



D. D. Kosambi





# DAMODAR DHARMANAND KOSAMBI

(1907 - 1966)

Elected Fellow 1946

## FAMILY BACKGROUND AND EDUCATION

DAMODAR DHARMANAND KOSAMBI was born on July 31, 1907 at a village Kosben in Goa. He was brought up in a family known for its rigorous standards of learning and social behaviour. He had most unusual and comprehensive education. From his early childhood he showed signs of a bright and keen intellect. He inherited his passion for learning and humanism from his father, Prof Dharmanand Kosambi, a well known scholar and research worker of Buddha philosophy. He always encouraged his son to go in for diversity of field work interests rather than specialising in one subject.

His father was on the Harvard faculty on a teaching assignment and therefore Kosambi joined the Cambridge Grammer School after some schooling in India, later the Latin High School and finally, Harvard University, from where he graduated in 1929 (Mathematics, History and Languages) with SB "Summa Cum Laude", also winning a Phi-Beta Kappa membership. He wanted to complete his PhD but the authorities at Harvard were in great difficulty to find positions for their graduates and Kosambi was discouraged from completing his studies at Harvard. So he returned to India and accepted a post of Professor at the Benaras Hindu University.

He was a great linguist and had practically mastered a number of Indian and European languages including French, German, Italian and Russian. He had enough knowledge of Greek and Hebrew also. He was fond of swimming, hiking and gymnasium and had developed a very good physique. He held Prof Birkhoff of the Faculty of Mathematics, in high respect among his teachers and completed his graduate studies under his guidance. Prof Kosambi and Prof Norbert Wiener (Cybernetics fame) were friends of long standing. He had close contacts with statisticians of international repute. Bhandarkar Oriental Research Institute was the venue of his activities and had associated with some well known Sanskrit scholars and Vidwans.

## RESEARCH CONTRIBUTIONS

### *Mathematics and Statistics*

He had only a Bachelor's degree in Mathematics and yet had a complete grasp over the latest developments of mathematical research in Europe. He regarded Math





matics as the language of nature, giving preciseness to the results of other sciences, but was also aware that nature has its own philosophy. He was very much fascinated by the clarity and exactness which mathematics can give and brought to bear the same in all branches of science he handled.

He had specialised in pure and applied mathematics (Tensor Analysis, Probability), theoretical and applied statistics and in these, his reputation was unchallenged. He won the first award of the Ramanujan Memorial Prize in 1934 and a special Bhabha Prize in 1974. He had been to China on a personal invitation from the Academia Sinica, Peking, to suggest statistical methods for the forecasting of Chinese food-crops and quality control in industry.

Statistical methods used by him in deciding the dates of coins from their weight led to the foundation of a new branch of science viz., Numismatics, while his work on the seasonal death rate and the subsequent suggestion to concentrate on anti-typhoid work about three weeks before the onset of monsoon resulted in the saving of considerable number of lives. Statistical methods originally suggested by him to engineers for constructing dams have now been adopted by the 5-year plan committee as the basis for location and size of dams.

Prof Kosambi was an equally able Professor of Mathematics. He worked in the Benaras Hindu University, Aligarh University and the Fergusson College. He kept his mark everywhere he worked and contributed to the development of higher Mathematics and Statistics. He had a number of brilliant students working for PhD under him. While in TIFR, he found a much wider field for mathematics to make contributions in the researches in Atomic energy in India. Many of his papers were published in reputed journals abroad.

### *Physics*

His interest was then transferred to theoretical and nuclear physics. He was a student of mathematics and had not taken even the sophomore course in Physics but was thoroughly familiar with the Einstein theory of relativity. He was the guest of the Institute for Advanced Study, Princeton in 1949, where the main work covered several technical discussions with Einstein on his unified theory.

### *Sanskrit Text Study*

As he was arranging coin groups according to dates, a question came as to who struck the coins. Reply to this could only be found in old records about kings and Purans written by Buddhist and Jain, but this needed some knowledge of Sanskrit. The urge to learn Sanskrit led him to undertake one specific problem and that was the study of Bhartrahari's epigrams (Subhasitas). It ranged from the search for manuscripts to publications. He had to put in 5 years work to edit Bhartrahari, but his work did receive professional approval. The principal editions of Bhartrahari Sataks are admitted





the best of their sort and as having added considerably to methods—Indian textual criticisms.

## INDIAN HISTORY AND CULTURE

As he was going through Sanskrit literature in an effort to edit Bhartrahri, his attention was attracted to Indian History. He found that no reliable sources of data exist and arrived at a new definition of history, adopting it from the theory of Karl Marx. According to Prof Kosambi, history should be related to the development of means of production and farmers, villagers, low caste nomads, tribal minorities were the main sources of data for writing history as distinct from a series of historical episodes relating to kings. Nevertheless, he was aware that in an undeveloped country, socio-economic forces guiding major wars, major changes in rulers, did reveal fundamental changes in productive efforts. His *'Introduction to the study of Indian History'* and the *Culture and Civilisation of Ancient India in Historical Outline'* are supposed to make a new stage in Indian historiography. To write them, he did pioneer work in archaeology and ethnography, showing that written sources would not suffice.

The second characteristic of his work in this field is the concept of Feudalism introduced by him, leading to study of feudal structure of Indian society and state by many scholars.

He had provided the most vital missing link in the Robert Graves (a great Historian) researches on the life of Christ. He had proven the presence of Christ in Kashmir from some rare documents in Srinagar Fort.

### *Indology*

He had put forth a view that development of language cannot be separated from the succession of prehistorical stages through which a given society has passed. So if we want to study the problems of ancient Indian culture, a linguistic study of these problems will definitely help. However, such a study must be supplemented by an intelligent use of archaeology, anthropology, sociology and a suitable historical perspective. As an Indologist, he was invited under the sponsorship of the British Council and the London School of Oriental Studies and had a special invitation to attend the next International Congress of Orientalists.

So far as his work in Archaeology is concerned, he showed that 'Stones could be made to yield secrets of history. He was the first scholar to recognise the presence of microliths characteristic of the Stone Age on the Vetal Plateau near Poona. His collection of microliths was a unique one and it is through this study that he was able to discover, read and publish a Brahni inscription in plain sight at Karle caves which has passed





unnoticed. An ordinary annual festival at the temple near the Karle caves led to his discovery of a very ancient rite performed before the Kolis took to fishing. His suggestion to use Malshet pass as a key road from Bombay to Ahmednagar resulted in a saving of few millions that would have been spent on creation of a railway route. The suggestion was not based on book reading and maps alone, but an extensive field work which led to his rediscovery of neolithic routes, Buddhist caves and old inscriptions. He founded the Archaeological Society and donated all his rare collections to its Museum.

Consequent upon the Chromosome Theory of Heredity advanced by Morgan, chromosome mapping has been an active pursuit among geneticists for better understanding of the serial order of genes and spatial relations. He showed that there is nothing like an intrinsic unit of map length which is only an imaginary metric unrelated to either the physical or cytological length of the chromosome, the primary requirement in the mapping function is consistency, together with simplicity. The formula suggested by Kosambi though largely an intelligent empiricism, gave satisfactory additive estimates of map lengths irrespective of the kinds of organisms and the lengths of their chromosomes on which recombination data are gathered.

The guiding principle in all his activities was his love for humanism and peace. His approach to life was based on Marxism but not its blind uncritical application. He used to mix freely with all the cross sections of the community to understand their problems as according to him this was the first step to solve problems in science. He was shy and never went out of his way to seek publicity or fame. He took a keen interest in the activities of the Council for Peace of the World and organised several campaigns on 'peace by peaceful means'. He was intensely human with natural compassion for the fellow human being, especially for the underdog and he championed their cause with all vigour and strength.

PV SUKHATME  
Sankhyadarshan  
64/12 Erandavana  
Pune 411004

## BIBLIOGRAPHY

- 1930 Precessions of an elliptical orbit. *Indian J. Phys.*, 5, 359-364.
- 1932 On a generalization of the second theorem of Brouwer. *Proc. Acad. Sci. of the U.P.* 1.  
 — On the existence of a metric and the inverse variational problem. *Ibid.*, 2, 17-28.  
 — On differential equations with the group property. *J. Indian Math. Soc.*, 19, 17-28.  
 — Modern differential geometrics. *Ibid.*, 7, 159-164.  
 — Geometric differentielle et calcul des variations. *Rendiconti d.r. Acad. Naz. d. Lincei.*, 410-415.  
 — Affin-geometrische Grundlagen der Einheitlichen Feld-theorie. *Sitz. Preuss. Akad. Wiss. Phys. Math. Klasse.* 342-345.





- 1933 The problem of differential invariants *J. Indian Math. Soc.*, 20  
 – Parallelism and path-spaces. *Math. Zeitschrift*, 37, 608-618.  
 – The classification of Integers. *J. Univ. Bombay*, 2, 18-20.
- 1934 Collineations in path-space. *J. Indian math. Soc.*, 1, 69-72.  
 – Continuous groups and two theorems of Euler. *Math. Student*, 2, 94-100.  
 – The maximum modulus theorem. *J. Univ. Bombay*, 3, 11-12.
- 1935 Systems of differential equations of the second order. *Quart J. Maths. (Oxford)*, 6, 1-12.  
 – Homogeneous metrics. *Proc. Indian Acad. Sci.*, 1, 952-954.  
 – An affine calculus of variations. *Ibid.*, 2, 334-335.
- 1936 Differential geometry of the Laplace equation. *J. Indian Math. Soc.*, 2, 141-143.  
 – Path-spaces of higher order. *Q.J. Maths (Oxford)*, 7, 97-104.  
 – Path-geometry and cosmogony. *Ibid.*, 7, 290-293.
- 1938 Les metriques homogenes dans les escapes consmogoniques. *Comptes Rendus (Paris)*, 206, 1086-1088.  
 – Les espaces des paths generalises qu'on peut associer avec un espace de Finsler. *Ibid.*, 1538-1541.
- 1939 The tensor analysis of partial differential equations. *J. Indian Math. Soc.*, 3, 249-253.  
 – A note on the trial of Sokrates. *Fergusson Coll. Mat.* 1-6.  
 – Revolution and the progress of Science : *New Age* 5, 320-325.  
 – Science learns the goose-step. *Ibid.*  
 – Path-equations admitting the Lorentz-group-1. *J. Lond. Math. Soc.*, 15, 86-91.  
 – A statistical study of the weights of old Indian punchmarked coins. *Curr. Sci.*, 9, 312-314.  
 – The concept of isotropy in generalized path-spaces. *J. Indian Math. Soc.*, 4, 80-88.  
 – A note on two hoards of punch-marked coins found at Taxila. *New Indian Antiquary*, 3, 156-157.
- 1940 A note on frequency distribution in series. *Math. Student*, 8, 151-155.  
 – The emergence of national characteristics among three Indo-European peoples. *ABORI* 20. 195-206.  
 Trial speculation on Indology.
- 1941 On the study and metrology of silver punch-marked coins. *New Indian Antiquary*, 4, 1-35 and 49-76.  
 – A bivaite extension of Fisher's Z-test. *Curr. Sci.*, 10, 191-192.  
 – Correlation and time-series. *Ibid.*, 10, 372-374.  
 – The Quality of renunciation in Bhartrhari's poetry. *Fergusson. Coll. Mag.*  
 – Path-equations admitting the Lorentz Group-II. *J. Indian Math. Soc.*, 5, 62-72.  
 – On the origin and development of silver coinage in India. *Curr. Sci.*, 10, 395-400.
- 1942 Additions and corrections. *New Indian Antiquary*. 5.  
 – On valid tests of linguistic hypotheses. *Ibid.*, 5, 21-24.  
 – Zeros and closure of orthogonal functions. *J. Indian Math. Soc.*, 6, 16-24.  
 – The effect of circulation upon the weight of metallic currency. *Curr. Sci.*, 11, 227-231.  
 – A test of significance for multiple observations. *Ibid.*, 11, 271-274.
- 1943 Progress in the production and consumption of textile goods in India. *J. Indian Merchants' Chamber (Bombay)*. 11-15.  
 – Race and immunity in India. *New Indian Antiquary*. 6, 29-33.  
 – Statistics in function space. *J. Indian. Math. Soc.*, 7, 76-88.
- 1944 The estimation of map distance from recombination values. *Annals Eugenics*, 12, 172-175.  
 – Soviet victory and the world revolution. *Indo-Soviet Journal*, 2, 6.  
 – The geometric method in mathematical statistics. *Am. Math Monthly*, 51, 382-389.  
 – The change in the Soviet constitution. *Indo-Soviet Journal*, 2 (9).  
 – Direct derivation of series spectra. *Curr. Sci.*, 13, 71.  
 – Caste and class in India. *Sci. Soc.*, 8, 243-249.  
 – Soviet Science. What can it teach us? *Indo-Soviet Journal*, 2, 11-13.  
 – George David Birkhoff. 1884-1944 (Obituary). *Math. Student*, 12, 116-120.
- 1945 Parallelism in the tensor analysis of partial differential equations. *Bull. Am. Math. Soc.*, 51, 293-296.  
 – The Raman effect. *People Age*.  
 – Some extant versions of Bhartrhari's Satakas. *JIBBRAS*, 21, 17-32.





- 1945 The Satakhatrayam of Bhartrhari with the commentary of Ramarsi. Ed. in collaboration with Pt. KV Krishnamoorthi Sharma, 2 + 140 + 6 + 1, *Anandashrama Sanskrit Series*, 127.
- The Parvasamgraha of the Mahabharata. *JAOS*, 66, 2, 110-117.
- 1946 The Law of large numbers. *Math. Student*, 14, 14-19.
- On the authorship of the Satakhatrayi : *JOR (Madras)*, 15, 64-77.
- Sur la differentiation covariante. *Comptes Rendus (Paris)*, 222, 211-213.
- Silver punch-marked coins with special reference to the East Khandesh Hoard. *J.Nu.Soc.Indian*, 8, 63-66.
- Early stages of the caste system in northern India, *JBBRAS*, 22, 33-48.
- The Southern Archetype of Epigrams ascribed to Bhartrhari. *Bhartiya Vidya Series*. 9, Bombay, 176 + 13 + 8.
- 1947 The Village community in the "old conquests" of Goa. *J.Univ. Bombay*, 15(4), 63-78.
- An extension of the least-squares method of statistical estimation. *Annals of Eugenics*, 13, 257-261.
- 1949 Les invariants differentiels d'un tenseur covariant a deux indices : *Comptes Rendus*, 225, 790-792.
- Differential invariants of a two index tensor. *Bull. Am. Math. Soc.*, 55, 90-94.
- Characteristic properties of series distributions. *Proc. Nat. Inst. Sci. (India)*, 15, 109-113.
- Lie Rings in Path-space. *Proc. Nat. Acad. Sci. (U.S.A.)*, 35, 389-394.
- The Avatara syncretism and possible sources of the Bhagvad Gita. *JBBRAS* 24-25, 121-134.
- Marxism and ancient Indian Culture. *ABORI*, 29, 271-277.
- 1950 On the origin of Brahmin Gotras. *JBBRAS* 26, 21-80.
- 1951 (With KULKARNI ED) Parvasamgraha figures for the Bhisma-Parvan. *JAOS*, 71, 21-25.
- Series expansions of continuous groups. *Quart. J. Math.*, 2, 244-257.
- Chronological order of punch-marked coins-II. The Bodenayakanur Hoard. *JBBRAS* 27, 214-218.
- Urvasi and Pururavas. *Ibid.*, 27, 1-30. Reprinted in *Indian Studies Past & Present*, 1, Calcutta 1959. 141-175.
- On a Marxist approach to Indian chronology. *ABORI*, 31, 258-266.
- (With RAGHAVACHARI S) Seasonal variations in the Indian birth-rate. *Ann. Eugenics*, 16, 165-192.
- Imperialism and Peace. *Monthly Review.*, 3, 45-49.
- 1952 Path-spaces admitting collineations. *Quart. J. Math. (2)*, 3, 1-11.
- The Cintamani-Saranika of Dasabala. *Supplement to JOR (Madras)*. 8 + 15.
- The Sanskrit equivalents of two Pali words. *ABORI*, 32, 53-60.
- Path Geometry and continuous groups. *Quart. J. Math.* 3, 307-320.
- Ancient Kosala and Magadha. *JBBRAS*, 27, 180-212.
- Science and freedom. *Monthly Review*, 4, 200-205.
- Geldner's Rgveda: *JOR (Madras)*, 291-295.
- Chronological order of punch-marked coins-III. The Paila Hoard. *JBBRAS*, 27, 261-271.
- 1953 Brahmin clans. *JAOS*. 73. 202-208.
- 1954 (With RAGHAVACHARO S) Seasonal variation in the Indian death rate. *Annals of Human Genetics*. 19, 100-119.
- The Periodization of Indian History. *ISCUS*, 1, 40-55.
- Note on the class structure of India. *Monthly Rev.*, 6, 205-213, 109.
- The metric in path space. *Tensor (New Series)*, 3, 67-74.
- 1955 What constitutes Indian History? *ABORI*, 35, 194-201.
- The basis of ancient Indian History. *JAOS*, 1, 75.
- The working class in the Amarakosa. *JOR (Madras)*, 24, 57-69.
- 1956 Origins of feudalism in Kashmir. *JBBRAS (Sardhasatabdi Volume)* 108-120.
- On the development of feudalism in India : *ABORI*, 36, 258-269.
- Introduction to the study of Indian History. *Popular Book Depot, Bombay*.
- 1957 The Subjasitaratnakosa of Vidyakara. *HOS*, 42 (Ed-wi GOKHALE VV)
- Exasperating Essays. *People's Book House, Poona*.
- Dhenukakata. *JBBRAS*, 30, 50-71.
- The basis of despotism. *Economic Weekly (Bombay)*, 2, 1417-9.





- 1958 Indo-Ariskii Nosovoi Ukazatel' : *Sovetskaya Etnografia (AK Nauk USSR)*, 1, 39-57.
- Classical Tauberian theorems. *J. Indian Soc. Ag. Stats*, 10, 141-149.
  - (With RAO UVR) The efficiency of randomization by card shuffling. *J. Royal Stat. Soc.* 121-ii, 223-233.
  - The text of the Arthasastra. *JAOS*, 78, 169-173.
- 1959 The method of least squares. (Chinese text, *AC.Sinica* unknown publication) *J. Indian Soc. Agric. Statistics*, 11, 40-57.
- Notes on the Kandahar edict of Asoka. *JESHO*, 2, 204-6.
  - China's communes. *Monthly Rev.*, 10, 425-429.
  - Primitive communism. *New Age*, 8(2), 26-39.
  - Indian feudal trade charters. *JESHO*, 2, 281-293.
  - An application of stochastic convergence. *J. Indian Soc. Ag. Stats*, 11, 58-72.
- 1960 At the crossroads. *JRAS (London)*, 17-31, 135-144.
- 1961 Social and Economic Aspects of the Bhagvad-Gita. *JESHO*, 4, 198-224.
- 1962 Kaniska and the Saka era. *Marg*, (also *JBBRAS*), 35, 36-37.
- Myth & Reality Studies in the formation of Indian culture, Bombay.
  - Pierced microliths from the western Deccan plateau. *Man*, 4, 10-12.
  - Megaliths in the Poona district, *Ibid*, No.108, 65-7+ plates.
  - (With DUCRAY S) Normal sequences *J. Univ. Bombay*, 31, 1-4.
- 1963 The sampling distribution of primes. *Proc. Nat. Acad. Sciences (USA)*, 49, 20-23.
- Combined methods in Indology. *Indo-Iranian Journal*, 6, 177-202.
  - Adventure into the unknown, *Asian Thoughts*.
  - Prehistoric Rock Engravings near Poona. *Man note*, 60, 57-8.
  - The autochthonous element in the Mahabharata. *JAOS*, 8, 31-44.
  - An inscription at Palasdev of Saka 1079. *JBBRAS*, 38, 69-73.
  - Staple 'Grains' in the western Deccan. *Man note*, 156, 130-131.
  - The beginning of the iron age in India. *IJESHO*, 6, 309-318.
- 1964 Statistical methods in number theory. *J. Indian Soc. Ag. Stats*, 16, 126-135.
- (With DUCRAY S) Probability and prime numbers. *Proc. Indian Acad. Soc.*, A 60, 159-164.
  - Review of FR Allchin's Pikhilal excavations. *Man*, 163-164.
  - The passionate adventure of Dr. Einstein. *Times of India*.
- 1965 The Culture & Civilization of Ancient India in historical outline.
- German translation (to appear).
- English version : London (Routledge & Kegan Paul), 1965.
- French translation (to appear).
- Japanese translation by T Yamasaki (Iwanami & Co. 1966).
- (With DUCRAY S). The sequence of primes. *Proc. Nat. Acad. Sci.*, A.62, 145-149.
  - The Historical Krishna. *Times of India Annual*. 27-36.
  - An Asokan Pillar/Banaras mystery. *Times of India (Daily)*.
  - Numismatics as a science. *Scientific American*.
- 1967 The vedic 'Five Tribes'. *JAOS*, 87, 33-39.
- Chronological order of punch-marked coins of the Amaravati Hoard.
  - Living pre-history in India. *Scientific American*.
  - The line of Arthasastra Teachers.
  - Prime Numbers. Monograph completed a few days before the author's death. Not yet published.
  - Ancient India. A History of its Culture & Civilization. 243. 89 pl. New York (Pantheon Books).
- 1969 (With MASSON JL) The Avimarbka of Bhasa. Motilal Banarsidas, New Delhi.

