The present theoretical knowledge about photons and hard photoproduction processes, i.e. the production of jets, light and heavy hadrons, quarkonia, and prompt photons in photon-photon and photon-hadron collisions, is reviewed. Virtual and polarized photons and prompt photon production in hadron collisions are also discussed. The most important leading and next-to-leading order QCD results are compiled in analytic form. A large variety of numerical predictions is compared to data from TRISTAN, LEP, and HERA and extended to future electron and muon colliders. The sources of all relevant results are collected in a rich bibliography.
$e^+ p \rightarrow h^\pm + X$

$165 < W < 251 \text{ GeV}$

$|y| < 1$

--- $\xi = 1/2$

--- 1

--- 2

$d^2\sigma/dy dp_T^2 \text{ [nb/GeV}^2]$ vs $p_T \text{ [GeV]}$
\( \frac{d^2 \sigma}{dy dp_T^2} \text{ [nb/GeV}^2\text{]} \)

\[ \text{ep} \rightarrow K^0/\bar{K}^0 + X \]

\[ |y_{\text{lab}}| < 1.3 \]

\[ \xi = 1/2 \]

1

2

H1

\( p_T \text{ [GeV]} \)
(b)

\[ \text{ep} \rightarrow K^0 / \bar{K}^0 + X \]

\[ 2 \text{GeV} < p_T < 5 \text{GeV} \]

\[ \xi = 1 \]

\[ \frac{d\sigma}{dy} \text{[nb]} \]

\[ y_{\text{lab}} \]
$e^+e^- \to e^+e^-h^\pm + X$

$|y| < 1.5$

$\xi = 1/2$

$\xi = 1$

$\xi = 2$

$\frac{d\sigma}{dp_T} \text{ [pb/GeV]}$

$p_T \text{ [GeV]}$

OPAL $\times 10^2 \times 10^3$
$pN \rightarrow \gamma^* X$ at $p_{lab} = 800$ GeV

$5 \text{ GeV} < Q < 6 \text{ GeV}$

$0.1 < x_F < 0.3$

$\sigma / dp_3$ (pb/GeV$^2$)