$$P(E) \quad \left[g(E)\, e^{-\beta E} \right]$$

$$\ln \left[\qquad \right]$$ GARATU MAXIMOAREN inguruan

$E^* \approx U$ GAUSSIARRA!

$$\ln\left[g(E)\cdot e^{-\beta E}\right] = \ln\left[g(E)\cdot e^{-\beta E}\right]_{E=U} + \frac{\partial}{\partial E}\left\{\ln\left(g(E)\, e^{-\beta E}\right)\right\}(E-U) +$$

$$\ln\left(g(E)\, e^{-\beta E}\right) = 0$$

$$+ \frac{1}{2}\frac{\partial^2}{\partial E^2}\left(\ln g(E)\cdot e^{-\beta E}\right)\Big|_{E=U}(E-U)^2 +$$

$$+ \ldots$$

$$\simeq \ln\left[g(U)\cdot e^{-\beta U}\right] + \frac{1}{2}\frac{\partial^2}{\partial E^2}\left(\ln\left(g(E)\cdot e^{-\beta E}\right)\right)\Big|_{E=U}\cdot(E-U)^2$$

$$\ln\left[g(U)\cdot e^{-\beta U}\right] = \ln g(U) + \ln e^{-\beta U} = \frac{S}{k_B} - \frac{U}{k_B T} = \frac{ST-U}{k_B T}\left(= \frac{-F}{k_B T}\right)$$

$$\ln g(U) = \frac{S}{k_B} \qquad \beta = \frac{1}{k_B T} \qquad ST - U = -F$$

$$\frac{1}{2}\frac{\partial^2}{\partial E^2}\left(\ln\left(g(E)\cdot e^{-\beta E}\right)\right) = -\frac{1}{2}\frac{1}{k_B T^2}\cdot\frac{1}{C_V}$$