Instantons and the Spin of the Nucleon

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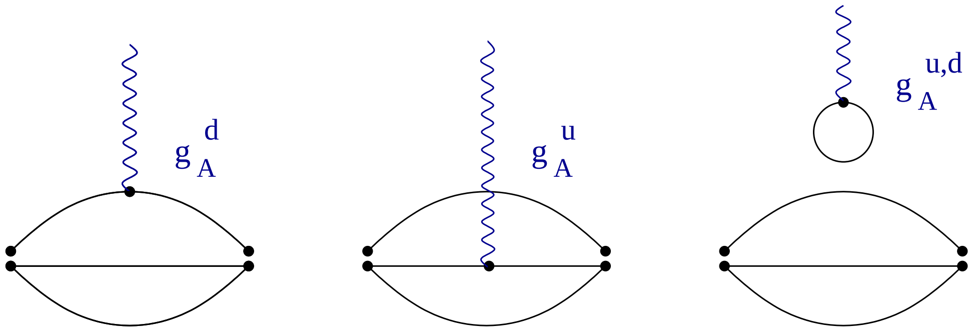
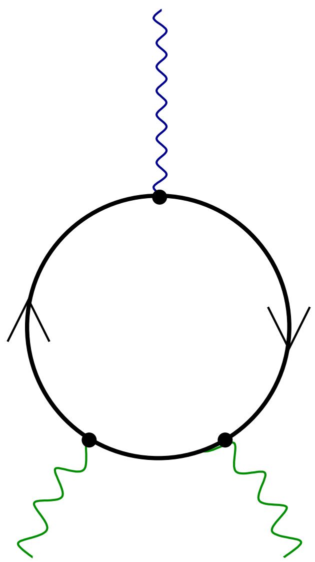
Nucleon Spin

- polarized DIS implies large OZI violation



$$g_A^0 \simeq 0.25$$
$$g_A^8 \simeq 0.65$$

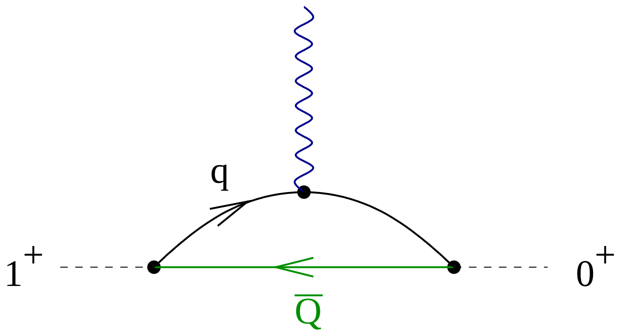
- related to axial anomaly and instantons?

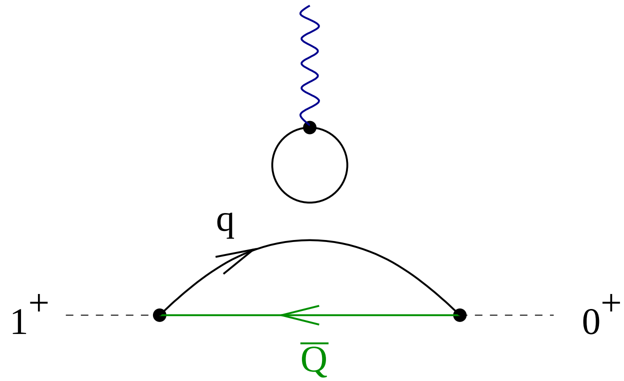


$$\partial^\mu A^0_\mu = \frac{N_f g^2}{16\pi^2} G^a_{\mu\nu} \tilde{G}^a_{\mu\nu}$$

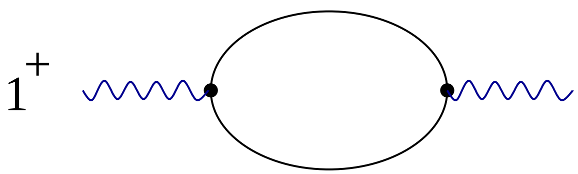
OZI violation

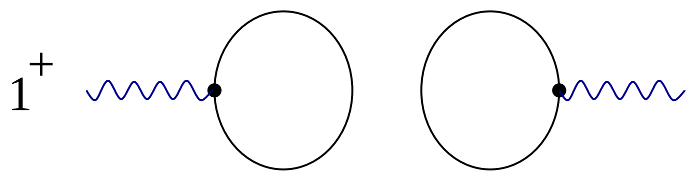
Suppression of g_A^0 property of the nucleon or of the QCD vacuum?





$(g_A^Q)^0 - (g_A^Q)^3$



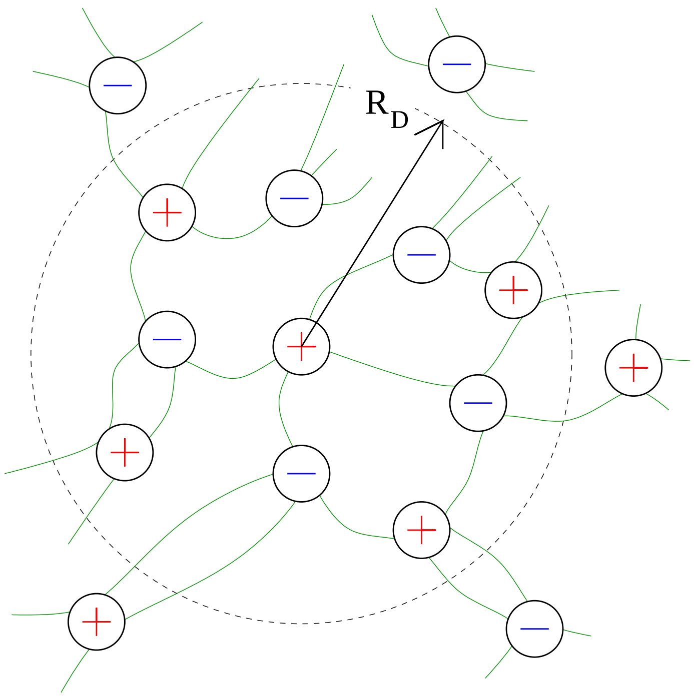


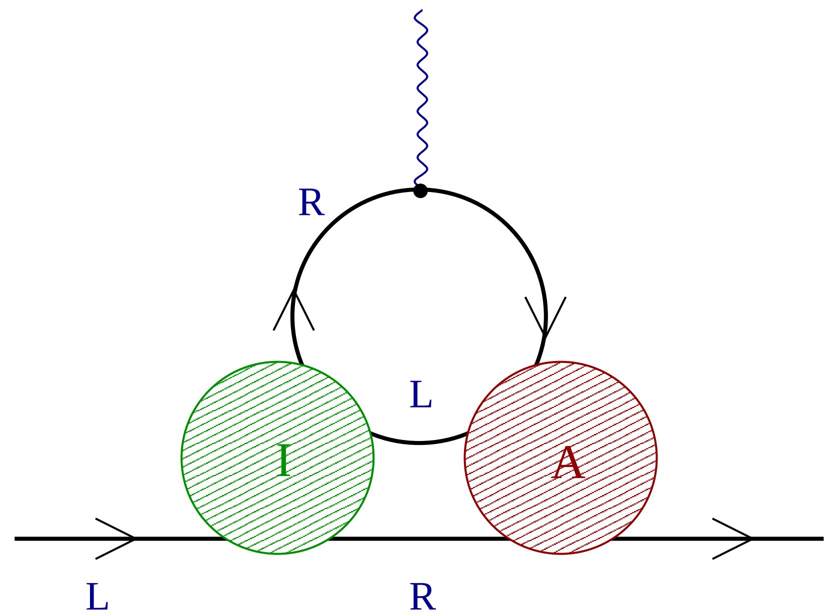
$(f_a^2 m_a^2)^0 - (f_a^2 m_a^2)^3$

Study singlet correlators in $\bar{q}q$ and $\bar{Q}q$ (or QQq) channel

Vacuum Properties

Axial charge screening related to topological charge screening?



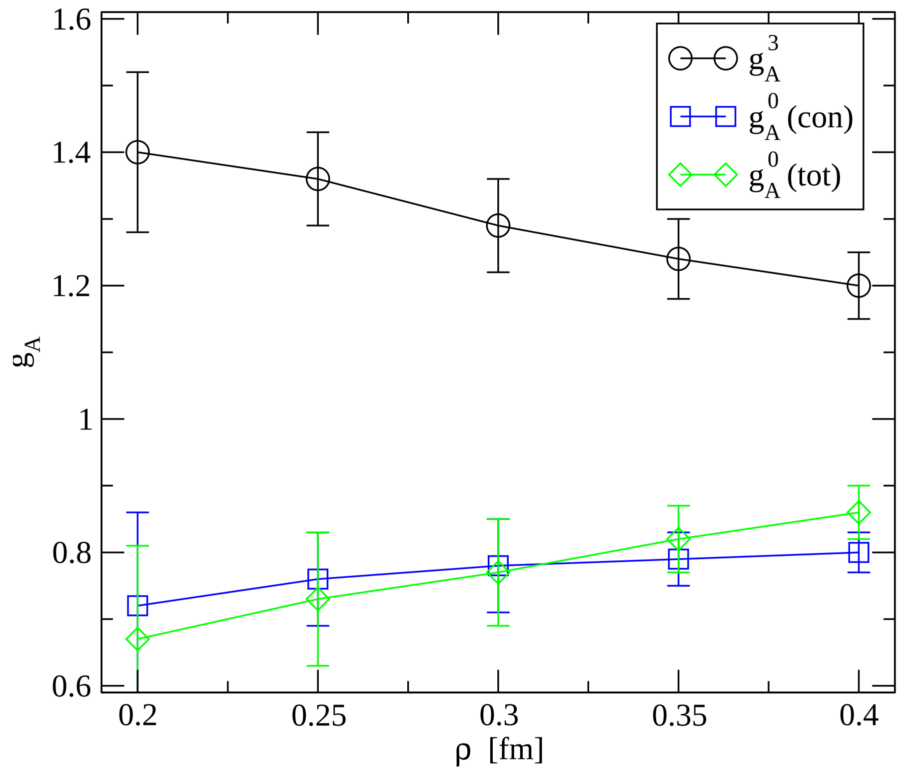


$$\chi_{top} = \frac{1}{V}\langle Q_{top}^2\rangle = 0 \qquad\qquad L \to R(\bar{L}R)$$

e.g. Veneziano and Shore $g_A^0 = g_A^8\sqrt{\frac{6\chi'_{top}(0)}{f_\pi^2}}$ (target independent)

also: Shuryak and Forte, Dorokhov and Kochelev

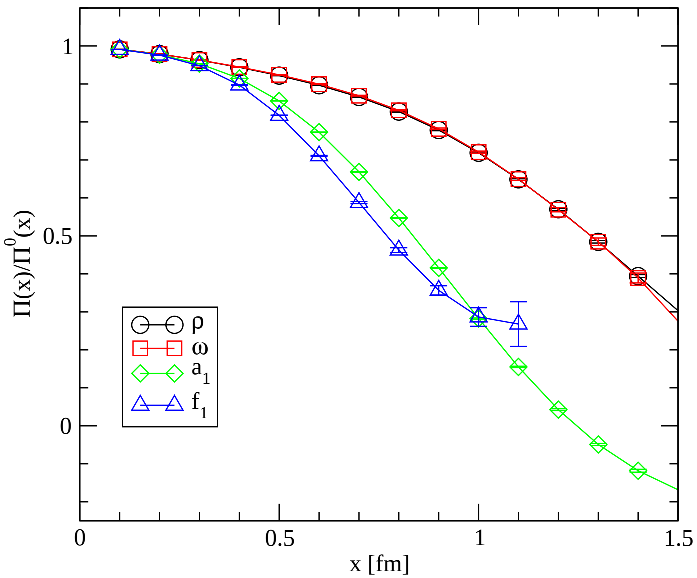
Numerical Study

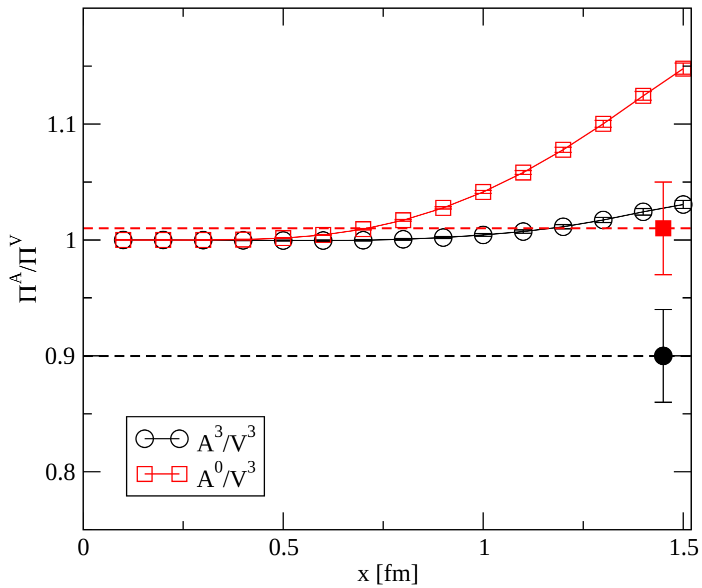


$g_A^3 \simeq 1.25$ agrees with experiment
$g_A^0 \simeq 0.75$ too large

Very little OZI violation

$(\bar{Q}q)$ and $(\bar{q}q)$ states





$$(f^2m^2)^0 > (f^2m^2)^3$$

$$(g_A^Q)^0 > (g_A^Q)^3$$

Summary

- instanton liquid reproduces axial vector coupling g_A

  But: $g_A^8 \simeq g_A^0 \simeq 0.75$

  something missing with regard to the structure of the nucleon?

- no evidence that suppression of g_A^0 is a vacuum effect

  $$[(g_A^Q)^0 \sim 1] > [(g_A^Q)^3 \sim 0.9]$$

- lattice calculations:

  1) check nucleon vs vacuum by studying more than one system

  2) check instanton dominance of disconnected graphs