

*Abstract submitted for 61st Annual Meeting of the Australian  
Mathematical Society*

---

**Title:** Universal properties of polynomials via doctrinal Yoneda structures

**Author(s):** Mr Charles Walker

**Session:** Category Theory, Algebraic Topology, K-Theory

---

Given a category  $\mathcal{E}$  with pullbacks, one may form the bicategory of spans in  $\mathcal{E}$ , denoted  $\mathbf{Span}(\mathcal{E})$ . The universal properties satisfied by this construction, as established by Dawson, Paré, Pronk and Hermida, simply describe what data one needs in order to construct a homomorphism of bicategories from this bicategory  $\mathbf{Span}(\mathcal{E})$  to another bicategory  $\mathcal{C}$ .

In this talk, it is our primary goal to describe an analogue of these results for the bicategory of polynomials, denoted  $\mathbf{Poly}(\mathcal{E})$ , both with the simpler cartesian 2-cells, and the more complex general 2-cells between polynomials. However, we do not prove these results directly; indeed, it is the secondary goal of this talk to show how one may avoid most of the coherence conditions which stem from the complicated nature of polynomial composition. This is to be done through the use of Yoneda structures. Our approach will thus lead to a proof of the universal properties of the polynomial construction, whilst avoiding many of the coherence conditions that would have appeared in a direct proof.