

Main Research Interests and Contributions. I am a logician, mathematician, and computer scientist. My research is mainly in logic, where I work in both pure logic and on developing logic-based methods as a mathematical modelling technology for reasoning about systems and behaviour, and in security, where I work in security policy and security economics.

Here are some specific topics of interest.

Logic

- The semantics and proof theory of classical, intuitionistic, modal, epistemic, and substructural logics.
- Resource semantics: process algebra, bunched, and modal logics as a basis for mathematical systems and security modelling, including models of access control in systems contexts; logical theory and connections with game theory and strategic reasoning.
- Access control logics that account for system architecture (connects my work in logic and information security).
- Logics for behaviour, with application in systems/security/policy contexts.
- The logical theory of reductive logic and proof-search.

Security

- Access control logics that account for system architecture (connects my work in logic and information security).
- Information security economics: connecting economic models of security behaviour and investments to mathematical system models.
- Public policy in information security, including the concept of information stewardship.
- The philosophy and methodology of security.

My scientific contributions to-date can be summarized as follows below.

Logic

- The semantics and proof theory of bunched logic: provided the basis for separation logic and its subsequent developments: resource semantics. Aspects of this work formed the basis of Separation Logic and the tools its supports.
- Resource semantics: process algebra, bunched, and modal logics as a basis for mathematical systems and security modelling, including models of access control in systems contexts; logical theory and connections with game theory and strategic reasoning.

The logic BI is the basis of Separation Logic, which is a specific model of a theory of data structures in BI.

- Categorical models of classical logic/sequent calculus and its theory of reduction: long-standing open problem solved.
- The logical theory of reductive logic and proof-search: summarized in an Oxford Logic Guide.
- Proof theory, computational logic, and categorical model theory for dependent type theory and logical frameworks.
- Unification for first-order dependently typed λ -calculus.

Security

- Access control logics that account for system architecture (connects my work in logic and information security).
- Information security economics: connecting economic models of security behaviour and investments to mathematical system models.

- The concept of information stewardship in security economics.