Feynman-Hellmann theorem:

$$\langle\langle\bar{\psi}\psi\rangle\rangle = \frac{\partial\Omega}{\partial m_q} = -\frac{\partial p}{\partial m_q}$$

with $\langle\langle T^\mu_\mu\rangle\rangle = \epsilon - 3p = T^5\partial/\partial T(p/T^4)$

$$\langle\langle G^2\rangle\rangle = -\frac{8}{9}\left[T^5\frac{\partial}{\partial T}\left(\frac{p}{T^4}\right) - m_q\frac{\partial p}{\partial m_q}\right]$$

dilute gas of hadrons : $\delta p(T,\mu) = \sum_h M_h\rho^s_h(T,\mu)$

- $\dfrac{\partial p}{\partial m_q} = \dfrac{\partial p}{\partial M_h}\dfrac{\partial M_h}{\partial m_q} = \dfrac{\partial p}{\partial M_h}\Sigma_h/m_q$
- $m_\pi^2 F_\pi^2 = -2m_q\langle\bar{q}q\rangle$

$$\frac{\langle\langle\bar{\psi}\psi\rangle\rangle}{\langle\bar{\psi}\psi\rangle} = 1 - \sum_h \frac{\Sigma_h\rho^s_h(T,\mu)}{F_\pi^2 m_\pi^2}$$

$$\langle\langle G^2\rangle\rangle - \langle G^2\rangle = -\frac{8}{9}\left[\sum_h M_h(\rho^s_h(T,\mu))' - \Sigma_h\rho^s_h(T,\mu)\right]$$