

July 1955

時間定常場の整理?

一つの粒子と他の粒子の相互作用

$$\Psi(x, y, z, t)$$

(x, y, z, t)
 相互作用のある場

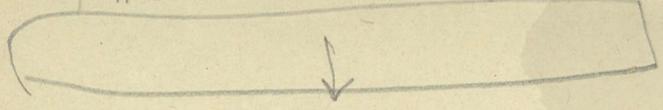
$$\Psi_\alpha(x, y, z, t)$$

interacting particles

相互作用の mode α に対する

$$\Psi_\alpha(x, y, z, t)$$

mode α の相互作用



mode α の相互作用の整理

mode α の相互作用

$$\Psi = c_0 \Phi_0 + \sum_{\alpha} c_{\alpha} \Phi_{\alpha}$$

mode α の相互作用

mode α の相互作用

$$\Phi_0; \quad a_{\alpha} \Phi_0 = 0; \quad \Phi_{\alpha} = a_{\alpha}^* \Phi_0; \quad a_{\alpha} \Phi_{\alpha} = \Phi_0$$

\Rightarrow mode α の相互作用

$$a_{\beta}^* \Phi_{\alpha} = a_{\beta}^* a_{\alpha}^* \Phi_0 = 0$$

$$a_{\alpha} a_{\beta} \Phi_{\alpha} = 0$$

$$\Psi = (c_0 + c_{\alpha} a_{\alpha}^*) \Phi_0$$

Kodak Color Control Patches

Blue Cyan Green Yellow Red Magenta White 3/Color Black

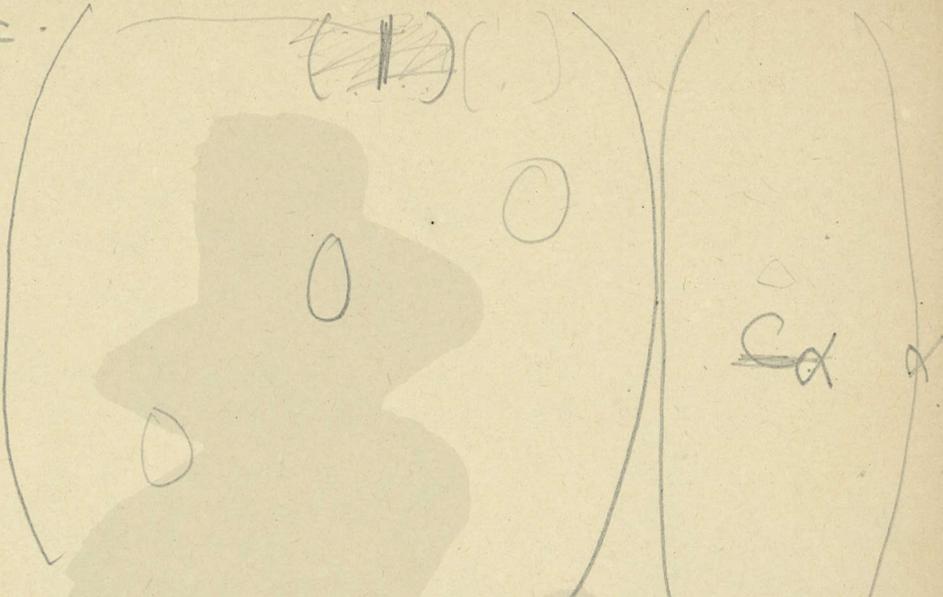
(2)

~~α~~

~~a_α~~ $a_\alpha =$

α

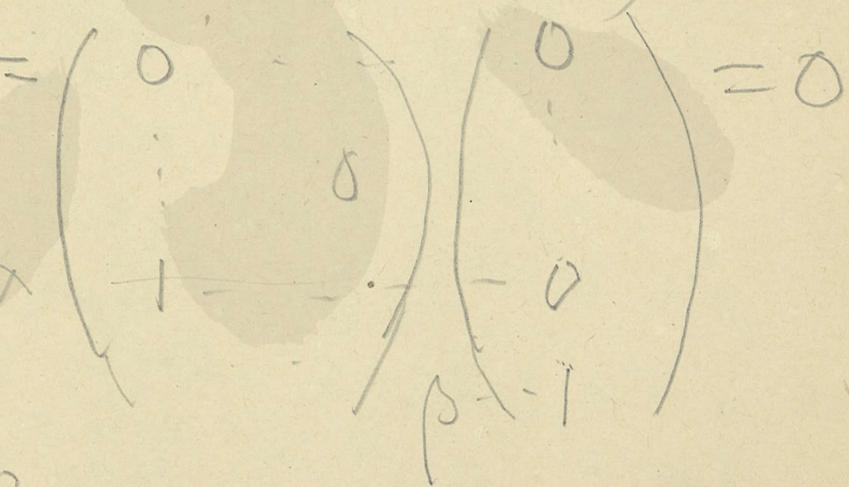
~~(1)~~



$a_\alpha^* =$



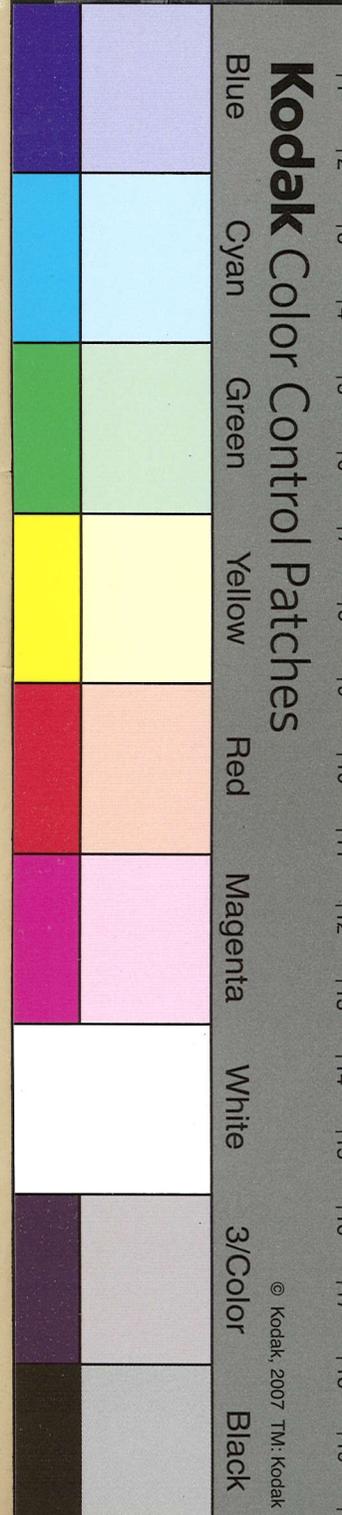
$a_\alpha^* a_\beta^* \Psi_0 =$



$a_\alpha^* a_\alpha \Psi_0 = \Psi_0$

$a_\alpha^* a_\alpha \Psi_0 \neq 0$

$a_\alpha a_\beta^* \Psi_0 = \delta_{\alpha\beta} \Psi_0$



$$\begin{aligned}
 & [a_\alpha, \rho_{\beta\gamma} a_\beta^* a_\gamma] \Psi_\delta \\
 &= \rho_{\beta\gamma} a_\alpha a_\beta^* a_\gamma \Psi_\delta - \rho_{\beta\gamma} a_\beta^* a_\gamma a_\alpha \Psi_\delta \\
 &= \rho_{\beta\gamma} a_\alpha \delta_{\gamma\delta} \Psi_\beta - \rho_{\beta\gamma} \delta_{\alpha\delta} \delta_{\gamma\delta} \Psi_0 \\
 &= \rho_{\beta\gamma} \delta_{\alpha\beta} \delta_{\gamma\delta} \Psi_0 - \rho_{\beta\gamma} \delta_{\alpha\delta} \delta_{\gamma\delta} \Psi_\beta \\
 &= \rho_{\beta\gamma} (\delta_{\alpha\beta} \delta_{\gamma\delta} \Psi_0 - \delta_{\alpha\delta} \delta_{\gamma\delta} \Psi_\beta)
 \end{aligned}$$

$$[a_\alpha, \rho_{\beta\gamma} a_\beta^* a_\gamma] \sum_\delta c_\delta \Psi_\delta = \rho_{\alpha\delta} \Psi_0 - \rho_{\beta\delta} \delta_{\alpha\delta} \Psi_\beta$$

$$= \rho_{\beta\gamma} \rho_{\alpha\delta} c_\delta \Psi_0 - \rho_{\beta\delta} c_\alpha \Psi_\beta$$

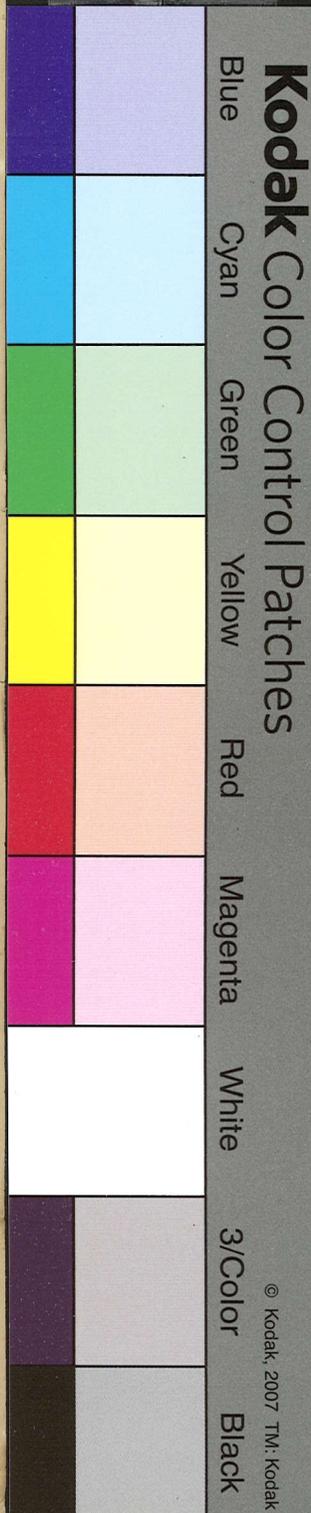
$$= \rho_{\alpha\beta} c_\beta \Psi_0 - \rho_{\beta\delta} c_\alpha \Psi_\beta$$

$$\rho_{\alpha\beta} a_\alpha^* a_\beta \Psi_\gamma = \rho_{\alpha\beta} \delta_{\beta\gamma} \Psi_\alpha = \rho_{\alpha\gamma} \Psi_\alpha$$

$$\rho_{\alpha\beta} a_\alpha^* a_\beta \Psi = \rho_{\alpha\gamma} c_\gamma \Psi_\alpha = \rho_{\alpha\beta} c_\beta \Psi_\alpha$$

$$c_\alpha \rightarrow \rho_{\alpha\beta} c_\beta$$

$$\Psi = \sum_\alpha c_\alpha \Psi_\alpha \rightarrow \rho \Psi = \sum_{\alpha,\beta} \rho_{\alpha\beta} c_\beta \Psi_\alpha$$



$$\Psi(n_1, n_2, \dots)$$
$$= \sum_{n_1, n_2} c_{n_1, n_2} \Phi_{n_1, n_2} \dots (n_1, n_2, \dots)$$

$$\frac{1}{2}(p^2 + q^2 + 2fq)$$
$$= \frac{1}{2}\{p^2 + (q + f)^2\} - 2f^2$$

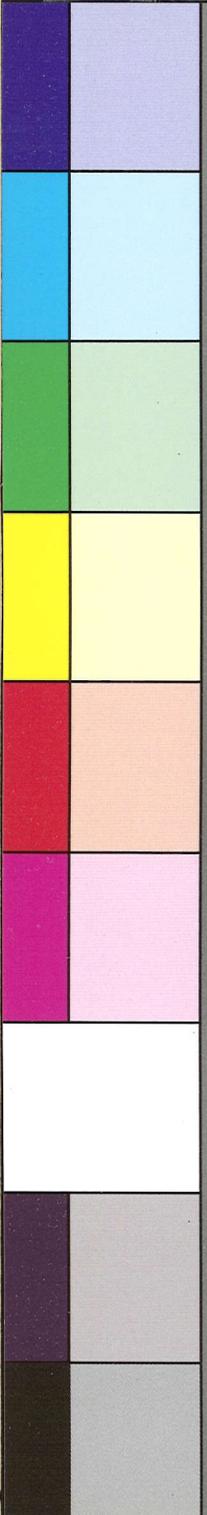
$$H_n(q)$$

$$H_n(q + f)$$

$$H_{n_1}(q_1) H_{n_2}(q_2) \dots$$

$$H_{n_1}(q_1 + f_1) H_{n_2}(q_2 + f_2) \dots$$

Kodak Color Control Patches



Blue Cyan Green Yellow Red Magenta White 3/Color Black