Coley Responds: In Ni's Comment,[1] he first describes his own contributions to the subject; contributions which, for reasons of space, I was able to refer to only briefly. The Lagrangian (1) (in Ni's Comment) follows trivially from the fact that the laws of physics in question are derived from the quantity λg_{ab} (and is therefore just the relativistic Lagrangian using λg_{ab}). Ni then argues that the results in my Letter[2] prove that WEP→ EEP.

Essentially, the view expressed by Ni is that the results represented by (5) in the Letter imply that the quantity λg_{ab} is the "physical metric" [note that (5) represents only six constraints since λ is arbitrary]. That is, since λg_{ab} is the only quantity occurring in (5), it acts as the physical measuring system in all processes involving gravity and electromagnetism (at least in the formalism).

Although I personally share this view I chose to take a more conservative approach for the following reasons. There is no *a priori* reason for not assuming the existence of a quantity g_{ab} that is also related to physical measurements. g_{ab} might govern "rods and clocks" in other processes not governed by the electromagnetic-gravitational laws in the formalism. There are many authors in the literature who favor the idea that different quantities might govern the measuring process in different types of physical systems. This idea finds expression in those theories that postulate that different unit systems may be employed in different physical laws. For example, Canuto and Goldman[3] conjecture that atomic clocks and gravitational clocks may not be equivalent (in that the ratio of their periods may not be constant). In the context of this note, this might suggest that while λg_{ab} governs electromagnetically constituted atomic clocks, g_{ab} might govern the rate of a gravitational clock consisting of, for example, a binary system. Clearly a nonconstant λ would then lead to a violation of the EEP.

However, it could be argued that since no other "physical laws" are given in the formalism, such an object g_{ab} is superfluous. Thus λg_{ab} is the only candidate for the claim of "physical metric." But in principle the existence of g_{ab} is not precluded [and in actual fact Eqs. (1)–(3) in the Letter are derived from a general set of covariant equations which explicitly assumes the existence of a tensor g_{ab} occurring in gravity-related laws —f and g are the components of g_{ab} in a spherically symmetric static gravitational field]. However, if this latter situation does exist, the UGR can then be used to show the equivalence of the two quantities (regardless of the specific form of the additional laws in the theory that will govern g_{ab}).

In conclusion, if the view expressed by Ni is adopted then the stronger result that WEP→ EEP will follow, as noted in the Letter. This in turn implies WEP→ UGR, which lends support to Nordtvedt's results in Ref. 5 of the Letter. However, I am not convinced that this result is totally justified by the results of the analysis outlined in the Letter alone.

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[1] Wei-Tou Ni, preceding Comment [Phys. Rev. Lett. 50, 1173 (1983)].
[2] A. Coley, Phys. Rev. Lett. 49, 853 (1982).
[3] V. M. Canuto and I. Goldman, Nature (London) 296, 709 (1982).