Report on visit of Dr John Power, SICSA Distinguished Research Fellow

John Power visited Scotland from 21 July to 25 August. He was based at the School of Computing of the University of Dundee, but he also made weekly visits to the University of Strathclyde and made one visit to the University of Edinburgh.

In Strathclyde, John spent each Monday morning doing joint research with Prof Neil Ghani on category theoretic models of dependent types.
Neil had begun to think about the question recently, arising from his deep knowledge of functional programming, while John had worked with a PhD student on the question several years ago. This led to a fruitful exchange of views and development of the idea between them, but it will take some time yet before a paper emerges: the ideas are not sufficiently developed yet.

On Monday afternoons, John gave a series of seminars at Stathclyde on Lawvere theories. These amount to a category theoretic formulation of universal algebra, alongside a formulation in terms of monads. The latter have been used as a way to model computational effects, but John's thesis is that Lawvere theories are better suited to the role.
There has been considerable work in Scotland, much of it centred on Strathclyde and Edinburgh, on category theoretic modelling of computational effects, so there was considerable interest in John's views. His seminars regularly attracted researchers from computer science departments in Strathclyde, Edinburgh, Dundee, and a few from England, together with a few mathematicians. The seminars generally attracted over ten people, which is a remarkable number to sustain over a period of four full afternoons on a narrowly focused topic.

John also gave one general talk on the historical background and conceptual setting of category theory, his specialism, at Dundee on 10 August. That talk attracted several visitors from the computer science department of St Andrews as well as Dundee researchers.

Finally, he visited Edinburgh on 19 August for informal discussions of a general nature about research and teaching, primarily with Prof Gordon Plotkin, but also with several others.

In addition to giving his talk in Dundee, John talked at some length with Karen Petrie in her capacity as head of BCSWomen, which runs the annual BCSWomen Undergraduate Lovelace Colloquium: John is his department's equality coordinator and has provided the largest number of participants at the Lovelace colloquium for each of the past two year.
But primarily he did joint research with Ekaterina Komendantskaya. That was about category theoretic models of logic programming. Ekaterina, John and Prof Guy McCusker have recently modelled ground logic programming using the category theoretic technique of coalgebra, their work having been published in the respected international AMAST conference; so now it was time to extend that work to arbitrary logic programs. That is not at all trivial, as substitution gives rise to subtle technical

issues involving a combination of the notion of Lawvere theories (which model substitution of terms in terms) and lax naturality (modelling substitution of terms in formulae), requiring sophisticated techniques of a 2-categorical nature: 2 here means one must consider not only vertices and edges of a graph, but also the faces induced by such graphs in the plane. This should lead to at least one joint paper between Katya, John and Guy over the coming months, perhaps two.