This thesis explores one such contribution to the current state of Particle Cosmology. We have developed a model of Thermal Inflation in which a thermal waterfall scalar field, ϕ, is coupled to a light spectator scalar field, ψ. If this spectator field remains light from the time of primordial inflation up until the time when the thermal waterfall field decays, then a contribution to the primordial curvature perturbation ζ will be generated by two mechanisms: "end of inflation" and modulated decay. The motivation for the creation of this new model was to determine whether it can produce the dominant contribution to the primordial curvature perturbation and then to scrutinise its predictions for various quantities that can be observationally (and theoretically) tested.

Our model explores two different cases for the decay of the inflaton φ: Inflaton decay is complete before the start of thermal inflation and inflaton decay occurs after the end of thermal inflation. We have also explored several different cases for the initial value of ϕ during primordial inflation, which we label ϕ_* Case A, B and C. With regard to the decay of the thermal waterfall field ϕ, we have only considered the case that the decay is via direct interactions with the particles in the thermal bath that exist due to the (partial) reheating of the inflaton φ. Regarding the decay of the spectator field, we assume that this field, ψ, decays around the same time as the thermal waterfall field ϕ.

We have used the δN formalism to study the perturbations that are generated from both the "end of inflation" and modulated decay mechanisms within this model. We find that ζ is of the same magnitude to first order for both cases.