

# The Gildener-Weinberg mechanism for light Higgs bosons

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If, as so many believe, there are “BSM” Higgs bosons, it poses three questions:

- Why is the 125 GeV Higgs, H, so light?
- Why does H have only the Standard Model (SM) couplings to gauge bosons and fermions?
- What are the BSM Higgs masses?

Their answers are in a forgotten treasure by Eldad Gildener and Steven Weinberg (GW), Phys Rev D33, 3333 (1976). GW assume a scale-invariant electroweak theory with multiple Higgses. The scale symmetry is spontaneously broken and H is its massless dilaton. In the one-loop approximation, scale symmetry is explicitly broken at a scale identified with the electroweak decay constant  $v = 246$  GeV. Then, H acquires the low mass  $M_H = 125$  GeV, and a sum rule relates its mass to those of the BSM Higgses. Thus, the mass scale of the BSM Higgses is set by  $v$  or, equivalently,  $M_H$ , and the BSM Higgses are all relatively light, of order 500 GeV in a two-Higgs doublet model of the GW scheme.

## Alternate track

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Yes

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