

$$\begin{array}{ccccc}
 A & & F(A) & \xrightarrow{\eta_A, \eta'_A} & \mathrm{Hom}_{\mathcal{C}}(C, A) & \xrightarrow{f^*} & \mathrm{Hom}_{\mathcal{C}}(C', A) \\
 \downarrow h & & \downarrow F(h) & & \downarrow h_* & & \downarrow h_* \\
 A' & & F(A') & \xrightarrow{\eta_{A'}, \eta'_{A'}} & \mathrm{Hom}_{\mathcal{C}}(C, A') & \xrightarrow{f^*} & \mathrm{Hom}_{\mathcal{C}}(C', A')
 \end{array}$$