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Frederic P. Schuller* (fps@aei.mpg.de). *Constructive Gravity – How to unlock the hidden information about gravity that is encoded in a matter action.*

Constructive gravity allows to calculate the Lagrangian for gravity – rather having to postulate it – provided one previously prescribes the Lagrangian for all matter fields that are assumed to inhabit the spacetime. Even if these matter field dynamics employ a tensorial background geometry that is more refined than a Lorentzian metric, it is precisely this refined geometry that is given dynamics. This result is built on key observations of the original geometrodynamics program and on significant new results, employing an intricate interplay of the modern theory of partial differential equations, convex analysis and algebraic geometry.

We explain the physical and mathematical foundations of the constructive gravity program and show how one can now answer some questions about gravity that previously could not be addressed. In particular, we will present results on the systematic search for vacuum birefringence. (Received September 24, 2018)