

**line element of Stiles (1946) with „color values” P, D, T**  
 three separate color signal functions  
 $F(P) = i \ln(1+9P)$   
 $F(D) = j \ln(1+9D)$   
 $F(T) = k \ln(1+9T)$   
**Taylor-derivations:**  
 $\Delta F(P, D, T) = \frac{dF}{dP} \Delta P + \frac{dF}{dD} \Delta D + \frac{dF}{dT} \Delta T$   
 $= \frac{9i}{1+9P} \Delta P + \frac{9j}{1+9D} \Delta D + \frac{9k}{1+9T} \Delta T$

ME120-1, B4\_47\_1

**line element of Vos & Walraven (1972) with „color values” P, D, T**  
 three separate color signal functions  
 $F(P) = -2i\sqrt{P}$   
 $F(D) = -2j\sqrt{D}$   
 $F(T) = -2k\sqrt{T}$   
**Taylor-derivations:**  
 $\Delta F(P, D, T) = \frac{dF}{dP} \Delta P + \frac{dF}{dD} \Delta D + \frac{dF}{dT} \Delta T$   
 $= \frac{i}{\sqrt{P}} \Delta P + \frac{j}{\sqrt{D}} \Delta D + \frac{k}{\sqrt{T}} \Delta T$

ME120-2, B4\_47\_2

**functions  $q[k(x-u)]$  „achromatic signal”-description**  
 with  $x = \log L$  ( $L =$  luminance)  
 $u = \log L_u$  ( $L_u =$  surround luminan.)  
 $q[k(x-u)] = 1 + 1/[1 + \sqrt{2}e^{k(x-u)}]$   
**function values:**  
 $q[k(x-u) \rightarrow +\infty] = 1$   
 $q[k(x-u) = 0] = \sqrt{2}$   
 $q[k(x-u) \rightarrow -\infty] = 2$

ME120-3, B4\_48\_1

**„achromatic signal”-description functions  $Q_{lm}[k(x-u)]$**   
 with  $x = \log L$  ( $L =$  luminance)  
 $u = \log L_u$  ( $L_u =$  surround luminan.)  
 $Q_{lm}[k(x-u)] = -\frac{l}{\ln\sqrt{2}} \ln q[k(x-u)] - m$   
**function values with  $l = m = 1$ :**  
 $Q[k(x-u) \rightarrow +\infty] = 1$   
 $Q[k(x-u) = 0] = 0$   
 $Q[k(x-u) \rightarrow -\infty] = -1$

ME120-4, B4\_48\_2

**„achromatic signal” discrimination as function of relative light density  $h = \ln H = k(x-u)$   $\ln =$  natural log.**  
 $Q' = \frac{d}{dh} [\ln\{1 + 1/(1 + \sqrt{2}H)\}] / \ln\sqrt{2}$   
 $= -\sqrt{2}/[\ln\sqrt{2}(1 + \sqrt{2}H)(2 + \sqrt{2}H)]$   
**function values:**  
 $Q'[k(x-u) \rightarrow +\infty] = 0$   
 $Q'[k(x-u) = 0] = -0,5$   
 $Q'[k(x-u) \rightarrow -\infty] = 0$

ME120-5, B4\_49\_1

**luminance discrimination possibility  $L/\Delta L$  as function of  $H$**   
 with:  $L = 10^x$   $H = e^h = 10^{\log_e k(x-u)}$   
 $dL/dx = \ln 10 L$   $dH/dx = k H$   
**it follows:  $L/\Delta L = [kH / (dH \ln 10)]$**   
 $\frac{L}{\Delta L} = \text{const } H / [(1 + \sqrt{2}H)(2 + \sqrt{2}H)]$   
 $Q'[k(x-u) \rightarrow +\infty] = 0$   
 $Q'[k(x-u) = 0] = \text{maximum}$   
 $Q'[k(x-u) \rightarrow -\infty] = 0$

ME120-6, B4\_49\_2

**double line element of Richter (1987) for the lighting technic with luminance  $L = F(P, D, T)$**   
**luminance signal function  $F(L)$**   
 $F(L) = iQ(H) = \begin{cases} \bar{i} Q(\bar{H}) & (x < u) \\ \bar{i} Q(\bar{H}) & (x \geq u) \end{cases}$   
 with:  $\bar{k} = 1,4$   $\bar{k} = 1$   $\bar{i} = 1$   $\bar{i} = -2$   
 $x = \log L$   $u = \log L_u$   
 $H = e^{k(x-u)}$ ,  $\bar{H} = e^{\bar{k}(x-u)}$ ,  $\bar{H} = e^{\bar{k}(x-u)}$

ME120-7, B4\_50\_1

**double line element of Richter (1987) for the lighting technic with luminance  $L = F(P, D, T)$**   
**luminance signal function  $F(L)$**   
 $F(L) = iQ(H)$   $H = e^{k(x-u)}$   
 $Q[\ln\{1 + 1/(1 + \sqrt{2}H)\}] / \ln\sqrt{2} - 1$   
**Taylor-derivations:**  
 $\Delta F(L) = \frac{dF}{dL} \Delta L = i \frac{dQ}{dH} \Delta H$   
 $= -i\sqrt{2} \Delta H / [\ln\sqrt{2}(1 + \sqrt{2}H)(2 + \sqrt{2}H)]$

ME120-8, B4\_50\_2

