

$$i \sum_{\nu} S_{\mu\nu} \frac{\partial c_{\nu n}}{\partial t} = \sum_{\nu} (H_{\mu\nu} + P_{\mu\nu}) c_{\nu n} + i \sum_{\nu} \mathbf{G}_{\mu\nu} \cdot \mathbf{v}^{\nu} c_{\nu n} \quad (1)$$

where

$$\mathbf{G}_{\mu\nu} = \langle \Phi_{\mu} | \hat{S} | \nabla \Phi_{\nu} \rangle \quad (2)$$

and  $\mathbf{v}^{\nu}$  is the velocity of the atom hosting basis function  $\nu$ .