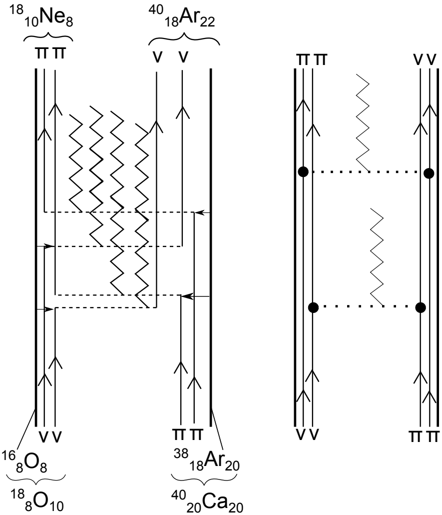
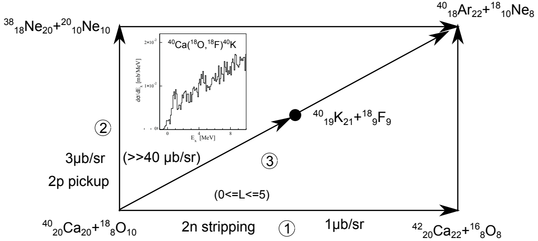


$$U = \int d\mathbf{r}'\rho(r')v(|\mathbf{r}-\mathbf{r}'|) \longrightarrow$$

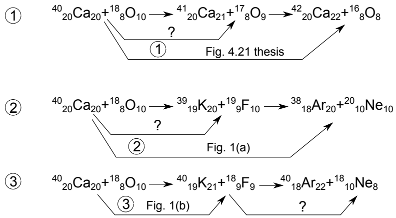
$$V = V_F\tau_1\tau_2 + V_{GT}\tau_1\tau_2\sigma_1\sigma_2 \quad \bullet\cdots\cdots\bullet$$

$^{40}_{20}Ca_{20}$ ($^{18}_{8}O_{10}$, $^{18}_{10}Ne_{8}$) $^{40}_{18}Ar_{22}$ (Fig. 2, 11μb/sr)



From a structure and direct reaction point of view,

$$\alpha \equiv (A + a(= b + 2)) \rightarrow \gamma \equiv (F(= A + 1) + f(= b + 1)) \rightarrow \beta \equiv (B(= A + 2) + b)$$



Q–value and recoil effects: setting structure on equal footing

$$a + A \to b + B \quad H = T_{bB} + H_b + H_B + V_{bB},$$

$$i\hbar\frac{\partial\Psi}{\partial t} = H\Psi; \quad \Psi_\beta(t) = \Psi^b_m(\xi_b)\Psi^B_n(\xi_B)e^{i\delta_\beta}$$

The phase factor $e^{i\delta_\beta}$ is essentially a Galilean transformation

$$\Psi = \sum_\beta c_\beta((r_\beta - R_\beta), t)\Psi_\beta(t)e^{-iE_\beta t/\hbar} \quad (c_\beta = a_\beta\chi_\beta)$$

$$i\hbar\dot{a}_\beta(t) = \sum_\gamma \langle\omega_\beta|V_\gamma - U_\gamma|\Psi_\gamma\rangle_{\mathbf{R}_{\beta\gamma}} e^{i(E_\beta - E_\gamma)t/\hbar} a_\gamma(t)$$

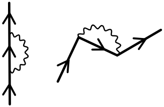
$$\frac{d\sigma_{\alpha\to\beta}}{d\Omega} = P_{\alpha\to\beta}\sqrt{\left(\frac{d\sigma_\alpha}{d\Omega}\right)_{el}\left(\frac{d\sigma_\beta}{d\Omega}\right)_{el}}; \quad (P = |a|^2)$$

$$(a_\beta(t = +\infty))^{(1)} = \int_{-\infty}^{\infty} \langle\phi^{B(A)}, U_{1b}(r_{1b})e^{i\sigma_{\alpha\beta}}\phi^{a(b)}\rangle_{\mathbf{R}_{\alpha\beta}} \exp\{\ldots\}$$

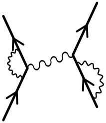
Independent pair motion (structure+reaction)

$$P_2 = \left| \frac{1}{\sqrt{2}} \left(e^{i\phi'} \sqrt{P_1} + e^{i\phi} \sqrt{P_1} \right) \right|^2 ; \mathbf{1} = \frac{1}{11}, \mathbf{2} = \frac{3}{11}, \mathbf{1} \times \mathbf{2} \approx 10^{-2}, \mathbf{3} = 1$$

Nuclear structure



${}^{40}{}_{19}K_{21}$, ${}^{18}{}_{9}F_{9}$



$\underbrace{{}^{42}{}_{20}Ca_{22},\ {}^{18}{}_{8}O_{10},}_{\text{n,n}}$ $\underbrace{{}^{18}{}_{10}Ne_{8},}_{\text{p,p}}$ $\underbrace{{}^{40}{}_{18}Ar_{22},\ {}^{20}{}_{10}Ne_{10}}_{\text{nn;pp}}$

(p, n) **pairing**
$({}^{50}$**Sc**$)$