We address and solve some long-standing yet well-documented open problems on output feedback tracking control of Euler-Lagrange systems with arbitrarily high relative degree; this includes underactuated systems. Our main contribution is to establish a theoretical foundation for the use of so-called dirty derivatives, a common “ad-hoc” replacement of unavailable state measurements such as generalized velocities, whence obviating the the use of observers for the purpose of position-feedback tracking control. Reminiscent of passivity-based control for robot manipulators, our control law is globally Lipschitz and the controller dynamics is linear. For relative-degree-two fully-actuated Lagrangian systems without dissipative forces (friction) and with bounded inertia matrix we establish uniform global asymptotic stability in closed loop. Furthermore, we show that our control approach applies to Lagrangian systems augmented by a chain of integrators (relative degree m+2 systems). The design method, which is based on a recursive procedure in the spirit of backstepping control, is intuitive as it exploits structural properties such as passivity and inherent input-output stability. As a corollary, we solve an output feedback global-tracking control problem for flexible-joint robots but also for systems coupled with output-feedback linearizable actuator dynamics. In addition, we discuss remaining open problems of fairly general interest in the realm of analysis and design of robust nonlinear systems.