59. The third-to-last statement in the problem about the peeling-off rate of the top layer and the thickening rate of the bottom layer is best interpreted, we feel, in the rest frame of the layer. Thus, imagining that we are in a reference frame moving up at v_t, then it is clear from the uniform nature of the described peeling-off of the top and thickening of the bottom that *in this moving reference frame* the center of mass of the layer must move downward with a speed $2v_f$ (if the rates were denoted R and were different then this would be $R_{\text{bottom}} + R_{\text{top}}$). Returning to the original reference frame, where we see the trapped bubbles rising at v_t, we find (with $+y$ upward) the center of mass velocity is

$$v_{\text{com}} = v_t - 2v_f = -1.5 \text{ cm/s} .$$