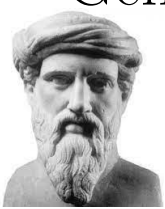
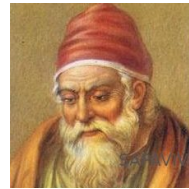
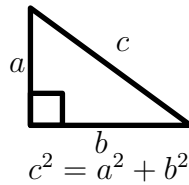


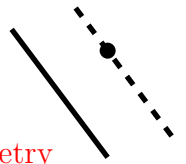
Genesis of the Dual Structure of Information Geometry



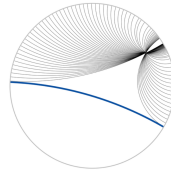
Pythagoras of Samos
(c. 570-495 BC)
Pythagoras' theorem



Euclid
(ca 365-300 BC)
Elements, **math. proof**
Playfair axiom, **Euclidean geometry**



Nikolai Ivanovich Lobachevsky
(1792-1856)
Hyperbolic geometry
(∞ -many lines passing through a point and // to another line)



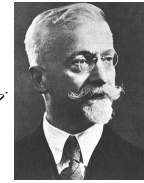
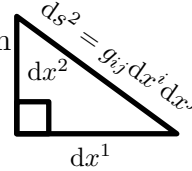
Christian Felix Klein
(1849-1925)
Projective geometry & symmetry group
Erlangen program



Johann C. F. Gauss
(1777-1855)
differential geometry of surfaces
Theorema Egregium



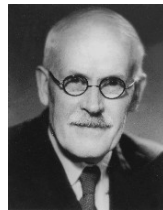
Georg F. B. Riemann
(1826-1866)
metric tensor (1854)
 $g = g_{ij} d\theta_i \otimes d\theta_j$
Riemannian manifold (M, g)



Élie Joseph Cartan
(1869-1951)
affine connections
differential forms ω



Sir Ronald Aylmer Fisher
(1890-1962)
Mathematical statistics
Fisher information, MLE
 $I(\theta) = E_{p_\theta} [(\nabla_\theta \log p_\theta)(\nabla_\theta \log p_\theta)^T]$



Sir Harold Jeffreys
(1891-1989)
Jeffreys prior $\propto \sqrt{|g|}$
J-divergence



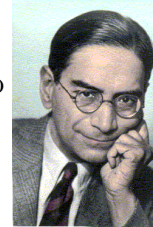
Alexander P. Norden
(1904-1993)
conjugate connections wrt g
Affinely connected spaces



Harold Hotelling
(1895-1973)
Econometrician
Fisher metric
(1930)



Calyampudi Radhakrishna Rao
(1920-)
Fisher-Rao distance
Cramér-Rao lower bound
(1945)



Prasanta C. Mahalanobis
(1893-1972)
Distances in statistics
Mahalanobis distance
statistical field (1936)



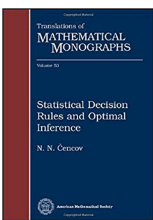
Claude Elwood Shannon
(1916-2001)
Information theory
Entropy:
 $h(p) = - \int p \log p d\mu$



Solomon Kullback
(1907-1994)
Richard A. Leibler
(1914-2003)
KL divergence
 $D_{KL}[p : q] = \int p \log \frac{p}{q} d\mu$



Ernest Borisovich Vinberg
(1937-2020)
characteristic functions
on homogeneous cones



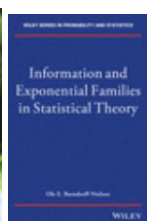
Nikolai Nikolaevich Chentsov
(1930-1992)
statistical invariance
geometrostatistics
Category theory, connections



Imre Csiszár
(1938-)
information projections
f-divergences
 $I_f[p : q] = \int p f(\frac{p}{q}) d\mu$



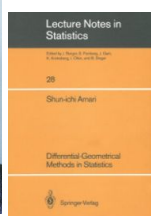
Jean-Louis Koszul
(1921-2018)
Hirohiko Shima
homogeneous bounded domains



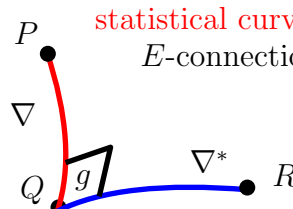
Ole E. Barndorff-Nielsen
(1935-)
Exponential families
observed information geometry



Bradley Efron
(1938-)



Shun-ichi Amari
(1936-)
Information geometry
dualistic structure (M, g, ∇, ∇^*) :
 $Zg(X, Y) = g(\nabla_Z X, Y) + g(X, \nabla_Z^* Y)$
dual $\pm\alpha$ -connections
 $(M, g_F, \nabla^{-\alpha}, \nabla^{\alpha})$



$D(P : Q) + D(Q : R) = D(P : R)$
Generalized Pythagoras' theorem
in dually flat space (M, g, ∇, ∇^*)



Steffen Lauritzen
(1947-)
statistical manifold (M, g, C)



Information geometry
journal (2018-)