Summary of Publications:

1. Simple generalizations of Anti-de Sitter space-time, **J Magueijo, A Mozaffari,** *arXiv:0911.3697, Class. Quantum Grav.27:135004,2010*

We considered new cosmological solutions which generalize the cosmological patch of the Anti-de Sitter (AdS) space-time, allowing for fluids with equations of state such that $w \neq -1$. We used these solutions to derive the associated full manifold, finding embeddings in flat five-dimensional space-time with **--+++** signature, revealing deformed hyperboloids, meaning the topology and causal-structure of these spaces is unchanged.

2. Case for testing modified Newtonian dynamics using LISA pathfinder, **J Magueijo, A Mozaffari,** *arXiv:1107.1075, Phys. Rev. D 85, 043527 (2012)*

We quantify the potential for testing MOdified Newtonian Dynamics with the Laser Interferometer Space Antenna Pathfinder, should a gravitational saddle point fly-by be incorporated into the mission. Forecasting the expected signal-to-noise ratio, we find middle to high double figures. Concerns about systematics arising from self-gravity and/or the Newtonian background are shown not to be problematic. We investigated constraints from a negative result as a first approach to constraining these theories.

3. Differentiating Between Modified Gravity Theories in the Solar System, **A Mozaffari,** *arXiv:1112.5443,,* Submitted *Class. Quantum Grav.*

We further the analysis of testing MOdified Newtonian Dynamics near the saddle points of the Solar System, analysis to include quasi-linear formulations of these theories. Using similar quantitative and qualitative tools, we demonstrate that in general, both the instrumental response and typical Signal to Noise Ratios for such a test will be different. Finally we investigate constraints from a negative result and parameterised free functions.

4. Saddle stresses for generic theories with a preferred acceleration scale, **J Magueijo, A Mozaffari,** *arXiv:1204.6663, Phys. Rev. D 86, 123518 (2012)*

We show how scaling arguments may be used to generate templates for the tidal stresses around saddles for a vast class of MONDian theories, *detached from their obligations as dark matter alternatives.* The constraints obtained can then be contrasted with those from cosmology. The central technical content of the paper was the derivation of a scaling prescription allowing complex numerical work to be bypassed in the generation of templates.

5. Time delays across saddles as a test of modified gravity, **J Magueijo, A Mozaffari,** *arXiv:1212.3687, 2013 Class. Quantum Grav. 30 092002*

Modified gravity theories can produce strong signals in the vicinity of the saddles of the total gravitational potential. In some models, this translates into diverging time-delays for echoes crossing the saddles, these models arise from the possibility that gravity might be infrared divergent or confined (and if suitably designed they are very difficult to rule out). We show that Lunar Laser Ranging during an eclipse (or similarly Very Large Baseline Interferometry) could probe the time-delay effect within meters of the saddle, thereby proving or excluding these models. Such experiments would shed light on the infrared behaviour of gravity and examine the puzzling possibility that there might be well-hidden regions of strong gravity and even singularities inside the solar system.

6. Parameterised free functions and saddle stresses in modified gravity, **A Mozaffari**, *arXiv:1212.3905, Phys. Rev. D 87, 064034 (2013)*

We explore the parameter space of free functions in non-relativistic modified gravity theories more widely, showing that solutions in the large and small acceleration regimes have similar functional forms between different models. We investigate the effects on scaling tidal stresses, consider a new intermediate limit in these theories as a way of understanding the two regimes transition. Finally we suggest a model independent framework, with the aim of constraining the parameter space using data from future missions e.g. LISA Pathfinder.

7. Tests of Modified Gravity Theories in the Solar System, **A Mozaffari**, arXiv:1404,0313, *Accepted Canadian Journal of Physics*

Invited paper for a review issue on modified gravity theories in the Canadian Journal of Physics. Reviews previous work on the subject of solar system based tests of modified gravity.

8. Solar System Tests of Screening Mechanism, **A Mozaffari** *, arXiv:1405.0268*

We explore the possibility of testing the screening mechanisms, such as the chameleon model, present in dynamical dark energy theories. Framing these models in the same language as non-relativistic modified gravity theories with a preferred acceleration scale, we find distinctive tidal stress signatures and consider the chances of observing these mechanisms, untangling them from other sources of signal.

In Preparation:

Cosmological Perturbation Theory with Bimetric theories
We consider biometric theories composed of separate Einstein Hilbert and stress energy sectors and interactions actions composed of both metric and twin metric. We look at background and perturbative cosmologies and see how different classes of theory fare against current constraints, particularly in light of new frameworks for modified cosmologies.

Stability analysis of Galileon models
Seifert and Wald posited that a viable theory of gravity should possess static, spherically symmetric solutions. Building on their toolkit of sympletic current analysis, we investigate whether a set of Galileon models (motivated by Khoury et al) are indeed viable or will be unstable in a set lifetime. This analysis has already been extended to various modified gravity theories and our aim is to extend it to other theories which will in some way affect weak-field results. We also investigate whether such tools are applicable in cosmological scenarios.