. Ten years ago we were dealing with tiny pieces of graphene, hardly visible under the microscope, so it was difficult and time-consuming to produce and process the material. Now we have centimetre-sized graphene sheets, graphene inks and many other types of 2D crystal. So I am more optimistic about graphene than other carbon nanostructures.

How did you begin to shape the music?

SL: The first thing I looked at was graphene's molecular structure — the hexagonal honeycomb pattern — so I used the number six a lot in the music. It is a six-movement piece, the parts that are about graphene itself are in six-eight time, and I have tried to interpret the hexagon structure musically in one of the movements.

And how will it work in performance?

SL: Some of the audio will come from data on graphene that we have turned into waves, so we can play them as sound. Each movement is four to five minutes long. Some parts are orchestral; others will be played by my band. The classical element — a string quartet, with oboe and trumpet in some places — reflects the history of Manchester, its scientific achievements. The modern element — drums, bass, guitar and keyboard — represents the idea that this is a really forward-looking time, and that graphene is a wonderful discovery. The first movement is a journey representing 'science at work': the long hours, the commitment and the frustrations. The second movement goes on to the moment of discovery, the sheer excitement of it. The third is all the hard work that happens once that discovery has taken place. Another is dedicated to women — it has a noble, keep-on-going attitude.

What are your hopes for the *Graphene Suite*?

SL: I hope that it will help to shine a spotlight on the spaces that are available for women in science and composition. We are both passionate about making sure that that is a legacy of the project. ■

INTERVIEW BY MARK PELOW

This interview has been edited for length and clarity.