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Mathematical logic and computational complexity theory have many topics in common. In most cases the links between the two fields are fostered by finite combinatorics, manifesting either via proof theory or via finite model theory.

There are, however, also topics in complexity theory where infinitary methods of logic shed a new light on old problems. I will discuss, in particular, how non-finite model theory relates to proof complexity. The relevant model theoretical problems involve constructions of models of bounded arithmetic and of expanded extensions of pseudo-finite structures. I will describe forcing with random variables aimed at tackling these problems, and give some examples of results that can be obtained in this way.