Fragmentation functions as probes for the transversity distribution

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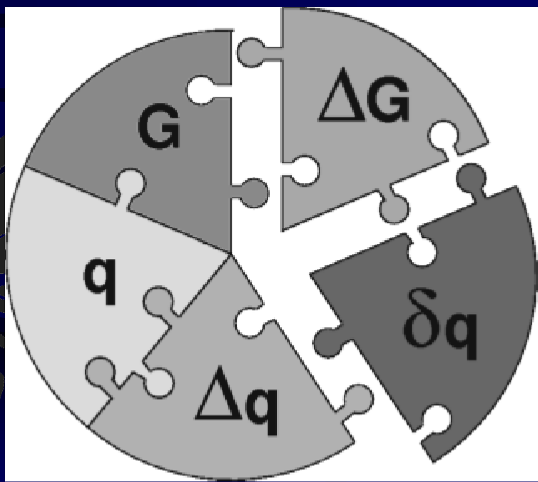
Outline

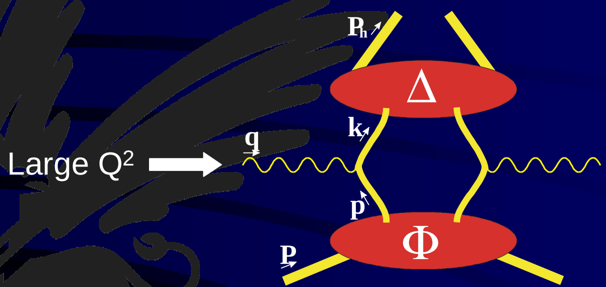
- The transversity distribution
- The Collins fragmentation function
- Polarized Λ fragmentation
- 2-hadron interference fragmentation
- Spin-1 fragmentation
- Conclusions

The puzzle of the distribution functions



Semi-inclusive DIS

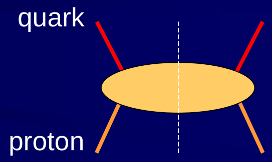
$$d\sigma\ (l + H \to l' + h + X) \propto L_{\mu\nu} W^{\mu\nu}$$



$$2M\, W^{\mu\nu} \propto \mathbf{Tr}[\Phi(x_B)\gamma^{\mu}\,\Delta(z_h)\gamma^{\nu}]$$

Different ways to see the distribution functions

1. Operator decomposition of the correlation function



$$\Phi(x) = \frac{1}{2}\{ f_1(x) + g_1(x)\gamma_5\, S_L + h_1(x)\gamma_5\, \not{S}_T \}\gamma^-$$

$q \qquad \Delta q \qquad \delta q$

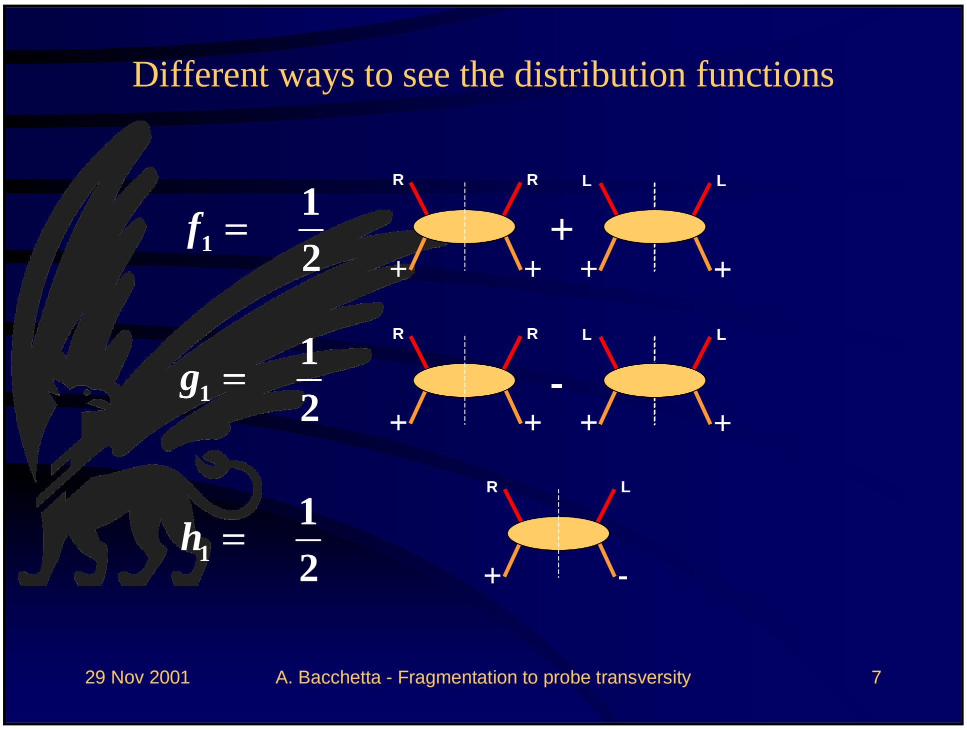
NOTE: no intrinsic transverse momentum is included!

Different ways to see the distribution functions

3. Matrix elements in hadron spin space ⊗ parton chirality space

A.B, M. Boglione, A. Henneman, P. Mulders, PRL 85 (2000)

	R +	R -	L +	L -
R +	$f_1 + g_1$	0	0	$2h_1$
R -	0	$f_1 - g_1$	0	0
L +	0	0	$f_1 - g_1$	0
L -	$2h_1$	0	0	$f_1 + g_1$


Different ways to see the distribution functions
f1 = 1/2
+
g1 = 1/2
-
h1 = 1/2
R
L
+
-
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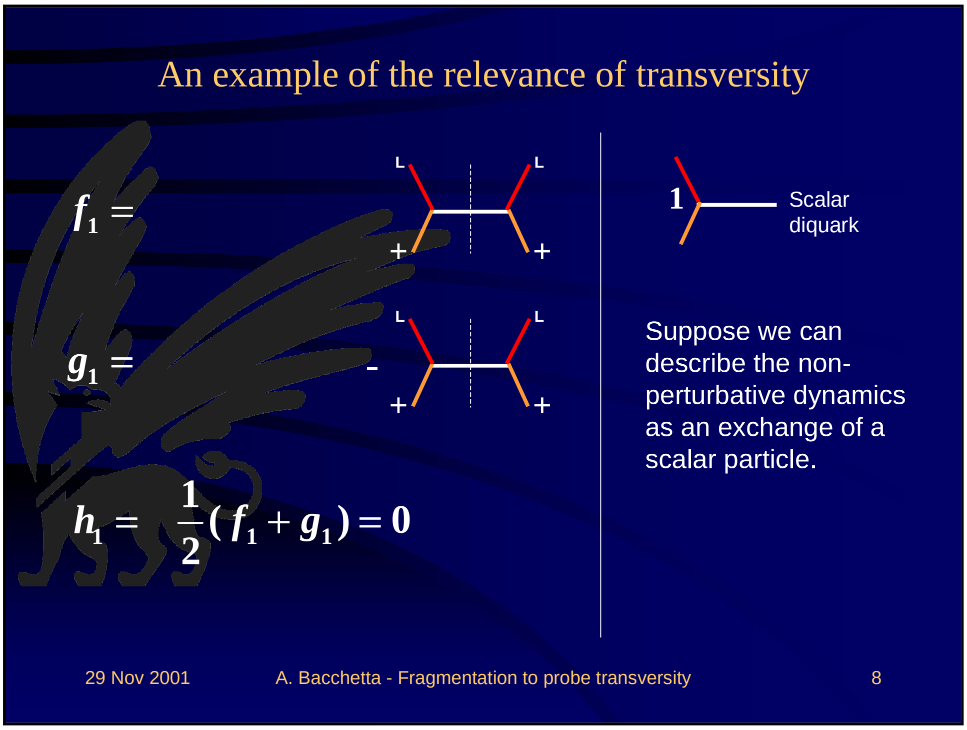
An example of the relevance of transversity
f1 =
g1 =
-
h1 = 1/2(f1 + g1) = 0
L
+
1
Scalar
diquark
Suppose we can describe the non-perturbative dynamics as an exchange of a scalar particle.
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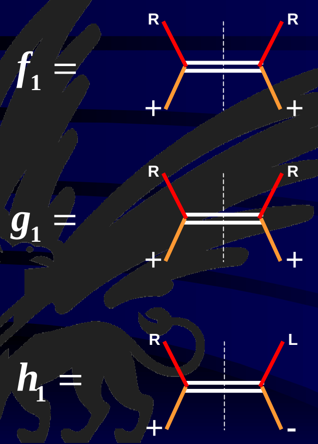
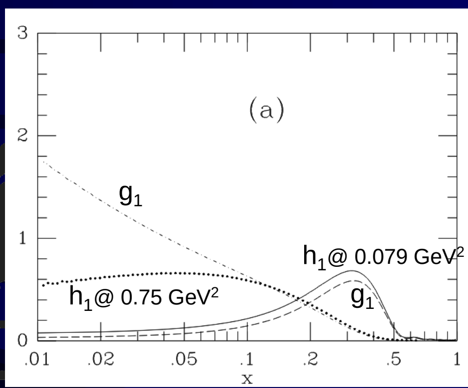
An example of the relevance of transversity



Suppose we can describe the non-perturbative dynamics as an exchange of a vector particle.

Model calculation of h_1



S. Scopetta, V. Vento, PLB 424 (1997)

for a nice review on the transversity see also

V. Barone, A. Drago, P. Ratcliffe, hep-ph/0104283